DIJ /Nishogakusha U. Seminar "Pathways to Innovation"
Session V May 20th-21th, 2002

R&D and innovation by the Japanese firms in Japan and foreign countries, especially in Asian countries

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(1) Conventional R&D strategy of Japanese firms

- Conventional R&D strategy by Japanese firms was preserving the most important R&D within the central research institute of parent companies in Japan.
- Successful automobile companies established joint R&D system of developing key parts in cooperation with qualified parts suppliers.

(2) Difficulty and change of Japanese firms' R&D strategy

- Good performance of Japan's R&D in the 1980s and its deterioration in the 1990s in comparison with US R&D
- Japanese firms have lost their confidence on their R&D system through the period of the long lasting recession in the 1990s.
- The "Modularity" of products and optimum combination (architecture) of "Modules" based on "ICT revolution" has effected severely on Japanese firms' production system and R&D system since the beginning of the 1990s.

(3) Stagnant performance of R&D expenditure in the 1990s (DBJ)

- **The real growth rate of R&D expenditure by Japanese private firms was 9.2% in the 1980s (FY 1981 to 1990) and the rate was declined to 1.2% in the 1990s (FY 1991 to 2000).**
- **The contribution of R&D expenditure in the 1990s on labor productivity in Japan was very weak while other empirical results found clear contribution of R&D expenditure in the consolidated period of the 1980s and the 1990s.**

(4) The impact of The “Modularity” of products and optimum combination (architecture) of “Modules” on Japanese firms (1)

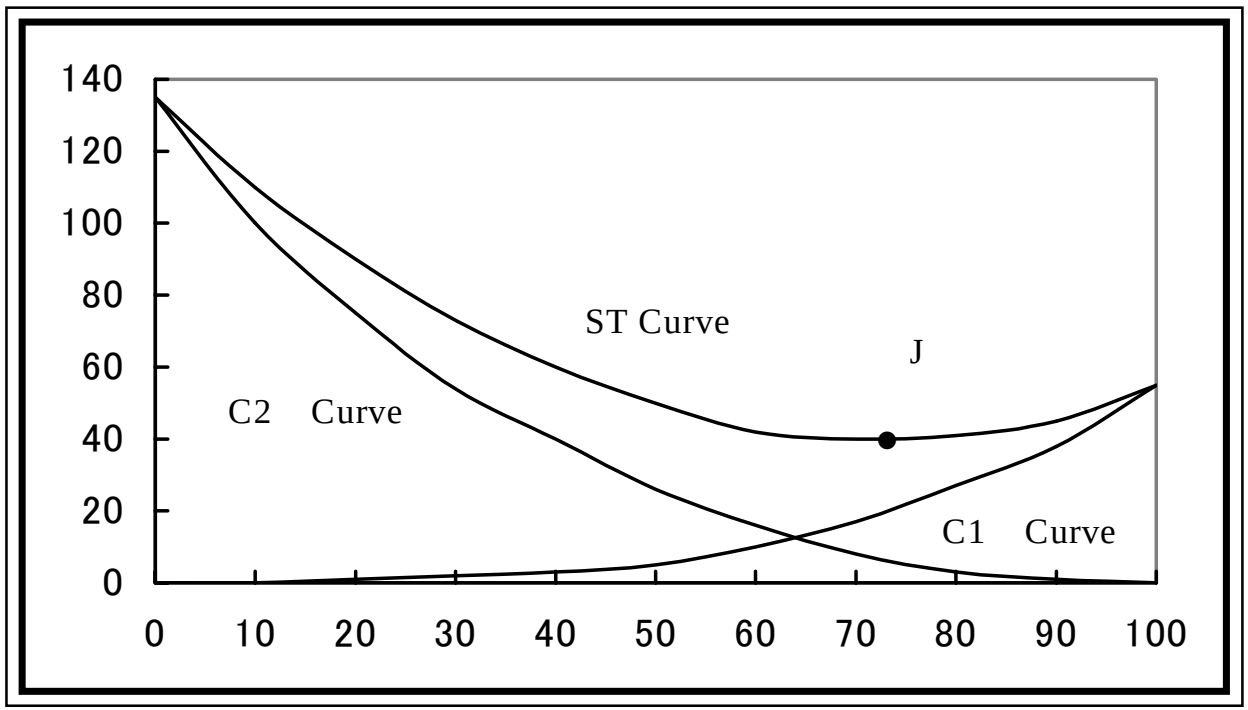
- The “Modularity” and the excellent architecture of modules mean a continuous process of transforming complicated “Specialty,” which is differentiated goods for specified usage in the sense of O. Williamson, into “Commodity” products
- The “Modularity” and the excellent architecture of modules mean that R&D is continuously accomplished for creating new modules and, furthermore, creating good combination of independent modules

(5) The impact of The “Modularity” of products and optimum combination (architecture) of “Modules” on Japanese firms (2)

- Japanese firms have their “ownership advantage” in producing well-qualified parts, which have nature of “specialty“, and in assembling those parts into well-qualified final products, which have also nature of “specialty.”
- The ownership advantage of Japanese firms is originated from their system to minimize the sum of market transaction cost and intra-firm transaction cost of “specialty” through achieving stable transaction with their suppliers over the long-term period upon condition of periodical re-negotiation between the both parties from time to time (see Tejima, 1996, 1998, 2000 and 2002).

(6) Figure 1 Japanese firms' total transaction cost (preserving long-term transaction>short-term opportunistic profit)

Figure 1 Japanese firms' total transaction cost



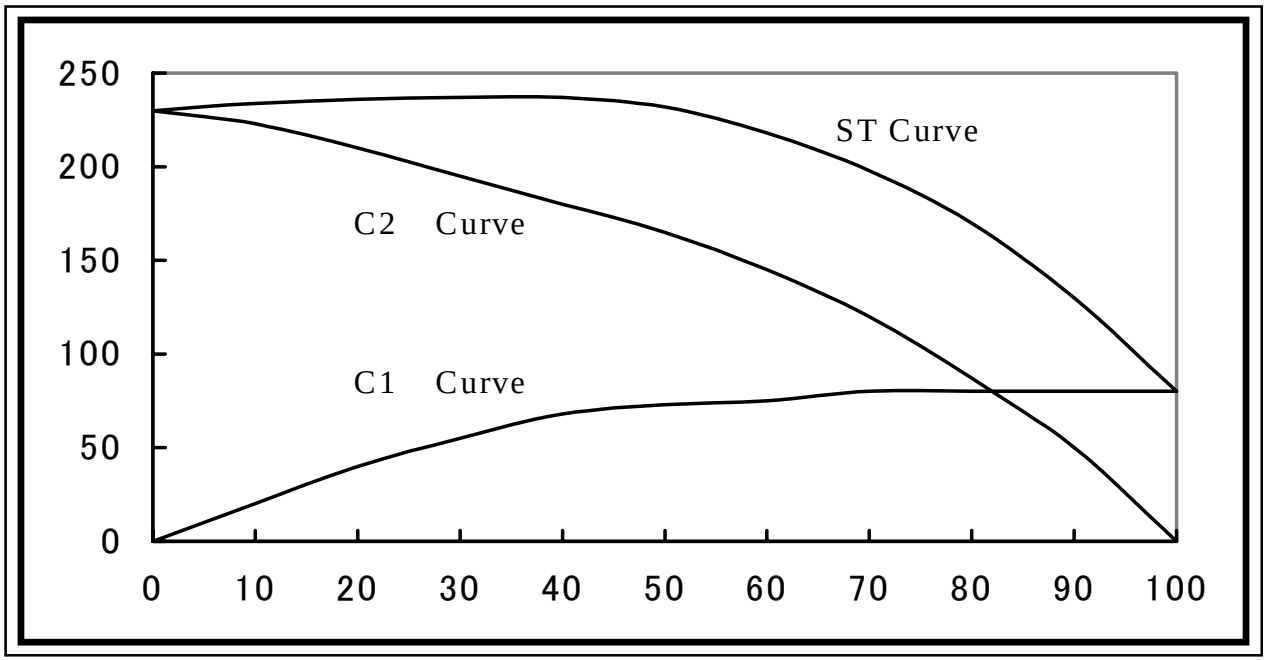
The share (α) of internal parts production by the company itself in the total parts procurement (Made by Author of this paper)

(7) Figure 2 Western firms' total transaction cost (preserving long-term transaction<short-term opportunistic profit)

Figure 2 Western firms' total transaction cost

intra-firm transection cost (C1)

market transection cost (C2)



The share (α) of internal parts production by the company itself in the total parts procurement (Made by Author of this paper)

(8) The impact of The “Modularity” of products and optimum combination (architecture) of “Modules” on Japanese firms (3)

- The ownership advantage based on reduction of transaction costs is still the origin of prominent competitiveness of Japanese firms in automobile industry and some types of electronics and IT industry.
- However, the appearance of “Modularity” based on “IT revolution” has reduced Japanese ownership advantage through processing the former-specialty goods to commodity goods

(9) The impact of The “Modularity” of products and optimum combination (architecture) of “Modules” on Japanese firms (4)

- “Modularity” gives much opportunity for Western firms to obtain good performance in R&D.
- Western firms concentrated on R&D of “new modules” and “new architecture” of modules, leaving production of those products to manufacturer, which can do the business at the lowest cost in the world.

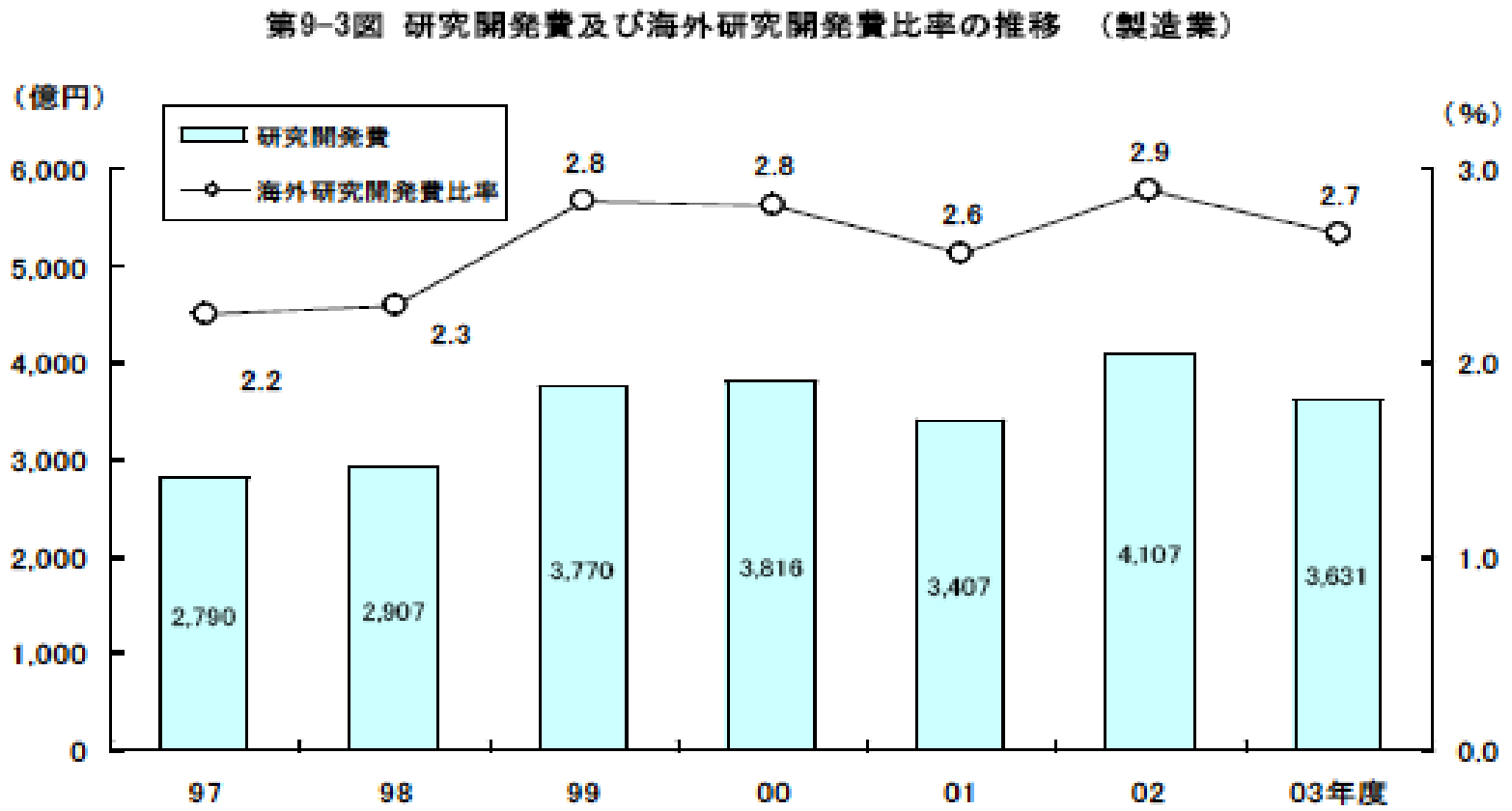
(10) Struggle for New R&D strategy of Japanese firms (1)

- **Reflecting prominent growth of US firms' innovative capacity in the 1990s, Japanese firms have tried to turn to US R&D system, including more open and cooperative R&D with unrelated companies, involving strategic alliance and M&A with domestic and foreign firms in R&D field while maintaining conventional R&D system between assembling firms and parts suppliers in automobile industry.**

(11) Struggle for New R&D strategy of Japanese firms (2)

- The most advanced R&D may be achieved in other developed countries for developing the new products, which can be accepted globally by sophisticated consumers in the world
- In Asian countries, Japanese firms try to utilize the location advantage of host countries through employing abundant and lower waged human resources for local R&D works in their foreign affiliates. Their R&D works shall be mainly designing some types of products, which can be responding rapidly and appropriately to growing local market.

(12) Figure 3: Japan's overseas R&D expenditure (100million Japanese Yen) and the ratio of overseas R&D expenditure to total R&D expenditure (METI)



(13) Table 1: The Average R&D expenditure per one company by region (million Japanese Yen) (METI)

Region FY	2000	2001	2002	2003
Total	415	385	405	344
North America	893	720	914	690
Asia	86	95	93	102
Europe	501	843	626	660

(14) Annual questionnaire surveys by Japan Bank for International Cooperation (JBIC)

- North America and European Union shall be more promising destination in both basic research over the long term period and development for new products and improvement of existing products over the short and medium term period than other regions, based on the 2002 survey.
- The development of new product is still stronger FDI motivation in the USA than in Asia, based on the 2004 survey.

(15) R&D projects implemented by Japanese TNCs through their affiliates in North America (NRI)

- basic research in the field of medical science, biotechnology and nanotechnology
- R&D expenditure by automobile firms for achieving local development and commercial production of new products
- R&D expenditure in many fields for developing new products, which are sensitively responding to the taste of local markets of developed countries

(16) R&D projects implemented by Japanese TNCs through their affiliates in China (NRI)

- R&D expenditure implemented for developing new products
- R&D expenditure by automobile firms for accomplishing local development and commercial production of new products
- R&D projects under University-Industry Interactions with Universities in China
- R&D center established in China for preserving Chinese engineers

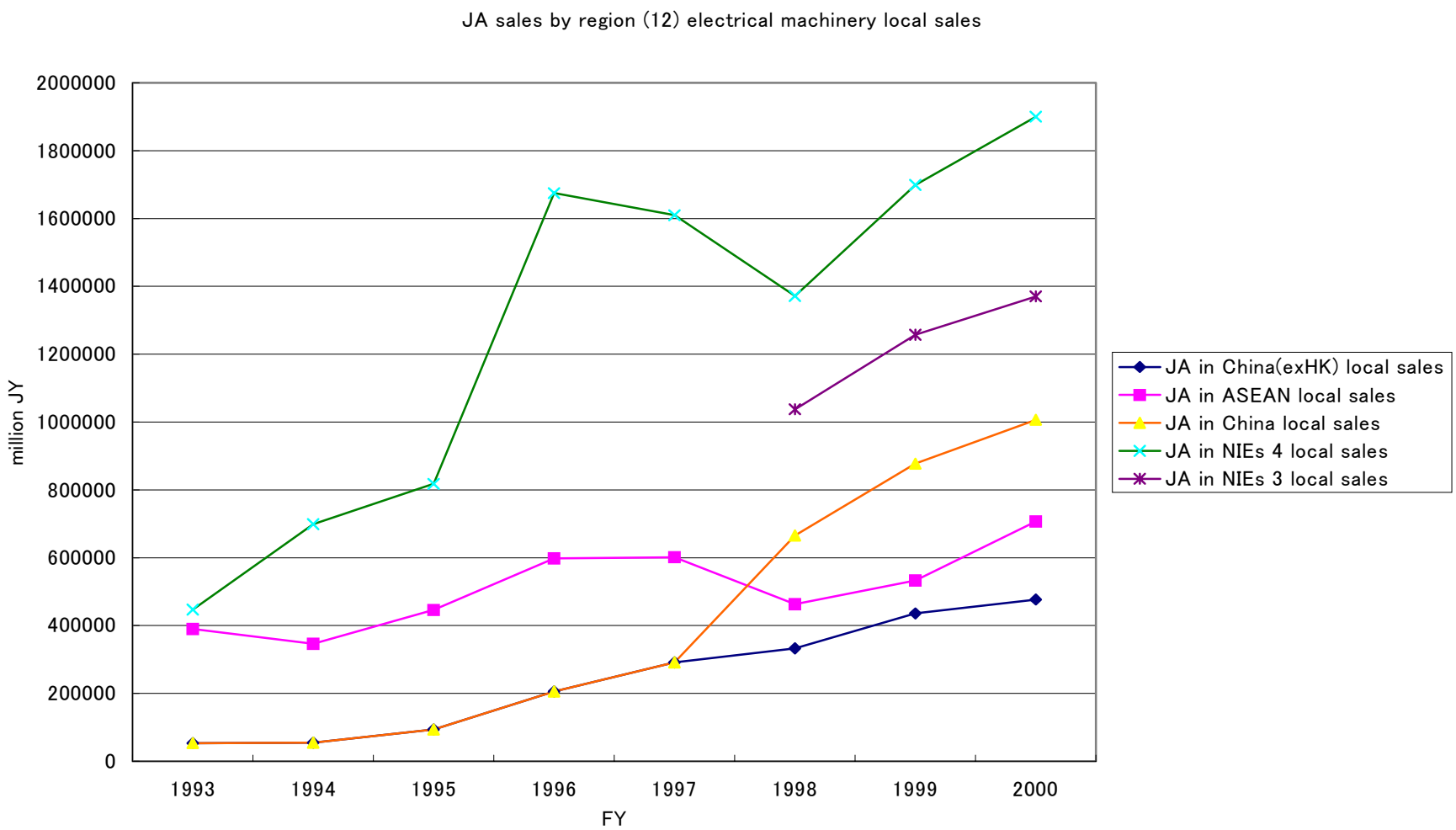
(17) R&D projects implemented by Japanese TNCs through their affiliates in ASEAN and other Asia (NRI)

- R&D projects under University-Industry Interactions in Singapore
- R&D projects of developing new products, which are accepted in local markets, for strengthen production and sales bases in Thailand, Malaysia, Vietnam and India
- R&D projects under alliance with local IT venture firms in Taiwan.

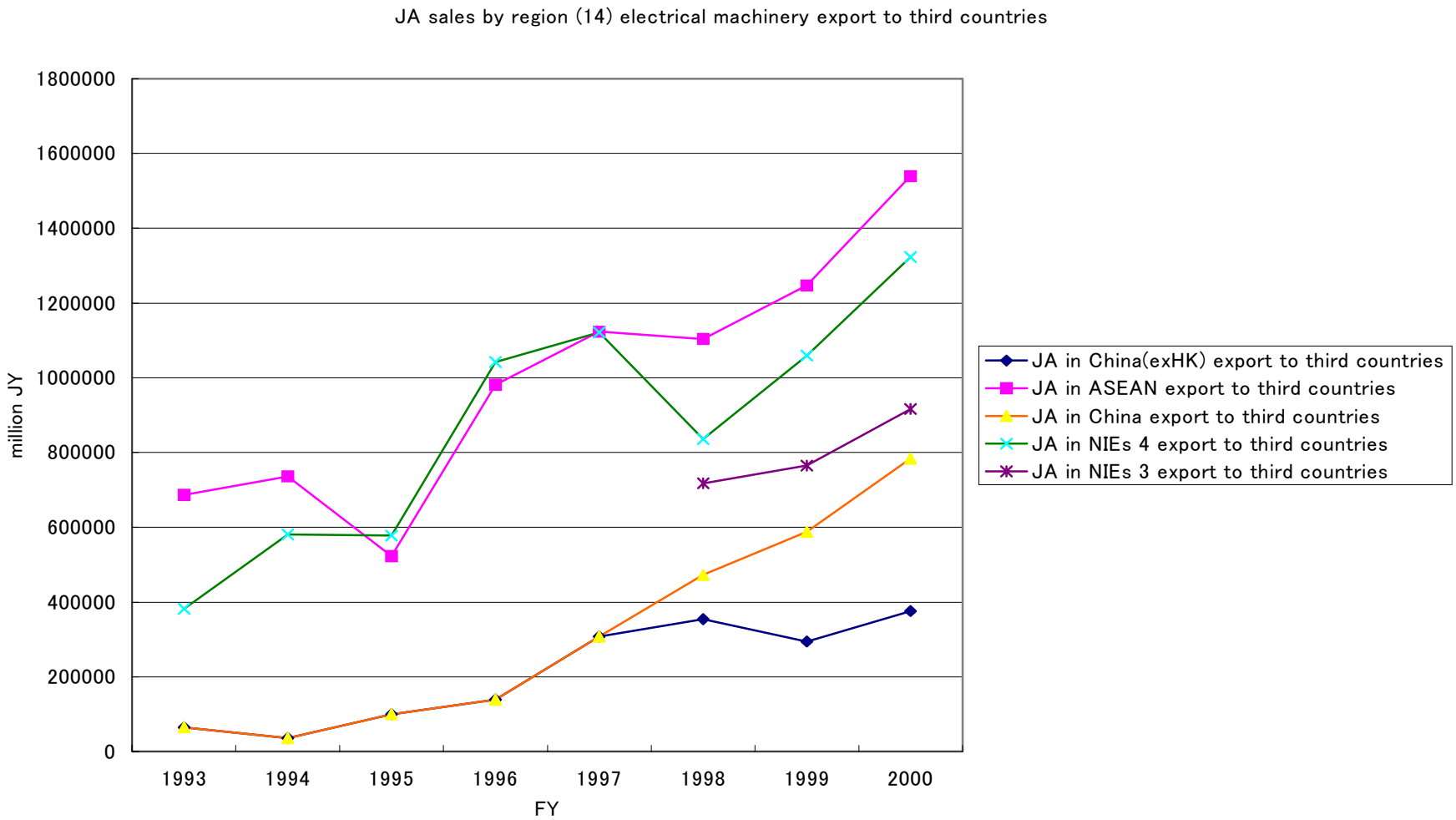
(18) Japanese firms' R&D in ASEAN Countries in comparison with China

- **ASEAN countries are in competition with China for attracting Japanese firms' R&D activity, especially, in the transportation machinery (automobile) industry and electric machinery industry, including ICT, because ASEAN and China is competing in attracting Japan's FDI for constructing production and sales bases in the transportation machinery industry and electric machinery industry, including ICT industry.**

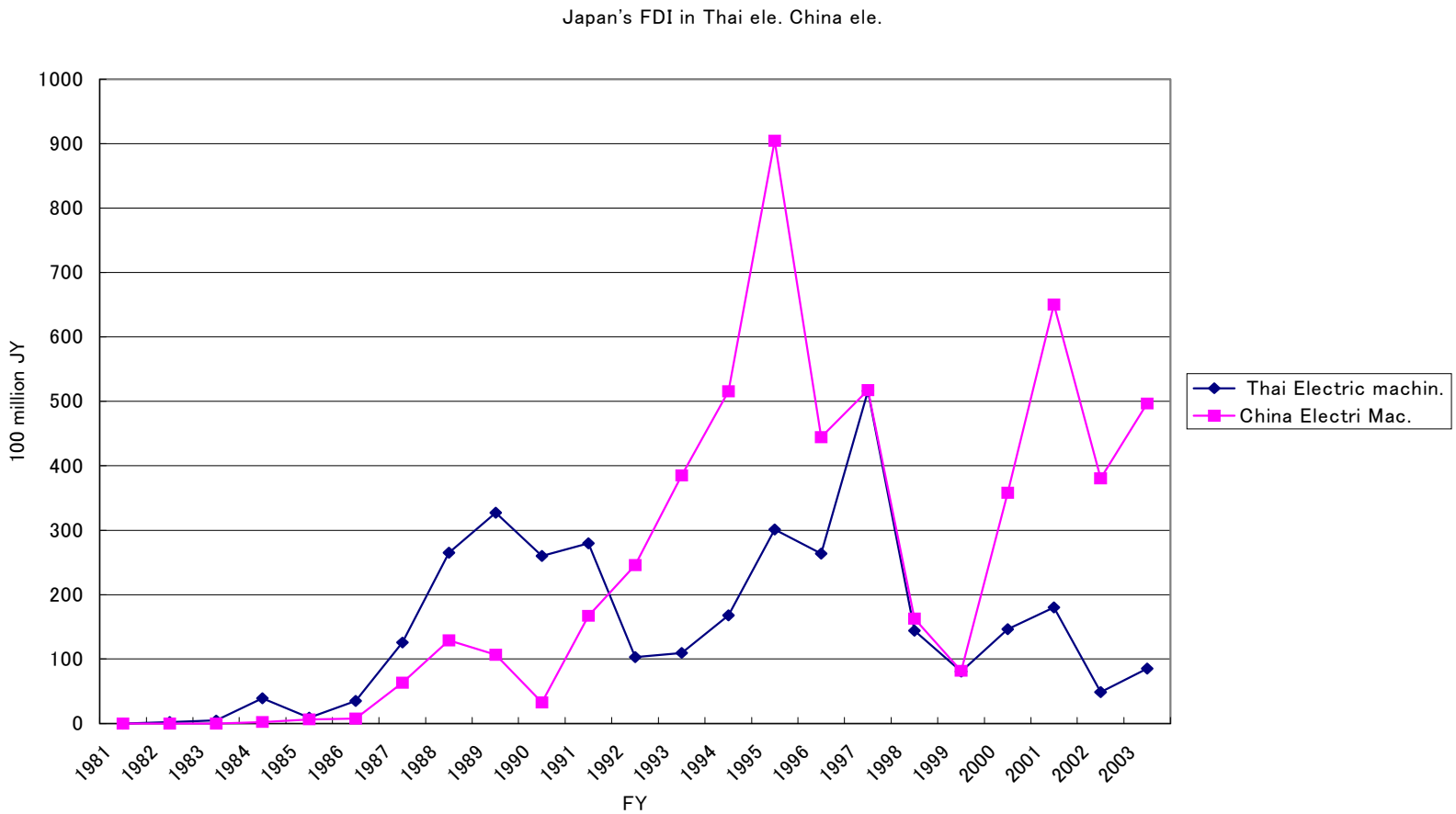
(19) Figure 4: Local sales by Japanese affiliates in China, ASEAN and NIEs in the electric machinery industry (compiled with METI data)



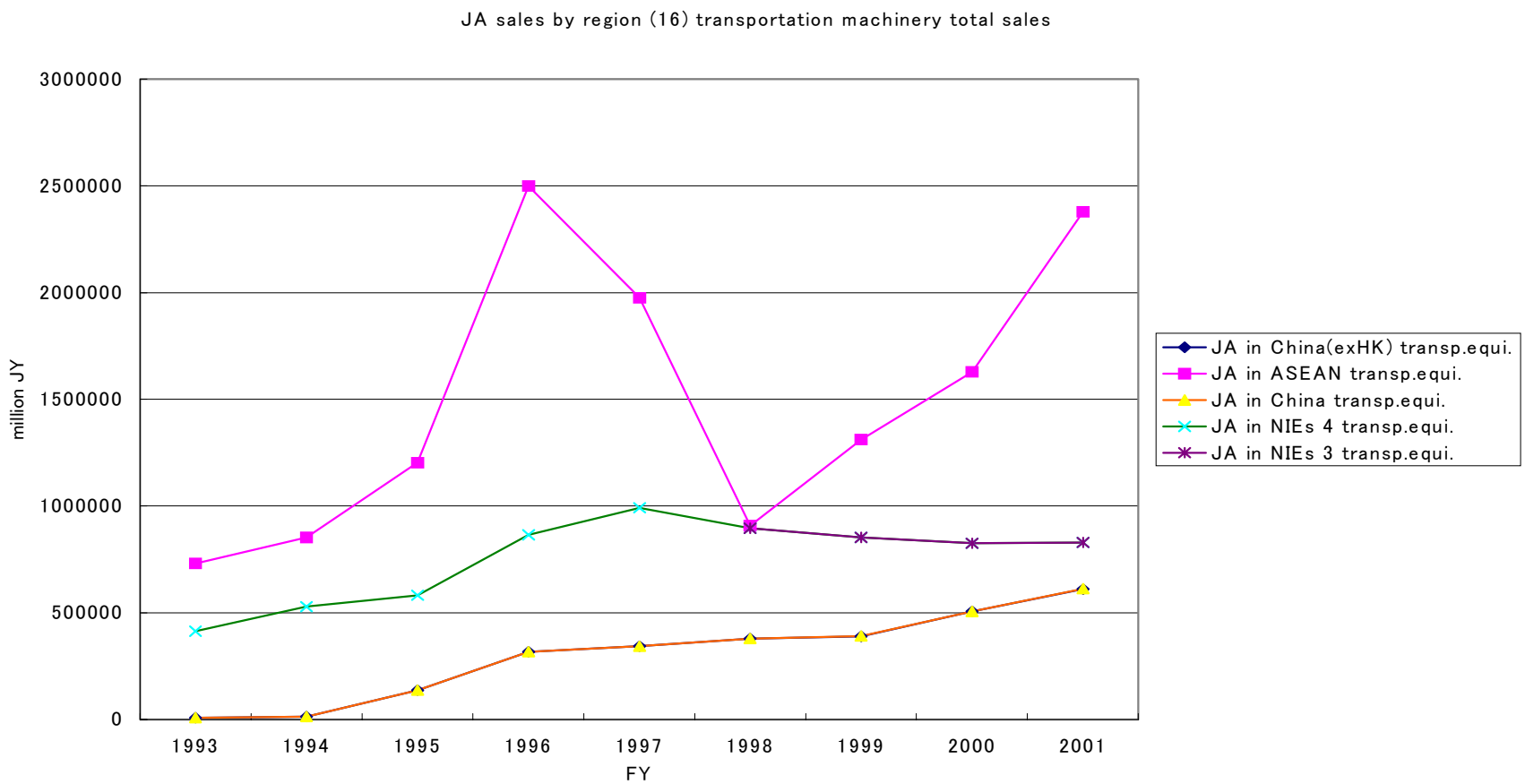
(20) Figure 5: Export sales by Japanese affiliates in China, ASEAN and NIEs in the electric machinery industry (compiled with METI data)



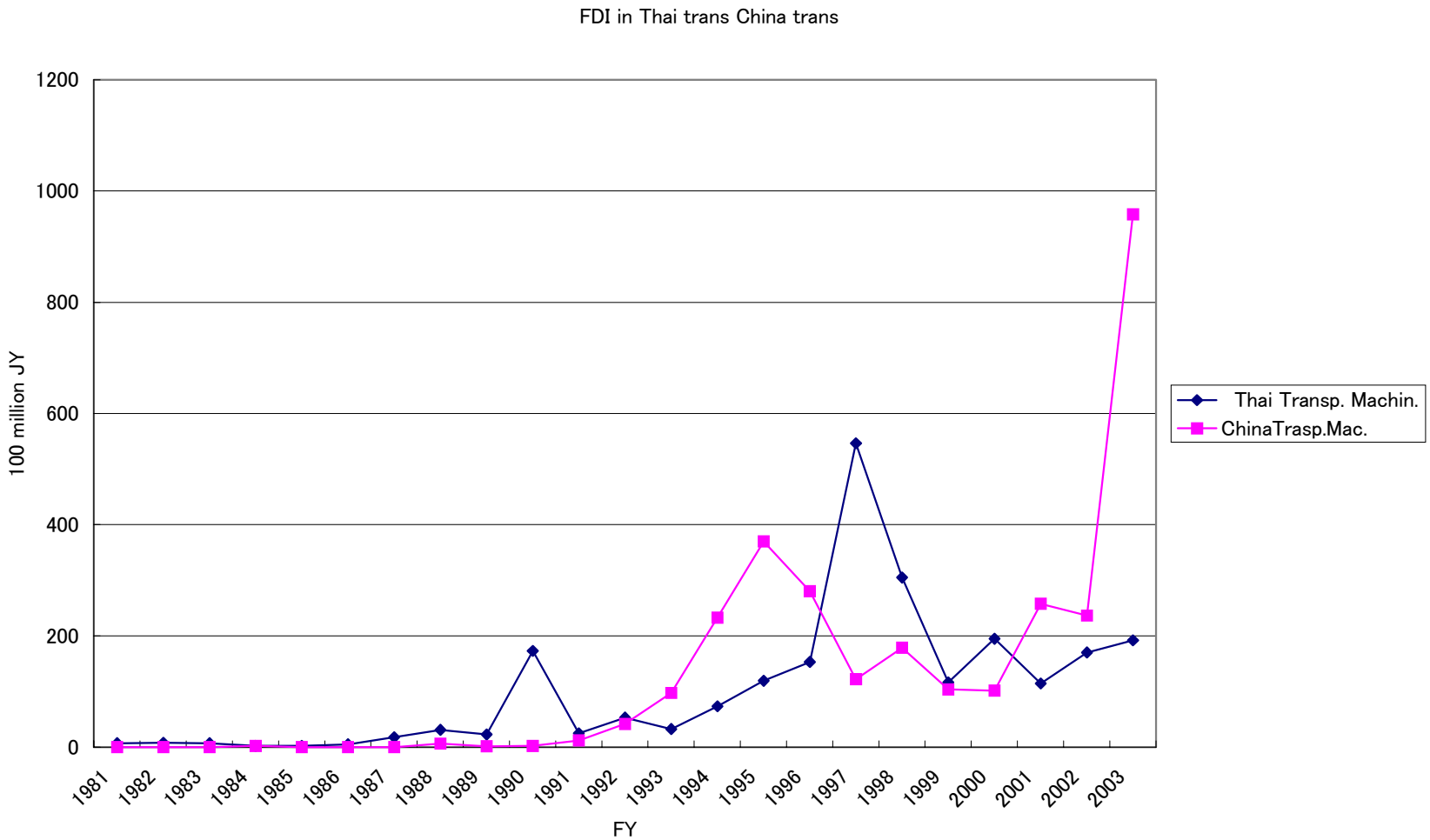
(21) Figure 6: Japan's FDI in Thailand and China in the electric machinery industry (compiled with MOF data)



(22) Figure 7: Total sales by Japanese affiliates in China, ASEAN and NIEs in the transportation machinery (automobile) industry (compiled with METI data)



(23) Figure 8: Japan's FDI in Thailand and China in the transportation machinery industry (compiled with MOF data)



(24) Japanese firms' FDI strategy in China

- Japanese firms may have a belief, in recent days, that they should take a good portion of the high growing markets of China for their taking advantages in competition with Western firms, because Japanese firms have already established considerable production and sales networks in developed countries and ASEAN.

(25) Japanese firms' FDI and R&D strategy in China

- More FDI in China, which is stimulated by strong expectation among Japanese TNCs' on growing China market, cause more R&D and FDI in China than in ASEAN, because most of R&D projects implemented by Japanese firms is aiming at increasing production and sales in Asian market.

(26) Competitiveness of Chinese firms

- **first, through receiving effectively technology transfer from Japanese and Western firms**
- **second, through outsourcing standardized modules and architecture from foreign firms, including Japanese and Taiwanese firms, and**
- **third, through utilizing well abundant and low waged human resources**
- **They accelerate “transformation to commodity” of new “specialty” products, which are developed by Japanese firms as “differentiated goods”, and offer their “standardized commodity product” with far lower price in Asian markets.**

(27)Three FDI and R&D strategies by Japanese firms, responding to Chinese low price policy

- First, to develop continuously higher value added and more sophisticated products than before and to offer continuously those new valuable products in Asian market
- Second, to develop new models of products, which have more price competitiveness than original Japanese products
- Third, to construct global export bases in Asia

(28) Some Policy Implications for Asia and Japan

- **Japanese firms can and should utilize fully the location advantage of national innovation system of Asian host countries for achieving the objective of their complementary reinforcing production, sales, R&D and innovation capability through positive FDI in the field of R&D expenditure**
- **Asian countries can be promising destination of Japan's FDI, including R&D expenditure, if they can offer, first, the growing large-scale markets for higher value added products, second, substantial accumulation of parts suppliers, which offer wide variety of well qualified and reasonably priced parts and, third, well-trained human resources.**