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Problems of technology transfer from CSIR laboratories to industry and policy issues in India and Korea

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This paper is an attempt to review the development of indigenous technology in India and Korea over the last forty years. It identifies the problems of technology transfer that the Indian national laboratories are facing. Indian technology does not have strong linkages with the industry with the result the utilization of the research is limited. Protection to domestic industry has been given so long that India could not catch up advances abroad. Whereas Korea made tremendous progress over the years because of its target oriented export policy. Korea became world leader in Semiconductor and left India far behind. On the other hand for India situation became worst after sudden liberalization during 1991 when the import of technology became liberal and indigenous technology had to compete with the mighty multinationals. Some of the industries vanished from the market due to tough competition. This is the high time that India should drastically change her research priorities to face the liberalization. What is required, that India should concentrate on areas where it has build up capabilities and excellence over the years, like software industry in computers. Secondly India should establish strong linkages with the industry to make value additions in the imported technologies.

Keywords: science, technology, CSIR laboratories, National Development Research Corporation, technology transfer

1. Introduction

Achievement of self-reliance has been one of the declared goals of India's development plans. Since technology is basic to any process development, the self-reliance would not be complete without technological independence. This recognition has led to evolution of policies geared to strengthen local technological capability to ultimately achieve technological self-reliance. The industrial trade and fiscal policies pursued over the past four decades have contained policy instruments directly or indirectly concerning technological development. Besides these, the Scientific Policy Resolution, 1958[1], laying down the framework for development of infrastructure for technological development and the Technology Policy Statement of 1983[2], retreating the goal of technological self-reliance and providing a broad perspective and guidelines for the policy instruments have been enunciated.

The *modus operandi* of the technology policy thus evolved has been two pronged as in the case of industrial development in general. They have sought to provide to local technology/

[1] India is the first country in the world, which has passed the Scientific Policy Resolution by the Parliament under the leadership of the first Prime Minister of India Pt. Jawahar Lal Nehru.

[2] Technology Policy Statement was issued by the Department of Science and Technology in Jan. 1983. It emphasized the need to plan technical collaborations agreements in ways that would ensure effective transfer of basic knowledge.

skill from the imported ones on one hand. On the other hand, the local generation of technology has been sought to be accelerated directly and indirectly. The technological capability that has been generated as a result of these policies is no doubt immense and has brought the country near the technological self-reliance in a number of industries. India has even been able to export a wide range of technologies and projects to other developing countries. There are some other areas however, where technological self-reliance is nowhere in sight and the technological gap has in fact widened over the years, for instance in the microelectronics.

In 1991 the Indian policy has taken a sharp turn in favor of liberalization. Government had given advantages to transnational corporations to attract foreign investment. Whereas Korea preferred not to suddenly open the floodgates for transnational corporations, instead their operations were consciously regulated to minimize the negative feature and induce /force them to contribute to the growth of economy. Korea has taken a slightly different route by adopting target oriented export policy and entered into OEM[3] arrangements with advanced countries to promote the business network. With a meagre of $89 million in 1971 Korean electronics exports grew to $20.683 billion in 1992 an increase by a factor of 232[4]. Korea became world leader in Semiconductors.

In this paper an attempt has been made to probe whether transnational corporations in India are responding to liberalization by investing primarily for export market or for the domestic market and examines the future prospects for export-oriented foreign investments. It also explores whether entry of the transnational corporation is beneficial for the country.

The paper discusses the aims of the technology policy of India from 1960s onwards; problems of technology transfer from laboratory to industry; impact of liberalization on technological change in the Indian industry and Korean model of target oriented exports in the context of the government policy.

2. Aims of technology import policy of India from 1960s onwards.

Indian technology policy is determined by the self-reliance objectives of developmental planning. The basic approach has been an inward looking one, which in relation to technology transfer has meant the adoption of policy measures to prevent foreign ownership, to control productive activities, to unbundle technology package, to internalize skills and institutional structures, to acquire self confidence to meet its own needs increasingly and then to look outwards and extend co-operation in technology matters to other third world countries (Subrahmaniam, 1986).

In pursuit of this approach, administrative guidelines and procedures have been used for regulating transfer of technology on a selective basis. Every permissible import of technology is screened and approved by considering its mechanism and terms of the transfer and its impact on local technological development and balance of payments.

Indian policy concerning technology transfer has evolved through a number of stages. In the first stage, until 1968, foreign collaborations agreements were approved through administrative procedures based primarily on foreign exchange considerations. More detailed procedures for screening collaborative agreements including technical evaluation and registering

[3] OEM (Original Equipment Manufacturing) is a kind of arrangement with the foreign firms where they put there trade mark on Korean products.

[4] Dataquest (American magazine). September 1993.

were established in the second stage between 1969 and 1978. In the third stage initiated in 1978, a more liberal policy has been adopted. Out of more than 6,500 collaborations approved between 1950 and 1980, around 84 per cent of cases did not entail any foreign ownership participation. Technological collaboration (licensing) agreement has thus been the major formal mechanism used for technology transfer. (Subrahmaniam, 1986).

Simultaneously with a policy of selective imports of technology, Indian technology policy has been aimed at stimulating indigenous technologies/developments. The policy measures used can be classified as either compulsive or incentive. Examples of the first type are; 1) forbidding import of technology available locally without much time lag, 2) stipulation of target oriented indigenisation of production, 3) strict scrutiny of applications for renewals of collaboration agreements, 4) tax rebates and other incentives for implant R&D and 5) increased state outlays on strengthening indigenous science and technology (S&T) systems.

The compulsive instruments must have exerted environmental pressures on the firms towards moving rapidly on technology-independence continuum by assimilation and adaptation of imported design and manufacturing processes. Ability to learn and assimilate technology must have been raised by the government's initiatives on subsidizing and strengthening technological infrastructure over time (Pillai, 1979).

At the same time the learning process would be constrained if excessively the restrictive conditions were imposed on the use of imported technology by the government of the host country. Detailed information about restrictive clauses in agreements approved by the government of India not available. The ones approved upon the sixties invariably had such limiting clauses.

2.1. Promotion of indigenous technology

In order to encourage the indigenously developed know-how and promote in-house R&D various policy measures have been adopted by the government. Mainly two types of policies affect R&D activity and its commercial exploitation. Firstly, those measures which are offered by the government in order to promote in-house R&D activity and the incentives offered by National Development Research Corporation (NRDC)[5] to firms and entrepreneurs to purchase locally developed technologies. Second, protection offered to indigenous know-how against foreign know-how by the licensing mechanisms.

The incentives offered to in-house R&D were quite wide. Complete income tax exemption was given to expenses incurred by a firm on R&D activities. Weighted deduction in taxes was also offered to expenses incurred by a private firm, which sponsored research in a national laboratory of CSIR[6] or a research association or an institution approved by the "prescribed authority" of the government in the field. A forty per cent deduction in computation of income and tax thereon is also made on income from royalty, technical fees etc. If the firm secures this income by providing know-how to foreign firm outside the country, the entire amount was deductible from income tax. A highly liberal policy of import of equipment, instruments and raw materials and spare parts needed for doing research by the research organizations recognized by the prescribed authority was also offered.

[5] NRDC is the key agency in the country mainly responsible for transferring research know-how to industry.

[6] CSIR is the biggest agency in the country responsible for industrial research. It has about forty national laboratories under its administrative control doing research in various disciplines like Physical Sciences, Chemical Sciences, Biological Sciences, Earth Sciences and Engineering Sciences. The CSIR is hundred percent funded by the government of India.

In 1976 this policy was further liberalized and private firms registered and recognized by the Department of Science and Technology (DST)[7] as having definite research schemes were allowed to import equipment, etc. needed for R&D work up to a value of Rs 100,000 without any import license. There were about 348 private firms and 20 public sector firms in 1976 which were recognized by DST as having facilities on in-house R&D expenses claimed by these firms, as R&D expenses in 1976 were around Rs 500 million (CSIR, 1979).

NRDC the organization mainly responsible for developing and marketing processes developed at CSIR laboratories also offers a number of services for purchase of know-how. Since the development of pilot plant prototype, demonstration plant, etc. add substantially to the total cost of developing the new technology and may constitute a crucial element in entrepreneurial decision to switch over to new technology, NRDC shares 50 percent of the cost incurred in these steps. Such a decision must be endorsed by the DST. Tax concessions were also offered to the entrepreneur on whatever expenses he incurred in these steps. The NRDC also offers a guarantee for performance of the new technology on a commercial scale and also helps with other services like obtaining imported equipment, materials and components and sometimes obtaining financial loans.

Among the indirect measures of protection offered to indigenous know-how, there were following types of regulation mechanisms: Industrial licensing, import and export stipulations differential laws of corporate taxation and control of foreign collaboration. (Subrahmaniam, 1972; Kidron, 1964 and Hazari, 1968) The general guidelines for control of foreign know-how and capital are specified in Industries (Development and Regulation) Act of 1951, the various Industrial Policy Resolutions and the policy statements of 1948, 1956, 1973 and 1977.

The emphasis and the focus of the control mechanism has shifted in different documents and these shifts have been interpreted differently in the studies made on the subject. Without going into the details of changing nature of the control mechanism we would present here its salient features.

Since the beginning the main thrust of the control of know-how on investment had been through the licensing device. All applications for foreign collaboration, and incorporation of foreign capital had to be submitted to the government and approved by the (inter-ministerial committee) Foreign Agreement Committee. In order to regulate the direction of agreement of technological change, the Foreign Investment Board of the Ministry of Industry had identified areas of industrial activity where foreign participation in know-how or capital or both are not needed. The Board also identified areas in which the country could be considered relatively self sufficient and no new technology was allowed to be imported. The government's licensing committee, however, had never interfered between the foreign collaborator and the local firm as a bargainer. It simply had the power of approving or rejecting the terms of the proposed collaboration. Such a mechanism had obviously its own limitations (Bhagwati and Desai, 1970).

But the main success of this device, it has been noted, that the government had been able to cut down the foreign costs of collaboration by regulating the terms of payments and royalties (NCAER, 1971).

Government has been successful in some cases in obtaining a progressive dilution of the foreign share holding, in deleting clauses banning exports, in preventing the use of brand

[7] DST is the government department responsible for funding of sponsored projects to various disciplines of science and technology at Universities and research institutions in the country. It also looks after the international cooperation in science and technology with other countries.

names and in insisting on the involvement of local design consultants. The government, in order to protect know-how had also put the representative of the CSIR in the licensing committee, which sanctioned the applications for collaboration. Differential laws of corporate taxation have also been stipulated for Indian and foreign firms as a measures of control of foreign know-how.

2.2. Problems with regard to technology transfer

Problems of technology transfer can be discussed at two levels. First, at the laboratory level where right from the inception of the R&D project to its completion, secondly, when it is ready for commercial exploitation. Technology transfer is done through various transfer institutions like NRDC and TUD (Technology Utilization Division)[8]. Before that an assessment of the market demand and competition with the foreign technology is undertaken.

First, let us discuss the problems of technology transfer at the laboratory level. In a few CSIR laboratories efforts have been made to undertake studies on cost-benefit analysis, techno-economic feasibility, market demand and assessment of social needs for specific research programs[9]. The needs of the research and development are generally perceived by scientists on the basis of their knowledge in the area of research. Scientists are not sure about the economic feasibility of the inventions to be developed before the research is performed and actual bench scale results are obtained. Further, scientists are mostly concerned with the publication of the results of their research rather than with pursuing the planning of R&D activities beyond bench scale results for opening up opportunities for commercialization.

Moreover, a research project in which the whole range of technology transfer consists of detailed planning and complexity of management, which the scientists are reluctant to undertake. Some of them believe that planning is antithetical to scientific research itself. Furthermore, applied research is multi-disciplinary in nature requiring co-operation of a number of scientists and technicians.

In the operation of the project, the boundaries between research divisions are rarely transcended, inter-divisional co-operation is accepted in principle by the scientists yet it has not been achieved in practice[10]. The scientists' fears that a research project, involving high expenditure will not find favour from the authority. Finally the scientists do not have the business approach, they have not been trained for it. This is evident from the research results of the laboratories presented by them. These economic assessments have been rudimentary. Cost-benefit analysis has been worked out by manipulating figures, which are favourable to the research results. The investment figure for commercializing the results is underestimated while profits from production are overestimated (Tilak, 1972).

[8] Technology Utilization Division is one of the technical divisions at CSIR Headquarters, concerns with the formulation of rules and regulations for the transfer of know-how developed by CSIR laboratories.

[9] Before selecting R&D project it is approved by the Research Council of the laboratory consisting of eminent scientists and industrialists expert in the field. They generally examine the project from the technical point of view.

[10] Most of the CSIR laboratories have got the same organizational structure, To streamline the administrative control a laboratory is divided into different research divisions supported by the administrative staff. Big national laboratories like NCL, NPL, CDRI have got the strength of 1500-2000 staff with an annual budget of around Rs 100 million. According to Professor Nayudamma former Director General of CSIR, there is hardly any coordination among the scientist of different divisions. He says, "Scientists would like to work in water tight compartment".

This raises the expectations of the entrepreneurs to obtain high rate of return on their investment in the adoption of the indigenous know-how. It has been noticed that during the course of transfer of know-how, it was realized by many entrepreneurs that actual investment figures for setting up production were much higher than those contained in the estimates provided by the laboratory. There is little to blame the scientists for this. In the absence of availability of expert knowledge of the economic impact of indigenous research, application of techno-economic analysis to research projects and their results must be improved.

Interaction between laboratory and industry helps in the identification and selection of research projects which are connected with the problems of the industry. The research results obtained from such project have good chances of being commercialized. Impeded or intermittent communication kept the research results on the fringe of failure.

2.2.1. Issues related to indigenous technology transfer from R&D laboratory to industry

Technology transfer from R&D institutions to industry seems to be more complex and difficult in developing countries. In a developed country the industry has the necessary capabilities to assess the work done in R&D laboratories without much or any assistance from outside. The developed countries firms can conduct their own market surveys, organize the design and construction of the plant, training of the personnel, manufacture and ultimate sale of the product. This is not so in a developing country where the entrepreneur requires assistance from the stage of selection of a process or product until he sells it. He needs assistance for the preparation of the feasibility report for obtaining loans from financial institutions, design of the equipment, erection start up trouble shooting, training of personnel, maintenance and ultimate sale of the product. Often he needs special assistance, tax rebates to aid the sale of his product (Tilak, 1972).

The entrepreneurs want to have a technology with guaranteed performance. One of the best means of insuring transference of technology from indigenous research laboratories to industry is offering a) prototype of the product b) trying out of the processes/products on pilot plant scale and according to certain laid down specifications initially. It may be emphasized here that relatively more attention needs to be given to development work on pilot plants, prototypes demonstration units, making available feasibility report, cost estimates and market surveys.

Pilot plant work may even costs ten times more than the cost of the work done at the laboratory stage, but any hesitation or reservation in incurring this expenditure at the pilot plant/bench scale and demonstration stage could lead to severe-bottlenecks, even if the technology passed to genuine entrepreneur its commercial viability may eventually die. The work at the pilot plant level goes a long way to check premature or exaggerated claims of the R&D scientists and thus avoids later failures of the technology (Rajan, 1981).

There are problems in setting up pilot plants due to a) non-availability of finances, b) the time required to establish the plant is at least one year or sometimes more. By the time the pilot plant is ready the technology used is overtaken by new technologies developed somewhere else. Consequently, as much as possible, the R&D work should be completed at the laboratory stage. The availability of the feasibility reports, cost estimates and market surveys will fill the initial gaps and help to create confidence in the entrepreneur to convert the industrial research into a commercially viable unit.

The feasibility report prompts the prospective entrepreneur to know about the worthiness of the R&D work. It will determine whether or not the market exist for indigenous technology, raw materials, labour with necessary technical skill are available, infrastructure vital to

the project is at hand. The entrepreneur will also know the estimates of overall costs of plant and equipment etc. Most important is the fact that from the feasibility report the prospective entrepreneur is able to determine the expected income from the indigenous technology, which will help workout the profit margin. R&D laboratories can go a step further help the industry/entrepreneur by offering plant on turn-key basis with adequate performance guaranteed wherein the R&D personnel could be actively associated with the production operation even after commissioning the plant.

It is important to associate engineers (mechanical, electrical, electronic as the case may be) from industry with the R&D investigations at the early stages in the laboratories, so that difficulties of designing the plant, machinery and equipment, installation etc., could be avoided at the time of technology transfer. The indigenous technology developed in the laboratories will certainly be successful if the engineers from industry help scientists in the design of the plant and machinery in improving the quality of the product in response to market changes (Rajan, 1981).

Another problem of the technology transfer is the lack of confidence in the minds of Indian entrepreneurs in indigenous know-how. There is competition between indigenous technology in its infancy and foreign technology proved for several decades under well-known trademarks. Therefore, it is necessary to somehow instil the confidence in the Indian entrepreneurs about indigenous technology.

Technology transfer requires a long chain of activities such as assessment of market demand, availability of finance training of personnel...etc. Due consideration had not been given to provide a complete package of technology transfer to the adopters. Sometimes a technology is not utilized because the adopter is not able to obtain capital goods and raw materials licenses, or is unable to arrange foreign exchange etc.[11]

3. Impact of liberalization on technological change in India from 1991 onwards

A major objective of the economic reforms program initiated in India in 1991 is to make the country more attractive to the transnational corporations (TNCs), and induce them to invest more money in India. A basic premise of the new economic policy is that a larger inflow of foreign direct investment (FDI) is *per se* good for the country. In this section we are mainly concerned primarily with the question whether unregulated entry and expansion of TNCs is necessary for technological change in the country.

3.1. Advantages for TNCs

The policy changes since 1991 favourably influence the operations of the TNCs as discussed below:

(a) The restrictions on the spheres of operations of the TNCs have been drastically reduced. In the past new FDI had to be justified having regard to factors such as priority of industries, nature of technology, degree of exports etc. (Government of India, 1988).

[11] Over the last few years CSIR has made structural changes in the process of transfer of technology: first, it has adopted totally business approach towards selection of research projects, secondly it has established Business Promotion Groups at each laboratory to streamline the transfer of know-how.

The government used to announce illustrative list of industries where no foreign collaboration is considered necessary. These restrictions have been abolished. Now all the industries are open for entry of foreign investors, though for those industries not mentioned in Appendix 1, government permission is still necessary. Moreover, the policy of automatic approval in Appendix 1 industries makes the policy transparent and is expected to reduce the bureaucratic impediments associated with discretionary policies of the past.

The sphere of operation of the existing foreign companies will be much larger due to the following reasons:

(1) FERA companies are no longer required to restrict their activities to Appendix 1 industries or to predominantly export oriented activities.

(2) The industrial policy of 1991 has drastically reduced the number of industries reserved for the public sector. The list has been further reduced in March 1993. Now only six industries viz., defence products, atomic energy, coal and lignite, mineral oils, railway transport and minerals specified in the schedule to Atomic Energy order 1953 are reserved for the public sector (Government of India, 1994). Thus the TNCs (as well as the Indian private companies) are now permitted to invest in iron and steel, mining of iron ore, heavy electrical plant, telephone and telephone cables generation and distribution of electricity etc., which were previously reserved for the public sector.

(3) The protection provided to small-scale firms being reduced. The government has decided to slash the list of items reserved for the small-scale sector. Garments, e.g. has already been de-reserved. The large firms are now allowed to produce the items reserved for the small scale sector provided they export 75 per cent of the output it has been reported that the government is planning to induce the export obligation to 50 per cent[12]. The small scale sector also used to be protected indirectly under the policy of excise tax exemption. Within the withdrawal of such exemptions in the Union Budget of 1994–1995, the advantages enjoyed by the small manufacturers will be eliminated in a large number of industries, e.g. shoes, bar soaps etc.[13]

(4) The industrial policy of 1991 has abolished industrial license except for a short list of industries related to security and strategic concerns, hazardous chemicals, few items of elitist consumption, etc. Licensing has been further liberalized with motor cars, white goods (refrigerators, washing machines, microwave ovens, air-conditions etc.) and almost all the bulk drugs and their formulations taken off the list of industries for which licensing is still required (Government of India, 1994 and Government of India 1995).

(5) The restrictions imposed by Monopolies and Restrictive Trade Practices (MRTP) Act[14] large firms expansion merger amalgamation and take-over etc. have been abolished. Such enlargement of areas of operations of existing firms also acts as an incentive for new firms. A new TNC is required to participate in the Appendix industries to be eligible for automatic 51 per cent foreign equity, but once the company is set up, the TNC can expand and diversify as explained above.

(b) Under the previous policy the foreign companies were debarred from using their brand names fully unless the sales were for essential drugs and pesticides. It is believed that

[12] Business World (BW). 1994. February 23 — March 8.

[13] BW. 1994. March 23 — April 5.

[14] MRTP Act introduced in 1969 it says that the industrial groups with assets of Rs. 200 million and above would be allowed to undertake activity only in specific group of industries.

the free use of brand names now would enhance the market power and hence the growth of TNCs in India.

(c) Left to themselves the TNCs naturally would decide the nature of their operation in a particular country with reference to their objectives of global profit maximization. The trade restrictions on the TNCs in the form of a local content or export performance requirements as we had in India to some extent, often conflicted with such global objectives. Now the TNCs in India are no longer required to export in order to enter, grow or have higher foreign equity. Similarly with the abolition of the Phased Manufacturing Program (PMP)[15] the TNCs are now free to decide whether they will use imported or local material.

(d) Another advantage claimed for the TNCs is the increase in the permissible extent of foreign equity from 40 percent to 51 per cent. A new TNC can automatically have 51 per cent foreign equity (and an existing one can increase it to 51 per cent provided they participate in Appendix industries.

3.2. Response of TNCs

The TNCs have reacted favourably to the new economic policy to enter and to grow in India. Gross inflow of FDI have gone up from Rs 5.3 billion in 1991 to Rs 38.9 billion in 1992, Rs 88.6 billion in 1993 and Rs 141.9 billion in 1994[16].

The entire amounts of FDI inflows are not being used for Greenfields projects. As discussed below, the TNCs are buying up Indian companies increasing their stake in existing companies, etc. Several steps have been initiated which will enhance the managerial control and the market power of the TNCs at the cost of Indian entrepreneurs.

3.3. Mergers and acquisitions

With the virtual abolition of FERA[17] and the monopolies part of MRTP, etc. there has been a sharp rise in the numbers of mergers and takeovers of companies. A few TNCs have sold out their companies/divisions to Indian-owned companies (Roy, 1994). For example, the textile tycoon Ajay Piramal has bought out the Swiss pharmaceutical TNC Roche's 74 per cent stake in its subsidiary in India[18]. Similarly the Indian groups of Reliance and GP Goenka have taken over the fertilizer and polyester divisions respectively of the British TNT, ICI (Roy, 1994). Tata Chemicals plans to acquire the phosphoric acid plant of Occcidental Chemical Co in Florida[19]. But what has really attracted attention is that a number of dominant indigenous enterprises, which have been competing against TNCs in their respective fields, are succumbing to TNCs. As a result, the structure of a number of industries is changing radically.

For failing to comply with the provision of FERA Coca Cola departed from India in 1977. This paved the way for the growth and domination of the soft drinks industry by Indian firms. About a decade later, the government allowed Pepsi. But the government imposed

[15] PMP was part of Technology Policy Statement 1983, which suggests that every industry importing technology has to undergo through the process of assimilation and adaptation by involving a research institution.

[16] Economic and Political Weekly. 1995. March 11. P. 475.

[17] FERA (Foreign Exchange and Regulation Act) introduced in 1973 which restricts the industrial activities of the companies having more than 40 per cent foreign equity to the same group of industries as the MRTP houses.

[18] Business India (BI). 1993. November 22 — December 5.

[19] Economic Times (ET). 1994. April 7.

a number of conditions e.g. an export obligation. The government did not allow unrestricted use of the brand name: Pepsi had to agree with the hybrid name: Lehar Pepsi, Pepsi was not allowed to own majority share. The equity of the company in India was held 44.35 per cent each by Pepsi and Voltas and 11.3 per cent by Punjab Agro Industries Corporation[20]. Pepsi could not dislodge Parle as the largest firm. Parle continued to be the market leader with about 60 per cent market share.

The recent policy changes and the re-entry of Coca Cola in 1993 however have changed the industry to almost 100 % TNC controlled. Coca Cola has ousted the market leader Parle, Ramesh Chauhan, the chief of Parle has sold out the successful brands of Parle--Thumps up, Limca, Citra Gold Spot and Maza — to Coca Cola for an amount reported to be $ 60 million Parle now has effectively been reduced to a bottler for Coca Cola[21].

In the light of the new economic policy and also to ensure quality of treatment between Coca Cola and Pepsi, the government has withdrawn all the conditions previously imposed on Pepsi. As a result, Pepsi has not only bought the stakes of Voltas but also plans to buy out the remaining shares held by Punjab Agro so that it will be a 100 per cent subsidiary. Pepsi has acquired another Indian soft drinks company, Duke, which has a strong presence in the Bombay region. Its market share of 37 per cent in Bombay is larger than that of Pepsi's though less than that of Parle's (45 per cent)[22].

Both Parle and Duke hold the government policy responsible for the demise of indigenous enterprise in the industry. The century old concern of Duke initially did not respond to the feelers from the TNCs to come to an understanding. But in view of the fact that the TNCs are spending massive amounts in the industry and are willing to withstand losses for several years to establish themselves. Duke decided to concede. As the 80 year old chief of Duke said, "There would be something wrong in my head if I didn't see the writing on the wall. I have been in the business for 59 years and with the money the MNCs are spending, I simply can't do well"[23]. Again as Ramesh Chauhan pointed out in an interview, "Pepsi was given permission, the government's overall policy was not to open floodgates for multinationals. I knew that I would be able to stop its entry. Today it's a very different situation — It made good business sense to realise the limits of one's potential and bow out — Indian entrepreneurship can develop only with the government support. Otherwise we will be reduced to just the bunch of traders working on commission"[24].

Similar apprehensions are being expressed in other industries. Thus the chief executive of Harbans Lal Malhotra and Sons (HML) pointed out that "It would be foolish to sit idle and watch a slow but steady decline of our share of the market (69 per cent) in the face of competition from other superior makers"[25]. HML has been for a long time the market leader in the shaving products industry where the entry of TNCs was regulated. Gillette, the global market leader, operates in India through Indian Shaving Products Ltd. the former was not allowed to own majority shares. It is only recently that Gillette has increased its stake to 51 per cent. Like Pepsi Gillette could not dislodge the market leader. It was only partially successful in India with a 10 per cent market share. However, under the new economic

[20] ET. 1993. August 24.
[21] ET. 1994. September 24.
[22] ET. 1994. April 11; BW. 1994. March 9–22; ET. 1994. May 27.
[23] BW. 1994. March 9–22.
[24] ET. 1994. April 19.
[25] Business Standard (BS). 1994. December 29.

policy, Gillette is now trying to buy out its competitors by using massive financial power. The deal has not yet been struck apparently due to differences among the three brothers who own HML, Gillette, however, taken another Indian company, Wiltech India[26].

In the ice-cream industry, an Indian company, Kwality has been the market leader with about 50 per cent share. Brook Bond Lipton India (BBLL), a Unilever group company which has recently set up a plant to manufacture frozen desserts has taken over the marketing networks of Kwality in the northern, western and southern regions of the country. Kwality will continue to own the manufacturing facilities, but these will be used exclusively for BBLI. One of the families controlling the eastern region operations of Kwality is still reluctant and hence is not part of the deal[27]. BBLL has also acquired the ice-cream division of another Indian company, Milk food which is a part of Jagatjit group companies[28]. It has been reported that another TNC Nestle has also started negotiations for tie up with the remaining important Indian companies like Vadila Arun and Joy to market ice-creams[29].

Soaps and detergent is another industry where indigenous enterprise like Godrej, Tata Oil Mills, Nirma, etc., have successfully competed against the TNCs such as Hindustan Levers and Proctor and Gamble. But the alliances and mergers allowed under the new environment have significantly enhanced the market power of the TNCs Tatas have decided to relinquish control in Tata Oil Mills and merge it with Hindustan Lever[30]. The merger scheme in fact envisaged issue of shares at a discount price to Unilever to enable it to have 51 per cent shareholding in the merged company. RBI however, has objected to the issue of shares at a discount price. Another TNC, Proctor and Gamble have practically bought off its competitor Godrej Soaps. The two companies have decided to float a new company where the former will have the controlling stake of 51 per cent and the latter the minority one of 49 per cent. While Godrej will make available its production capacities and the distribution network. Proctor and Gamble will provide international technology and brands[31]. Godrej has transferred the marketing, distribution and sales rights of all its toilet soap in the market which will compete with the brands of the new company controlled by Proctor and Gamble, justifying the deal, the managing director of Godrej Soaps said that to compete against the TNCs, the company requires financial and marketing muscle which it does not possess[32].

Bajaj Electricals, a dominant player in the home appliances market has decided to withdraw its products gradually from the market. This is an offshoot of the formation of a joint venture company between Bajaj and US tools and appliances giant Black and Decker. Bajaj will henceforth market the products manufactured by the new company[33]. Another joint venture announced between the two companies having business in the same field is between General Electric (owns 40 per cent equity) and Godrej and Boyce (60 per cent). The new company will take over the latter's refrigeration division G and B is now the market leader in refrigerators with a share of 45 per cent. The company will also diversify into compressors, washing machines, dishwashers, microwave ovens and other household appliances[34].

[26] ET. 1995. March 17.
[27] BS. 1994. September 14; BS. 1994. September 30; BW. 1994. January 25 — February 7.
[28] ET. 1995.April 7.
[29] ET. 1995.April 21.
[30] ET. 1993. March 11.
[31] ET. 1992.August 22.
[32] BI. 1993. April 26 — May 9. P. 57–58.
[33] BW. 1994. December 14–27.
[34] BI. 1992. May 25 — June 7; BI. 1993. April 26 — May 9.

The government's indifference to that status of the indigenous firms has surprised a number of experts. Commenting on the sell out of Parle to Coca Cola, Michael Porter, who studied competitiveness in different countries, has pointed out that "Few countries in the world would permit their dominant national player to be brought over by a multinational"[35]. Japanese TNCs have played an important role in Japan's economic prosperity, Saboro Okita, the veteran development economist who had direct experience in economic policy making in Japan in 1960s has advised against an overall opening up Indian industry to foreign investments. Giving the example of automobile industry in Japan, he argued that if Japan had opened its economy 20 or 30 years ago, then the Toyota and Nissans might not have existed today[36].

Some of the Indian industrialists e.g. Hari Shankar Singhania, who is a prominent member of the Bombay Club mentioned earlier, has complained about the pace of reforms. He pointed out that for industrial development, the basic role will have to be played by the indigenous sector. And the government encourages indigenous firms to grow before fully liberalizing foreign investments[37]. It however appears from demands put forward by the Bombay club, that these industrialists in general are more concerned about getting certain financial facilities to enhance their equity holdings and to prevent takeover. But undisputed control over their firms is not enough to tackle the TNCs (Ghosh, 1993). What is also important is government's support for the indigenous firms to grow *vis-a-vis* TNCs.

3.4. Attitude of foreign investors

The statements of industrialists and executives from abroad, who have been visiting India lately, convey the impression that they are more interested in the domestic market than in exports. A high level 50 member strong Japanese business team visited India in January 1992. The leader of the delegation pointed out that the large domestic market in India is a major attraction. To facilitate further Japanese investments, the team in fact requested the government among others not to insist on exports to pay for their dividends repatriation[38]. Addressing the Indo-US Chamber of Commerce, a representative of a large US firm said in January that the restriction on dividend repatriation subject to export earnings has raised doubts about whether India would allow reasonable access to the domestic market. This has made the TNCs sceptical about investing in India[39].

The president of the Federation of German Industry, who led a business delegation to India, said that there are two major motivations for German firms to invest in India (1) domestic market (2) low cost of production base for exports mainly to the Far East. He did not clarify whether both are equally important and if not which is more important. But significantly enough he also asked for the withdrawal of the export obligations.

The conditions of balancing dividend repatriation with export earnings were actually withdrawn in response to the complaints made by the foreign investors[40]. The Press Note which announced the withdrawal of the dividend balancing conditions in fact specifically mentions that this is being done to further stimulate foreign goods into the country (Government of India 1993b).

[35] BW. 1994. October 5–18.
[36] ET. 1992. February 4.
[37] ET. 1993. November 9.
[38] Times of India (TI). New Delhi. 1992. January 28.
[39] Indian Express (IE). New Delhi. 1992. January 16.
[40] ET. 1992. June 20.

The former chief of the Proctor and Gamble operations in India who has now joined the headquarters in the US said that India's biggest advantage is the large domestic market. The attitude that TNCs would come to India only to export and not to take advantage of the domestic market will not help[41]. A survey was conducted in the US to ascertain the prospects of US FDI in India compared to that in other Asian countries. The survey found that US investors are primarily interested in India for domestic production rather than for exports. Among the 23 factors identified, the most important factor influencing investment in India was found to be the size of the domestic market. The motivation of "exports to the third countries" and exports back to USA is ranked 15th and 20th respectively in descending order of importance.

3.5. Prospects of Export-oriented FDI in India

International production of TNCs actually has traditionally been organized primarily for the domestic markets of the host countries. Export-oriented investments were mainly restricted to natural resources. Studies on the determinants of FDI found that factors such as market size, trade restrictions are much more important than cost factors in determining such domestic market-oriented investments (UNCTAD, 1992).

An important change in the behaviour of TNCs over the last thirty years has been the increase in export-oriented investments in manufacturing by the TNCs abroad to take advantage of certain favourable conditions in the host countries e.g. lower cost of labour (UNCTC, 1985; UNCTC, 1992). With the intensification of international competition, the TNCs become more cost-conscious. The fall in trade barriers and communication technologies have made it possible for them to transfer a part of their activities to cheaper locations. Such export-oriented investments, however, were restricted to specified products/processes and these were located in selected countries in Asia and Latin America (United Nations, 1992; UNCTAD, 1993).

India was not one of the major destinations for these investments. As discussed in the previous section, the response of the TNCs as of now does not reflect a sharp break from the past. But it may be argued that the period since 1991 is too short to observe such a shift. If we take a longer term perspective, then under the new economic regime, is there a possibility of a significant spurt in manufacturing exports by the TNCs from India? This will depend on the growth of the relocation of production by TNCs in the third world countries and the share of this growth which India can manage for herself.

So far the size and the growth of international production by TNCs in the third world countries are concerned, the future trend is not very clear.

On the one hand. The *World Investment Report 1993* speaks of the emergence of an integrated global system of production. In the past the TNCs transferred particular activities to locations with cost advantages. They are now slowly moving to a system where all the activities of the firm are potential candidates for being undertaken in different locations depending on the respective advantages. Hence the report predicts an upsurge in the volume of international production (UNCTAD, 1993).

But on the other hand it is not very clear to what extent the third world countries will be able to take advantage of such increased internationalization of production as and when it takes place. The traditional advantage of the third world countries is the low cost of labour. A survey conducted by the International Finance Corporation on US TNCs

[41] ET. 1991. August 22.

found that new manufacturing technologies have made labour cost much less important than what it was before and hence the third world countries have become less important as export platforms to serve the developed country markets (Miller, 1993). A number of TNCs in consumer electronics (e.g. Philips) and computer (e.g. IBM, Apple) have already initiated steps to automate their plants at home and shift production from third world countries (UNCTC, 1988).

The International Finance Corporation study has also reported that radical organizational changes are being undertaken in TNCs which have negative implications for plant locations in the third world countries. Companies are trying to reduce costs through low inventories and quickness of response. The trend is to locate plants close to the customers. As a result the number of supplier's factories is increasing the average plant size is decreasing (Miller, 1993).

Thus export oriented investments by the TNCs may not increase at the same rate as in the past. Moreover, whatever may be the volume of such investments; the share of India will crucially depend on the advantages she offers compared to her competing countries. To attract FDI for export what is important is not whether the situation is better than that in the past but whether it is better than what the competing countries offer.

It appears from the demands put forward and the comments made by some of the foreign investors as referred below that India compare not so favourably with the competing countries. In terms of (1) infrastructure (2) control over labour (3) priority accorded to FDI etc.

A report of the Far Eastern Economic Review (FEER) sums up the general perception of foreign investors about India as follows.

The Indian business climate is not yet as hospitable as other locations for scarce capital. Wages rates are low, but so is productivity. Labour is highly specialized and powerful trade unions are reluctant to abandon traditional inefficient practices.

Infrastructure is already inadequate: for example, like all industries with continuous process, Du Pont is faced with having to provide 100 per cent power back up for its Goa plant. The country has only 5.5 million telephones lines for 850 million people.

Various local levies slow down distribution of materials and products; a truck with a valuable cargo may have to queue for two to three days at a state or city boundary, to pay octroi of a few US dollars[42].

To facilitate investment from Japan, a business team from that country has specifically requested the government among other things, for an early formulation of exit policy and more investments in infrastructure such as power and telecommunication services[43]. The leader of another Japanese business delegation reiterated that Japanese investments in India are unlikely to increase substantially unless an exit policy is formulated and unions are prevented from interfering with the working environment[44]. The US ambassador to India said that "Expansion in India's power sector will help attract higher levels of foreign investment. A major concern of foreign investors is the lack of a reliable power infrastructure relative to other opportunities in Asia"[45]. The government has taken a number of steps to improve the infrastructure facilities. But for obvious political reasons governments in the exit policy front have been slower than what has been desired in certain quarters.

[42] Far Eastern Economic Review (FEER). 1992. February 20.

[43] TI. 1992. January 29.

[44] BS. 1993. November 27.

[45] BI. 1992. July 6–19.

A conference of leading industrialists, official from World Bank Asian Development Bank, etc. organized by Foreign Investment Advisory Service (a joint facility of the International Finance Corporation and the Multilateral Investment Guarantee Agency) in Washington concluded that India has been unable to attract enough FDI due to "restrictive policies and bureaucratic red tape". The participants felt that a more welcome attitude to FDI is needed in India[46].

What often matters is not what has been indicated in official policy statements. A study sponsored by ministry of industry of the government of India, reveal that right now the foreign investment policies in India are much more open than most other Asian countries. In China, Indonesia, Malaysia and Taiwan, prior approval of the government is required for foreign investment projects. India in fact is similar to South Korea and Thailand where automatic approval is given for some industries, but prior permission is required for the rest. Only in Singapore no approval is required.

4. Korean policies and firm strategies: target oriented export model

The basic component of the foreign investment policy followed by South Korea e.g. during the formative years of her industrialization (1960s and 1970s) were: (1) to promote foreign investment in export oriented activities (2) to simultaneously develop independent channels of exports (3) to strictly regulate foreign investment for the domestic market by preventing the entry of TNCs in area where Korean enterprises are present and by insisting on local content requirements, etc. (4) to encourage foreign loans rather than foreign direct investment; joint ventures rather than 100% subsidiaries and direct import of technology through TNCs and (5) to have a strategic program to promote indigenous technology and enterprise by regulating the TNCs and encouraging indigenous efforts (Mason et al., 1980; Amsden, 1989; Haggard and Moon, 1983).

The electronics sector in South Korea provides a good example of such a strategic intervention on the part of the government. Initially the activities in the electronics sector were primarily restricted to assembling of black and white TVs. In the late 1970s as the part of the Fourth Five Year Plan (1977–1981), a conscious attempt was made to develop the sector beyond assembling. Several items e.g., semiconductor, computers etc., were selected for import substitution and export promotion. Among the steps taken by the government were: establishing a research institute for import of technology and further development: protecting the domestic market against imports and restricting the entry of TNCs (Amsden, 1989).

Thus South Korea did not provide unrestricted entry and freedom to the TNCs. Their operations were consciously regulated to minimize the negative features and induce/force them to contribute to the growth of the economy. The assessment of the policy planners of Korea appears to have been that the TNCs can contribute by providing (1) technology and (2) market access for exports. The strategy was to regulate the TNCs to ensure such contribution while simultaneously developing Korean technology and enterprise.

Korea's export performance in the electronics industry has been truly remarkable. From the meagre of $89 million in 1971, Korean electronics exports grew to $20.683 billion in 1992, an increase by a factor of 232. An industry that barely existed more than 25 years ago has been able to transform itself into a credible international competitor. Specially since the

[46] FEER. 1992. August 10.

mid 1980s, Korean electronics firms have penetrated a number of important international market segments. They are the second largest supplier, behind Japanese firms, in both the United States and Europe for a variety of consumer devices, ranging from radio equipment to CTVs, VCRs and microwave oven. Korean firms also excel as leading suppliers of PC monitors. Their meteoric rise in DRAMs (Dynamic Random Access Memories) is notorious, the three main Korean producers, Samsung Electronics (SE) Hyundai Electronics (HEI) and Goldstar succeeded in eroding the once overwhelming dominance of Japanese producers. Between 1988 and 1992, Korea's market share increased from 7.5 % to 17.7 % in US, from 7.8 % to 18.1 % in Europe and 23.6 % to 33.7 % in East Asia (exclusive of Japan)[47]. Semiconductor exports are now the largest item of Korea's electronics exports from an estimated $7.8 billion in 1993, it has increased to $11 billion in 1994. Since the seventies its export grew considerably faster than those of Korea's other industrial sectors. During the seventies electronics exports experienced a compound average annual growth rate (CAAGR) of over 43 %, while CAAGR for all manufactured exports was 35.6 %. Korea's electronics export passed the threshold of $2 billion around 1980 and continued to grow very fast at a very fast pace though most of 1980s, well above the growth for Korea's overall manufactured exports. This rapid growth of exports continued even after 1987 when rising wages and various appreciations of the won led to an erosion of Korea's traditional labour advantage. From $ 2.2 billion in 1981, electronics exports experienced a nearly eightfold increase to $17.2 billion in 1990 resulting in a CAAGR approximately 22% (much higher than the slightly less than 17% CAAGR for all manufactured exports). Due to this rapid growth in exports in 1988 the electronics industry became the country's biggest export item, overtaking for the first time the textile industry, the traditional export sector.

This section analyses how government policies and firm strategies have shaped the particular pattern of development of Korean industry. Foreign firms originally played a catalytic role in the launching of Korea's electronics exports. How and why the Korean government and the Chaebol[48] began in the mid 1970s to play an increasingly important role. In order to highlight some peculiar features of the government business interaction and their impact on Korean electronics industry. In earlier developments in Japan, which for all practical purposes, have guided Korea's policy interventions and from strategies as an implicit role model. Given its overwhelming concern with a rapid expansion of production capacities and market share, Korea copied a number of Japanese policy instruments. Three of them are of particular importance (1) Sophisticated mixture of import restrictions and export promotion (2); An emphasis on aggressive absorption of foreign technology while at the same time restricting inward foreign investment; and (3) A focus on creating national championship through sectoral targeting.

Such similarities, however should not be exaggerated, and important differences continues to exist between both the countries especially in terms of the industry structure and the resulting competitive strategies of firms. These differences reflect the idiosyncrasies in the development of institutions and organization in both the countries as well as that Japan has started decades earlier than Korea with its expansion into international electronics markets, and thus had to confront less demanding and complex competitive requirements. In the case of Korea the very same feature of government policies and firm strategies and of the resulting industry structure that until the late 1980s were conducive for the rapid expansion

[47] Figures provided by Dataquest (American magazine). 1993. September.

[48] Chaebol is conglomerate of big firms of Korea like Samsung, Goldstar, Hyundai and Daewoo.

of Korea's electronics exports now have become important constraints for attempts to sustain Korea's exports performance through an upgrading of its technological capabilities.

We have seen that Korea's electronics exports only started to take off when Korea became a final assembly export platform for a handful of US semiconductor firms. This was made possible by the willingness of the Korean government already during the 1960s to shift to the export promotion. Combined with tough labour legislation's and the ruthless suppression of labour conflicts, the Electronics Industry Promotion of Law of 1969, which made electronics a strategic export industry and the opening of the Mason Free Export Zone in 1970 contributed to the positive foreign investment climate in this industry. The main attractions for foreign electronics companies were Korea's cheap female labour and incredibly long annual work hours, together with policies favourable to the promotion of export manufacturing. At this stage technological capabilities were of minor importance and remained restricted to a few basic assembly tasks.

In 1968, foreign (predominantly US) companies were responsible for 71% of Korea's electronics exports and practically all its exports of integrated circuits and transistors originated from newly established subsidiaries of US firms[49]. Japanese firms for political reasons were late to invest in offshore chips assembly in Korea, Sanyo's joint venture, Korea Tokyo Silicon Company, Ltd., established in 1972, became the largest assembly line. In that year foreign firms, of which there were eight, accounted for about a third of Korea's electronics production and 55 per cent of its exports. It would be 1980 before their share in export fell below 40 per cent (Bloom, 1992). In short until the late 1970s, Korea's exports growth in electronics was led by foreign firms and based on simple, labor intensive assembly technology borrowed from abroad.

Initially at least, the electronics industry diverges from the common perception that Foreign Direct Investment (FDI) played only a minor role in the development of the Korean model (Haggard, 1990). By opening up export channels for assembled chips and from simple consumer devices FDI did indeed play an important catalytic role during the critical early phase of the development of Korean electronics industry. One techniques, which, not necessarily "best practice" certainly contributed to a gradual erosion of the traditional highly authoritarian Korean management practices[50] and their inherent rigidities and inefficiencies. Cost-cutting and need to comply to some minimum international quality standards without any doubt gave rise to some limited indirect learning effects related to the formation of production and investment capabilities. Yet as we will see in the next section, this was about all that foreign investment was willing to contribute during this early stage. For that to change, Korea needed systematic and well-coordinated government policies to promote the development of Korean firms.

4.1. Some basic features of Korean model

While Korea's export growth in electronics originally was led by foreign firms, the Korean government and the chaebol played an increasingly important role, especially since

[49] In 1968, four United States companies dominated Korea's chip assembly industry: Motorola, Signetics Fairchild Semiconductor and Komy Semiconductor Corporation, a United States joint venture which established the first transistor assembly line in 1965. Data taken from Dataquest Inc. report "Assembly industry — South Korea", March 1987.

[50] For two historical case studies of these changes in the Samsung Group, see Janelli, Roger and Yim Dawnhee [1993] and Lee Jin-joo [1991].

the mid-1970s. This shift in the center of gravity among the social carriers responsible for the development of Korea's electronics industry was due to number of locations in Philippines and Malaysia and gradually shifted most of their assembly activities to these two countries. Confronted with an increasing cost of capital, most of these companies were keen to reduce their equity involvement and began to shift too much looser firms of contract assembly, sub-contracting and OEM arrangements. In the case of Korea this gave rise to the development of Anam industrial, which, through its US based marketing subsidiary Amkor today has become the world's largest independent SC contractor assembler. Japanese firms in turn choose a somewhat different route, and this applies both to chip assembly and to their activities in other electronics components. In contrast to US firms reliance on foot-loose of offshore assembly, most Japanese firms concentrated on factory automation at home and gradually withdrew from offshore assembly activities both in Korea and Taiwan.

Parallel to this process of gradual withdrawal of foreign firms, there have also been push factors resulting from the increasingly demanding requirements imposed by the Korean government on foreign firms to contribute local value added and to increase the transfer of technology. Japanese firms in particular were extremely reluctant to open their closed international production networks and were concerned about a "boomering effect" through involuntary technology linkages. At the same time, rising competition from the increasing powerful chaebol added further pressure on foreign firms. Confronted with the alternatives to either upgrade their existing investment beyond the stage of assembly elsewhere. Within East-Asia, despite serious attempts by various Korean governments to bring foreign investment back into the country as a vehicle for accelerated technology diffusion. In 1992, for instance, Korea experienced an overall decline of inward FDI of 30 per cent to a low of $895 million since 1988, Korea has failed to appear on the list of the preferred ten foreign investment locations for both US and Japanese electronics firms.

For quite sometime there was no fundamental conflict between the interests of the Korean government and chaebol. Interaction between these two actors was driven by a common purpose — the rapid expansion of production capacity and international market share. As a result we find a fairly consistent pattern of latecomer industrialization which is characterize by the following features:

— A strong emphasis on export expansion based on imported technology.

— An early integration of Korean production into the international sourcing networks of electronics firms and mass merchandisers from the United States, Japan and Europe.

— An important role of government policies and regulations which in addition to providing essential externalities (especially a well trained industrial labor force), were focused on a judicious combination of export promotion and import restrictions sectoral targeting and the channeling of the investment funds to a select group of national champions.

— And finally, an industry structure which is characterized by a very high degree of concentration, due to the dominance of the chaebol and their privileged relationship with the government, but which at the same time is shaped by an intense competition among the leading chaebol. In the essence, the Korean electronics industry today is characterized by a tight oligopoly as defined by Bain (1956, 1959 and 1966). Others have stressed the advantages of such an industry structure for late comer industrialization[51].

[51] See the study of Martin Bloom [1992] on the Korean electronics industry. For more general argument, see Amsden [1989].

4.2. Governments policies and regulations

Policy interventions by the Korean government have played an important role in shaping the competitive strength and strategies of Korean electronics firms. Most debates narrowly focused on the macro-economic policies and the trade and exchange rate regime (OECD, 1992). By reducing market distortions, such policies are expected to generate quasi automatically an investment climate where "private domestic investment and rapid growing human capital — [can act as] — the principal engine of growth (Bell and Pavitt, 1993)."

One can't subscribe to such free market neo-liberalisation and will consider a much wider range of policy instruments and institutions. But this is not to deny the importance of macro-economic stability. Even though Korea borrowed heavily on international capital markets during the 1970s to offset the savings-investment gap caused by the government's policy of controlled interest rates and subsidized credits, it has not faced the debt crisis of the large Latin American borrowers.

Probably this is due to Korea's unremitting emphasis, shared both by the government and the chaebol, that would eventually help reduce its foreign debt burden. As for the trade and exchange rate policies, there is a strong evidence that, by and large, Korea has been able to establish a rough incentive neutrality between imports and exports rather than a strong bias in favor of the latter. Korea has frequently used selective "infant industry" as a part of its industrialization strategy, especially in the electronics industry. But import protection was mostly coupled with offsetting incentives for export sale, with the result that overall neutrality was roughly maintained the import protection enabled producers in a new industrial sector like electronics to exploit learning economies, while the export incentives provided the opportunity to reap scale economies not available in the domestic market.

This selective and at the same time synchronous approach to import substitution and export promotion as alternative development strategy has been greatly exaggerated as has the distinction between minimal government and a more direct and intensive role for the government. The objective is to understand the economy and society well enough to be able to identify where and how protection is effective and where and how division of labor should be arranged between the public and private sector in order to produce growth of well being — The notion that an economy (and indeed a society) that is in the same ways open is an idea that merits a great deal of attention.

Two arguments can be made for an active role of industrial and technology policies in the development of Korean electronics industry. First, the by now widely accepted "late industrialization" argument which shows that, without complementary government interventions, developing countries would have limited chance to begin a sustained industrialization process. Second industrial and technology policies have played a prominent role in the development of the electronics industry nearly everywhere. Due to high entry barriers and the importance of scale and external economies in the electronics industry government interventions are required to provide externalities and assist firms in their attempts to hurdle entry barriers. There is now a rich literature, which documents how critical such policies were in the United States, Europe and in Japan. There thus nothing unusual in the fact that Korea relied heavily on a variety of industrial and technology policies to promote its domestic electronics industry. The debatable issues are not that such policies have been pursued but what have been their main objectives and to what degree and at what cost have these been implemented. The most important policies used by the Korean government between 1967-1987 to promote electronics industry cover the whole spectrum of government interventions that have been used in OECD countries for the development of this industry.

Probably the most important feature of these policies is how closely they followed the Japanese pattern of policy interventions. Since the enactment in 1969 of the law of promoting the electronics industry, the Korean government has been providing various types of support to the electronics industry. The crucial importance of financial support has been widely recognized in the existing literature (Amsden, 1989 and Haggard, 1990). In addition the government has developed a rich arsenal of complementary legal supports that were meant to increase the effectiveness of the 1969 electronics industry promotion law. These complementary laws include a law for the promotion of national investment, a basic law for preferential tax treatment, a special law granting the return on tariff collection for raw materials used for exports, and law for promotion of SMEs.

Sectoral and product specific targeting also played an important role from the outset. While originally somewhat crude and unrealising targeting became more sophisticated during the four five year plan (1977-1981). In this plan, the following products were identified as "strategic development products" for the electronics industry:

— radios, black and white television sets tape recorders color TV sets, VCRs, digital watches and microwave ovens — for the consumer electronics sector;

— minicomputers, computer peripherals (especially monitors) electronics telephone exchange equipment, lasers, and electronics measurement equipment — for the industrial electronics sector;

— memory chips and connectors — for the electronics component sector.

Our analysis in the previous section of the product composition of Korean electronics exports shows that such policies have been roughly highly successful both for consumer electronics and for components, at least in terms of pace of expansion of production capacity and market share expansion. Yet no comparable progress could be detected in the trade statistics for industrial electronics. This failure in industrial electronics constitute an important flaw to the otherwise excellent reputation of Korean-style industrial policy that needs to be explained. The types of the policies that were conducive for developing mass-production capabilities for consumer goods and components may not necessarily have been the most appropriate ones for developing a sound industrial electronics sector.

One certainly cannot argue that the government neglected the development of industrial electronics. Ever since Park Chung Hee's ambitious plans to move beyond labor intensive assembly and to develop a broad base during the 1970s, Korea's industrial planners were convinced that in order to sustain their earlier success in chip assembly and low-end consumer electronics, industrial electronics would have to be substantially strengthen. In 1981, the electronics industry promotion law was revised to emphasize the production of electronics goods for industrial purposes rather than for household appliances and also to encourage the development of more advanced technology.

By the mid 1980s, the prevailing feeling was that Korea had gathered sufficient strength to try to upgrade its electronics industry and to transform it into a truly high-tech strategic industry that would push forward the modernization of its economy. It was also assumed that for the new stage in its industrial transformation Korea could rely again on its proven winning formula: the tight cooperation between the state and chaebol[52]. These expectations were centered on two main areas: the development of public switching systems and a development of a Korean computer industry with a focus on micro and mini-computers.

[52] Some interesting examples of these debates can be found in the special issue of *Electronics Korea*, August 1988, entitled "Painful Steps Towards Maturity -Industry After 30 years."

As for Korea's attempt to develop an internationally competitive computer industry, the results appeared to be fairly positive until around 1987. Both for 8 bit and 16 bit PC desk top machines, Korean firms experienced a rapid increase of OEM exports. And OEM exports grew even faster for computer terminals and monitors. Competing in PC clones and computer monitors was hardly different from competing in TV sets or in chip assembly what mattered was a reputation as a reliable, low cost producer and assembly unit labor costs remained extremely low until 1987. Combined with the Yen appreciation after the Plaza agreement in September 1985, this meant that Korean assemblers could outcompete Japanese firms and could attract a large chunk of the rapidly growing OEM demand for cheap PC clones. In 1987, 15 of the then leading international computer firms were importing PCs from Korea on an OEM basis, including Espon, NCR, Computer Land, loading Edge and Olivetti (Evans and Tigre, 1989).

While the shift from high risk sectoral targeting to broader diffusion oriented policies still constitute a minority position among policy makers and bureaucrats. A typical example of such inertia can be found in 1992 project of the Ministry of Trade and Industry. Following negotiations with the ailing US mainframe computer company Unisys, the ministry accepted Unisys's proposal to transfer, for a hefty yet undisclosed fees, its mainframe manufacturing technologies to Korea. As part of its general localization effort, the ministry then in 1993 announced a five year mainframe localization program, which in words of the ministry, would enable Korea's computer industry — "to move into high end computers and away from price competitive personal computers"[53]. Hard nosed neoclassical economists who oppose for ideological reasons any type of industrial policy will love this quotation to show that such policies are fraught with errors, huge costs and disastrous pitfalls. Such conclusions, in our view, however, mask the real issues: the need to make as explicit as possible the conflicting interests and trade off involved in different policy approaches[54].

5. Conclusion

The new economic policy initiated in India in 1991 has lifted a number of crucial restrictions on the operations of the TNCs. The situation now is much more favorable for them in terms of permissible extent of foreign equity, spheres of operations, use of brand names nature of import and export activities etc. Now the TNCs can have 51 per cent foreign equity automatically in a large number of industries specified in the Appendix and also in other industries with the government approval. All the industries are now open for the entry of new foreign investors, though for those not mentioned in the Appendix industries government permission is still necessary. FERA companies are no longer required to restrict their activities to the Appendix industries or to predominantly export-oriented activities. The restriction imposed by MRTP on expansion, merger, takeover etc. have been abolished. The TNCs are free to use their brand names also in the domestic markets. They are also free to decide whether they will export their output or use imported materials for their production here.

The TNCs have reacted favorably to the new economic policies to enter and grow in India. Several steps have been initiated which will enhance their managerial control and

[53] Quoted from Yearbook of World Electronics Data 1993, p. 178.

[54] For detailed analysis of these issues, see Ernst and O'Connor [1989].

market power at the cost of Indian entrepreneurs. India's current policies of lifting crucial restrictions on the TNCs amount to a passive reliance on the TNCs for economic development. None of the economically successful countries, whether Japan or Germany within the developed countries or South Korea, Taiwan or even Malaysia, Thailand within the less developed countries followed such a route. They do not provide the type of freedom to foreign enterprises which India is at present offering to them. During its recent phase of liberalization, even such a rich country as Japan did not indiscriminately lift controls on the western TNCs. Promoting Japanese enterprise continues to be a major objective. The policy planners did not open the investment doors until they felt that the Japanese enterprises are strong enough to compete with the foreign firms.

The new economic policy in India must be drastically changed. It is important to learn from the past mistakes and the experience of the other countries and among other things, regulate the TNCs keeping in mind the needs and the priorities of the country. A strategic intervention on the part of the government is required to take care of the negative features of the operations of the TNCs and to ensure that the country gains from their investments. Now it has become necessary for the national laboratories to reorganize priority for research in order to take the brunt of liberalization. India should concentrate on selected areas of research where it has build the capabilities and excellence and try to establish strong linkages with the industry to make value additions in the imported technologies to catch up the advances in technology abroad and compete in the international market. Korea has made tremendous progress over the last one decade to follow the policy of target oriented exports and make value additions in the imported technologies.

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ЭМПИРИЧЕСКОЕ ИЗМЕРЕНИЕ РОССИЙСКОЙ НАУКИ

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World science, especially in developed countries, is going to the new form of organization and assessment of scientific activity. Unfortunately, our science is lagging with assimilation of positive innovations.

Keywords: academic science, post-Soviet transformation, lagging, innovations

Social processes in Russian academic science during the post-Soviet decades
The results of sociological research[1]

Last two decades the reality in Russia clearly fits the notion of “unstable times”. The collapse of the Soviet Union (1991) has provoked serious political and socio-economic changes in all spheres of Russian life. The subject of our study was and is the **domestic academic science — the professional activity of scientists** working in the research institutes of the Russian Academy of Sciences (RAS). From 1994 to the present time our sector of Sociology of Science, which belong to Institute of the History of Science and Technology RAS, realized a monitoring of this phenomenon. Monitoring was based on regular sociological interrogations in representative groups of academic scientists and systematic analysis of data collected in these surveys. In 1990-ies the transformations in the political and socio-economic spheres were continuous. A long time academics are also expected to upgrade their sphere — science. However, during this period the State has ceased to be interested in science: funding (which has always been the only state one) declined sharply, many scientific organizations were liquidated. Academy of Sciences, as the focus of national basic research is preserved (converted from the USSR in the RAS). The scientists of academic institutions

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