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Korea

Managing the Industrial Transition

(In Four Volumes) Volume III: Industrial Policy Case Studies

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GLOSSARY OF ABBREVIATIONS

ASEAN	=	Association of South East Asian Nations
CRT	=	Cathode Ray Tube
DRAM	=	Dynamic Random Access Memory
DWT	=	Dead-Weight Tons
EEC	=	European Economic Community
ETRI	=	Korea Electronics and Telecommunications Research Institute
GATT	=	General Agreement on Trade and Tariffs
GOK	=	Government of Korea
GT	=	Gross Tons
HCI	=	Heavy and Chemical Industry
ICI	=	Imperial Chemical Industry of the United Kingdom
ICs	=	Integrated Circuits
IPR	=	Intellectual Property Rights
K-TAC	=	Korean Technology Advancement Corporation
KAIST	=	Korea Advanced Institute for Science and Technology
KDB	=	Korea Development Bank
KMPA	=	Korea Maritime and Port Administration
KOFOTI	=	Korea Federation of Textiles Industries
KTA	=	Korea Telecommunications Authority
KTDC	=	Korea Technology Development Corporation
MFA	=	Multi-Fiber Arrangement
MSI	=	Medium Scale Industry
NIF	=	National Investment Fund
OECD	=	Organization for Economic Cooperation and Development
OEM	=	Original Equipment Manufacturer
OPT	=	Outward Processing Trade
PAL	=	Phase Alteration by Line
RCA	=	Revealed Comparative Advantage
SIRP	=	Shipping Industry Rationalization Program
SMI	=	Small and Medium Industry
SMIB	=	Small and Medium Industry Bank
TBS	=	Temple, Barker, and Sloane, Inc.
TEU	=	Twenty-Foot Equivalent Units
USITC	=	U.S. International Trade Commission
VCR	=	Video Cassette Recorder
VLSI	=	Very Large Scale Integration
VTR	=	Video Tape Recorder

PREFACE

This volume contains three case studies undertaken as part of the macroeconomic-industrial policy project to examine issues of industrial structure and the role of government intervention. The cases were selected to represent (i) industries in clear need of rationalization; (ii) industries in transition, with some activities facing declining comparative advantage; and (iii) emerging industries with promising, if risky, growth prospects. The analyses are not intended to provide industrial prognoses as much as they are to highlight the public policy issues involved.

KOREA

MANAGING THE INDUSTRIAL TRANSITION

VOLUME III: INDUSTRIAL POLICY CASE STUDIES

Table of Contents

	<u>Page No.</u>
Case 1: Industrial Restructuring: A Study of Shipping	
A. Introduction.....	1
Basics of the Industry.....	1
The Economics of the Industry.....	4
B. Public Sector Role.....	7
Government Philosophy.....	7
Incentive Structure.....	8
Recent Industrial Policy Dilemma.....	9
Assessment of Intervention.....	11
C. Industry Outlook, Strategy, and Issues for	
Industry Outlook.....	13
Strategy.....	15
Public Policy.....	16
Case 2: Korean Textiles: An Industry in Transition	
A. Introduction.....	18
B. Overview.....	20
C. Factors Affecting Recent Evolution of Industry.....	22
Protectionism.....	22
Aging Machinery and Technical Developments.....	22
Competition from China and Others.....	24
Declining Credit Availability.....	25
Rising Wage Costs.....	28
D. Private Sector Adjustment Strategy.....	30
Product Mix Considerations.....	30
Cost and Productivity Considerations.....	30
Technology Considerations.....	31
Product Market Diversification.....	31
E. Public Sector Role in Textiles.....	33
Textile Modernization Fund.....	33
Capacity Control Regulations.....	34
Textile Sector Financing.....	34
Import Protection for Textiles.....	35
R&D in Textiles.....	36
F. Adjustment Strategies in Selected Countries.....	37
UK Experience.....	36
German Experience.....	37
Italian Experience.....	38
The US Experience.....	39
The Japanese Experience.....	41

	<u>Page No.</u>
G. Summary of Lessons of OECD Experience.....	42
H. Future Prospects of Industry.....	43
I. Scope for Public Policy.....	46
Case 3: Electronics in Korea: A Study of an Emerging Industry	
A. Introduction.....	60
Overview.....	60
Characteristics of the Industry.....	61
The Role of Electronics in the Economy.....	63
Global Developments.....	66
B. Electronics Industry Strategy, Outlook and Issues.....	68
Constraints on the Industry's Development.....	68
Private Sector Strategy.....	70
C. Public Sector Role.....	73
The System of Incentives and Government Attitudes.....	73
Industry Prospects.....	78
Effects of Market Structure.....	80
D. Concluding Issues.....	86

List of Tables

Table 1.1: Comparative Shipping Capacity.....	3
1.2: Shipping Shares.....	4
1.3: The Financial Situation of the Shipping Industry.....	5
1.4: The Financial Situation of Major Components of the Shipping Industry, 1983.....	6
 Table 2.1: Real Growth Rates of the Textile Industry, Manufacturing Sector and GNP, 1968-84.....	 19
2.2: Competition from China in the US Market.....	24
2.3: Shares of Credit Allocation by Banks.....	26
2.4: Outstanding Loans and Discounts of the Small and Medium Industry Bank.....	26
2.5: Cost of Borrowing.....	27
2.6: Average Debt Equity Ratios in Textiles and Clothing....	27
2.7: Nominal Wages and Productivity Growth.....	28
2.8: Comparative Wage Costs in Textiles.....	29
2.9: Growth in Equipment Investment in the Textile Industry, 1978-82.....	33
2.10: Profitability Trends.....	32
2.11: Textile Exports by Country.....	32
2.12: Average Nominal Tariff Levels in Korea's Textile Sector	35
 A.1: The Relative Importance of the Textile Industry.....	 50
A.2: Production of Textile Yarns, Fabrics and Chemical Fibers.....	51
A.3: Spinning Facilities and Capacity for Chemical Fibers...	52
A.4: Textile Facilities for Looms, Knitting Machines and Others.....	53

	<u>Page No.</u>
A.5: Demand and Supply Status.....	54
A.6: Textile Employment by Sector.....	55
A.7: Size Structure of the Textile Industry, As of End of 1983.....	56
A.8: Growth of Textile Exports, 1976-84.....	57
A.9: Age of Textile Machines.....	58
A.10: Age of Textile Machines in February 1983.....	59
Table 3.1: Output Structure of the Electronics Industry.....	63
3.2: Key Economic Ratios of Korea's Electronics Industry, 1983.....	64
3.3: Korea: Electronics Exports, Imports and Trade Balances by Subsector, 1984.....	65
3.4: Domestic and Export Market Sales of Electronic Equipment.....	65
3.5: Employment by Electronics Industry, Actual and Projected.....	66
3.6: Hourly Compensation (Wage Rates Plus Benefits) for Production Workers in 1984.....	77
3.7: Electrical and Electronics: Foreign Equity Investment (Approvals) by Share of Foreign Ownership, as of August 1983.....	62

List of Figures

Figure 3.1: Production of Electronics Industry.....	61
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INDUSTRIAL RESTRUCTURING: A STUDY OF SHIPPING

A. Introduction

1.01 The shipping industry is a valuable case study of industrial policy gone awry. For a number of reasons, including some public externalities related to national security but also based on the view that shipping services could add to the value-added of exports and reduce the value-added of imports, shipping was encouraged by government incentives. The ensuing expansion of capacity was financed with generally small amounts of equity and many firms entered the market. Average annual growth in Korean shipping capacity was 21.8% over the 1962-83 period. Unfortunately the industry has suffered net losses in recent years and a rationalization program was recently imposed by government to bring about a reduction in the number of firms and to provide the framework for a rollover of some of the industry's debts. Although government intervention in the merchant fleets of maritime nations is common, it runs counter to the Korean government's current policy intentions and thus merits more detailed analysis as a lesson for future actions. The following section describes the basic facts of the industry.

Basics of the Industry

1.02 Shipping is a capital-intensive industry providing a generally homogeneous service, although there are various lines of service depending on the material to be shipped. It is convenient to distinguish between dry bulk carriers, tankers, and container ships. Shipping is a worldwide market, with a number of very large firms and a host of smaller ones. Korea's share of gross world tonnage was approximately 1.5% (as of 1983) with slightly higher shares of the dry bulk, dry/liquid (i.e., convertible) bulk, and general cargo trade and considerably less of the tanker and container trade. According to KMPA, the size of Korea's merchant fleet was some 917 ships as of 1983, accounting for just over 6 million gross tons (g.t.) compared with a mere 114,000 g.t. in 1962 and 1.03 million g.t. in 1972. Thus, the average annual growth in shipping capacity was a healthy 23.2% in the 1962-1972 period and 18.3% in the subsequent 1973-83 period.

1.03 Compared with its contemporaries, Korea's shipping industry has grown somewhat more slowly than Singapore's and marginally less than Hong Kong's over the past decade, although its fleet ranks second in current gross tonnage. Korean ships have in part by virtue of reservation-waiver systems ^{1/} received increasing shares of Korean export and import cargoes: export shares rose from roughly 38% (1972-77) to 46% (1978-83) and import shares climbed

^{1/} The reservation-waiver system refers to the requirement that certain national bulk cargoes be carried by Korean-flag vessels unless waivers are requested and approved. Included in these commodities are imports of iron ore, coal, raw chemical products, grain, fertilizer, crude oil, and government purchases as well as exports of steel, cement, and plywood. The system of cargo preference is legislated in the Shipping Promotion Act of 1967.

from 32% (1972-77) to 49% (1978-83). Overall capacity utilization rates have exceeded world averages, even in difficult years like 1983;^{2/} however, the industry has not been profitable in 4 of the past 5 years being analyzed, and because of its heavy indebtedness has required government-sponsored relief efforts.

1.04 Korea's most recent surge in capacity, an increase of 62% between 1979 and 1983 has coincided with constrained world shipping demand. Therefore while some additions to capacity have taken place in container ships, and to a lesser extent dry bulk and other ships, global capacity reductions have been effected in tankers, dry/liquid bulk carriers, and conventional general cargo vessels. Somewhat surprisingly, in at least two of these categories Korea had added significantly to its capacity in recent years (see Table 1.1). By virtue of primarily second-hand purchases, Korea boosted its capacity in all types of ships except tankers. Given the general slowdown in world trade growth,^{3/} and the fact that about 40% of total Korean tonnage is in cross-trade,^{4/} the bullish expectations of Korean shippers must have been fueled either by (i) high hopes for Korean-origin or destination trade; (ii) lower anticipated costs of shipping enabling Korea to take new market shares; or (iii) very effective public incentives for expansion, perhaps based on non-economic strategic objectives.

1.05 It is important not to underestimate the strategic factor, as greater shipping self-sufficiency was a Korean national objective. While it is true that a certain amount of economic miscalculation occurred (viz., the somewhat unanticipated global slowdown), Korean shippers adopted a risky strategy of purchasing many fuel-inefficient and manpower-intensive ships in hopes of operating them at lower costs. The Korean urgency in buying second vessels created what was called the "Korean price," essentially highly inflated prices. This strategy, whether correct or not, could never have proceeded without Government's explicit support in the form of financing, although it should be noted that foreign banks also undertook this type of financing.^{4/}

1.06 Korea's shipping trade grew rapidly in the 1972-83 period of examination in concert with Korea's overall trade expansion. Export and import tonnage increased six- or seven-fold during the period and Korean flag vessels' share also increased markedly. Shipping accounted for about 26,000 jobs in 1982 (5.7% of total transportation employment) as well as some indirect employment in shipbuilding, although the latter impact is modest with only

^{2/} In dry bulk shipping, for example, 81% of Korean capacity was used in 1983 compared to a 55% worldwide average and in tanker traffic, 67.7% of Korean capacity was used versus a 41% average worldwide.

^{3/} Total tonnage in 1983 was accounted for by exports (14%), imports (46%), and cross trade (41%).

^{4/} Of course, foreign banks consider business loans to be essentially sovereign risk.

Table 1.1: COMPARATIVE SHIPPING CAPACITY
(millions gross tons)

	Bulk carriers			Tankers	Container ships	Other	Total
	Dry	Dry/liq	Gen'l cargo				
World 1979	81.80	26.50	30.20	183.20	10.00	31.30	413.00
World 1983	98.40	26.00	78.30	169.80	14.10	35.90	422.60
Change	20%	-2%	-2%	-7%	42%	15%	2%
Korea 1979	1.23	0.03	0.81	1.31	0.20	0.37	3.95
Korea 1983	2.87	0.71	0.99	1.00	0.31	0.51	6.39 ^{/a}
Change	133%	2,374%	22%	-23%	50%	38%	62%
Japan 1979	9.50	3.30	4.40	18.00	1.40	3.50	40.00
Japan 1983	11.50	2.00	3.70	17.50	1.70	4.20	40.80
Change	21%	-38%	-16%	-3%	25%	27%	2%

^{/a} Current estimates put total tonnage at slightly above 7 million gross tons.

Source: Lloyds Register of Shipping as reported in "An Overview of Prospects and Strategy for the Development of the Korean Shipping Industry," Report for the IBRD by Temple, Barker & Sloane and the Korea Maritime Institute (July, 1985).

14.8% of gross tonnage (and 12.4% of value-added) produced in Korean shipyards being for domestic firms. Shippers have relied primarily on imported purchases (79% of total tonnage between 1977 and 1983), much of it second-hand. Still, the average age of Korea's fleet at 10.9 years is equivalent to the world average, but older than either Hong Kong (7.4 years), Singapore (9.6 years) or Japan (7.9 years). It is reported that almost 25% of Korean ships are 15 years old or more. In terms of average ship size, Korea's fleet is considerably smaller (3,685 g.t.) than either Hong Kong (14,910 g.t.) or Singapore (8,198 g.t.) but not too different from Japan's (3,847 g.t.). Still Japan's ore and bulk carriers and container ships are considerably larger than Korea's, although Korea's fleet is increasing in terms of average tonnage in recent years.^{5/}

^{5/} Between 1979 and 1983, dry bulk ships averaged a 31% increase in average tonnage to almost 20,000 g.t. (compared with Japan's 32,000 g.t.) and container ships increased 38% in average weight to almost 11,800 g.t. (compared to 25,700 g.t. in Japan).

1.07 Korea's cost structure, at least with respect to operating costs, was competitive or better than that of its major rivals. And its capital equipment costs were also competitive, inasmuch as second-hand vessels purchased entail lower initial outlays and are often financed with credit from official institutions. The industry has produced about a third of the invisibles account revenue in recent years and about 9% of total foreign exchange earnings. Since no firm data is available on repayments of foreign loans by shippers, we cannot say what the net foreign exchange gain of the industry really is, however.

1.08 To summarize Korea's position in world shipping, it should be noted that Korea (i) expanded its fleet considerably, even in recent years when world demand was slack; (ii) concentrated on buying generally smaller, second-hand vessels because of their ready availability and lower cost; and (iii) successfully expanded its very small market share in most shipping categories (see Table 1.2), but did so at a price, i.e., by generating losses. These losses were difficult to absorb by the many highly leveraged firms in the market and this put Government, which had a role in the promotion of the industry, squarely into the "workout process" which was required when these highly indebted firms got into financial difficulties. The following section provides some background on the economic situation of the industry.

Table 1.2: SHIPPING SHARES
(percentages)

<u>Tankers</u>	<u>Dry bulk</u>	<u>Gen'l cargo</u>	<u>Container</u>	<u>Total</u>
<u>Shares of World Capacity (1983)</u>				
0.59	2.92	1.27	2.16	1.51
<u>Share of World Capacity (1979)</u>				
0.72	1.51	1.01	2.04	0.96
<u>Share of World Demand (1983)</u>				
0.40	2.38	0.65	1.53	"
<u>Share of World Demand (1979)</u>				
0.38	1.17	0.53	1.28	"

Source: Temple, Barker & Sloane.

The Economics of the Industry

1.09 Korea managed to do well in world shipping on a volume basis. Korean-based trade expanded and in the vital market of cross-trade (non-Korean trade), Korea managed to increase its market share from .21% in 1979 to 1.25% in 1983 at a time when the overall volume of cross-trade was steadily

declining.^{6/} In order to capture this difficult share -- and keep utilization rates considerably above world averages -- Korean shippers lost money. As noted in Table 1.3, the average return on sales (1979-83) was -1.1%, the average return on assets was -0.9%, and the average return on equity was -6.8%. Given an average debt-equity ratio of 8 to 1 as of 1983 and a rate of return of -29% in that year, it was clear equity was going to be eroded to the point where debts were nonrepayable. Firms lost a combined W 158 billion in 1984, pushing total debts to W 2,828 billion at the end of 1984, of which W 1,232 billion was short-term debt.

Table 1.3: THE FINANCIAL SITUATION OF THE SHIPPING INDUSTRY

	Return on sales -----	Return on assets (percentage)	Return on equity -----	Debt- equity ratio
1979	-0.2	-0.1	- 1.4	8.6
1980	-1.6	-1.4	-13.8	8.9
1981	0.4	0.3	2.2	5.6
1982	-2.9	-2.2	-14.0	5.4
1983	-4.1	-3.2	-28.8	7.9
1979-83 avg.	-1.1	-0.9	- 6.8	7.1

Source: Korea Maritime Institute and TBS (1985)

1.10 On a disaggregated basis, there is no component service of Korean shipping that was profitable in 1983, as seen in Table 1.4. In terms of assets, short sea haulers and special carriers account for about 11% of the total, while liner fleets account for 45%, bulk carriers 28%, and Southeast Asian carriers 16%. The biggest problem area is the bulk market which included 41 companies as of 1983 and in which firms were very highly leveraged and in which competition was ruthless. Freight rates below already depressed international prices were often quoted with the objective of survival rather than profit generation.^{7/} While this strategy is evident in other fields of Korean business (viz., it has received tacit approval by government through its reward system), Korean shippers were not alone in their desperation to cover some part of costs. Based on capacity utilization comparisons, however,

6/ Total world seaborne trade fell by about 20% between 1979 and 1983.

7/ The daily rate quoted for a Panamax class bulk carrier (55,000-65,000 d.w.t.), for example, fell from \$14,000 in 1981 to \$4,000 in 1983 and often below that.

it can be concluded that they were more successful than others in capturing market shares.

1.11 The resulting structure of the industry as of 1983 was generally as follows: there were 70 operators in the industry, but the 5 largest accounted for 44% of total capacity. Hyundai alone accounted for 13% of fleet capacity. While the number of crude oil carriers increased from 2 operators in 1970 to 4 in 1980, the number of nonliquid bulk carriers exploded from just 10 in 1970 to 35 in 1975, 43 in 1980, and 41 in 1983. Liner carriers increased rather extensively as well from 9 in 1970 to 21 in 1980 and 23 in 1983. Thus, by 1983 there was a plethora of firms in the shipping industry, competing vigorously with one another and trying to gain market shares by outbidding international competitors in a declining revenue market. Completing the dualistic structure of the industry were the 42 operators owning less than 50,000 g.t. of capacity and constituting 16% of total fleet size.

Table 1.4: THE FINANCIAL SITUATION OF MAJOR COMPONENTS OF THE SHIPPING INDUSTRY, 1983

Trade	Sample number of companies	Return on sales -----	Return on assets (percentage)	Return on equity -----	Debt-equity ratio	Proportion of long-term debt
Liner /a	4	-1.0	-0.8	-6.2	6.6	60
Bulk/b	31	-9.7	-6.3	-91.7	13.6	59
SE Asia/c	7	-2.8	-2.6	-18.0	5.8	45
Short Sea/d	8	-11.2	-9.8	-71.0	6.3	63
Special/e	4	-4.6	-3.4	-52.3	14.7	50
<u>Total</u>	<u>54</u>	<u>4.1</u>	<u>-3.2</u>	<u>-28.8</u>	<u>7.9</u>	<u>--</u>

/a Liner trade refers to regularly scheduled service, and in the case of Korea, refers to container ships.

/b Trade carried on a contractual or irregular basis (tramp service).

/c Liner trade to S.E. Asia.

/d Liner trade to Japan.

/e Ships designed for automobiles, refrigerated cargoes, chemicals, etc.

Source: Korea Maritime Institute

1.12 This industrial structure was not viable, and probably would not have arisen in the marketplace without explicit incentives because creditors would not normally finance new entrants into an industry not even earning normal profits. By the end of 1984, the shipping companies as a whole were saddled with debts (end 1984) of W 2,824 billion, a slight increase (W 54 million) over 1983. This debt level when compared with equity of W 274 million reveals a current debt-equity ratio in excess of 10. Of the total amount of debt outstanding, W 546 billion was to due Korean banks in 1985, much of it for past purchases of ships, and had to be rescheduled (over 8 years with a 3-

year moratorium) by the Government as a follow-up to its 1984 rationalization-rescue package. To put this set of public interventions into perspective, it is useful to review the public sector's role in the shipping industry.

B. Public Sector Role

Government Philosophy

1.13 Shipping takes on major strategic significance in the Korean setting. Faced with North Korea on one side and water on the other three, Government has made it a priority to be able to support itself satisfactorily by sea. This has in turn meant that public monies have tended to be used to produce shipping services which are perceived to be in the public interest. Inasmuch as shipping firms are privately owned, this philosophy has brought about classic intervention. Intervention has taken the form of legislation which provided specific industrial incentives, ad hoc financial measures aimed at supporting or rescuing ailing firms, and government-led industry restructurings, complete with forced mergers and rescheduling of debts.

1.14 Several interesting features of the shipping industry emerge as a result of Government's industrial policy. Explicitly, the incentive system and the low equity requirements encouraged a large number of entrants. Ultimately this resulted in virulent competition, undercutting of prices, and the sustaining of large losses as the combination of excess supply and poor world demand conditions coexisted. In a way, however, this mirrors industrial behavior in other sectors, where very active competition (often with different economic agents gaining unequal access to resources, for example, as with respect to credit) was encouraged to foster "the survival of the fittest." This was often the first step to further growth, industrial concentration, and further economic rewards. Thus, an implicit set of incentives encouraged firms to overexpand and overborrow in hopes of being one of the ultimate industry survivors and gain access to preferred sources of credit. While the strategy has benefits, it also entails certain costs.

1.15 One disadvantage of this approach, and one which is exacerbated by the weaknesses of the financial sector is that it ultimately brings in Government as industrial arbiter and gives the public sector a role in picking survivors. This is often accomplished, as in the Japanese case, through arranged mergers. In these cases, the larger firms tend to absorb the smaller ones, which validates the grow-at-all-costs strategy and rewards those who grew fastest rather than those which are most efficient or most profitable. Although there are cases where third-party intervention among competitors is useful,^{8/} public sector decisions are often based on noneconomic factors such as regional economic strength, balance among conglomerates or sheer guesses about survivability of firms, which again is often biased in favor of large firms.

^{8/} There are similarities to the prisoners' dilemma in same theory among feuding firms in an industry characterized by excess capacity.

Incentive Structure

1.16 The Government has taken an active role in promoting and now rescuing the shipping industry. This support has taken the form of direct and indirect financial support, including direct operating subsidies, preferential access for capital equipment (ship) purchases, tax incentives, subsidized credits for domestically produced ships, and most recently rationalization programs which work hand-in-hand with debt rescheduling. The Shipping Promotion Act of 1967, which incidentally codified the system of cargo preferences for Korean vessels, authorized operating subsidies totalling W 835 million which were disbursed over the 1967-73 period.^{9/} Financial support appears to have been ad hoc in order to bolster survival prospects of particular firms. It is not clear to what extent subsidiaries of conglomerates also benefitted from subsidies, but evidence points to their having benefitted.

1.17 In 1973, the subsidy program was discontinued, although a program of grants to the operators of full container vessels was instituted in 1976 with the objective of developing that segment of the industry. The beneficiaries of these grants (four major firms) received government grants averaging W 770 million annually during 1979-1982 and W 325 million annually during 1983-84. It is not clear whether this support was prompted by infant industry arguments, or national security, concerns or other factors. Container capacity did expand between 1979 and 1983 by 50%, but most firms have lost money consistently since 1979.

1.18 Prior to 1982, Korean shipping companies were exempt from corporate income tax. Subsequently, they have been liable to corporate taxation at the basic 30% rate. Exemptions are currently given for transfer and acquisition taxes in connection with the rationalization program which brought about wholesale mergers of shippers. Recent legislation will also exempt shippers and other declining industries from capital gains taxes in the disposing of real estate and other assets needed to pay off overdue bank loans as well as exempt the banks themselves from these taxes in selling of collateralized assets.^{10/}

1.19 Most of the buildup of Korea's shipping that has come by way of the second-hand market, but about 12% of new capacity installed during the decade ending in 1983 was domestically built. This figure is higher (i.e., 17%) for the subperiod 1977-82. Therefore, some of the benefits of incentives offered to the domestic shipbuilding industry indirectly accrued to the domestic shipping industry by way of subsidized ships, and others were directly targetted on Korean shippers to help finance the purchases of Korean vessels. These

^{9/} In addition, 394 million won was used to compensate two liner companies for 1970-73 losses incurred. See Korean Shipowners' Association for details.

^{10/} Tax Reduction and Exemption Law of 1985.

latter subsidies are not that dissimilar from incentives offered by other maritime producers, however.

1.20 The major vehicle for this kind of support in the late 1970s was the Planned Shipbuilding Program of 1976. In 1981, the Shipping Promotion Fund was established and qualified ocean-going carriers were eligible for special domestic financing ^{11/} in connection with purchases from Korean shipyards. The original objective was to expand shipping activity in new trades and invest W 10 billion annually; however, in actuality, only W 1 billion was allocated to the fund in 1981 and it was discontinued in 1983. Under the recent rationalization program, however, the grace period was doubled for these loans. In 1984 a new program for the conversion of insufficient tonnage was introduced with construction loans of up to W 10 billion being allocated under similar terms.

Recent Industrial Policy Dilemma

1.21 Government was recently faced with the following problem: shipping firms were losing money and a large number of them were unable to service their debts. Bankruptcies were considered generally not in the national interest because: (i) the financial sector was already straining under the difficulties caused by tardy repayments of shipbuilding and overseas construction loans; (ii) shipping capacity was considered to be in the national interest and certain forms of service were essential to maintain; and (iii) such actions could prompt a more generalized loss of confidence in Korea's creditworthiness and imperil its foreign debt exposure and cost of borrowing. The approach selected was a government-sponsored Shipping Industry Rationalization Program (SIRP).

1.22 The rationalization program offers support in the form of tax exemptions, ship conversion funds, and most importantly, loan moratoria to those firms agreeing to be merged within a group. The Korea Maritime and Port Administration (KMPA) proposed the formation of some 17 new groups of carriers in its rationalization program presented to the Industrial Policy Council, chaired by the Deputy Prime Minister (EPB) and including the Ministry of Finance and the Ministry of Trade and Industry. This recommendation was based on work done by the Korea Maritime Institute, which sought to preserve carriers in the deepsea bulk, shortsea bulk, deepsea liner, and shortsea liner routes.

1.23 KMPA's guidelines for newly created companies were as follows:

- o key deepsea bulk companies should include at least 8 smaller companies contributing a total of 500,000 g.t. and should command aggregate capacity of at least 1.3 million g.t.;

^{11/} Financing of 70-75% of cost at 10% over a 10.5 year period (grace period of 2.5 years) was normal.

- o key deepsea liner companies should include at least 5 component firms contributing a total of 300,000 g.t. and should exceed 1 million tons in total capacity;
- o for shortsea bulk trade, a tramp company for Korea-Japan and 3-4 tramp companies for Korea-South East Asia (each with about 20 ships) is desirable; and
- o for shortsea liner trade, one container company for Korea-Japan, 2 breakbulk companies for the same route, and one combined container/breakbulk company for Korea-South East Asia trade is desirable.

1.24 The objectives of these forced mergers has been to (i) reduce cut-throat competition among many small firms, particularly in bulk trade; (ii) achieve certain economies of scale by closing down redundant facilities; (iii) encourage the scrapping of outmoded capacity; (iv) establish efficient service on a number of important routes; and (v) ultimately improve the financial condition of the industry. The specific inducements offered are that firms qualifying under the program will be able to extend the grace period of loans given to buy domestically built ships or second-hand ships from the existing 2.5 years to 5.0 years, and therefore push out the final maturity to 13 years. Banks agreed to these 1984 rollovers, and Government guaranteed up to \$300 million (roughly W 255 billion) of these loans.^{12/} SIRP participants are allowed to take out foreign currency loans to repay both principal interest. An additional W 3 billion will be made available for the conversion of inefficient tonnage into energy and manpower saving ships. The aim is reported to be a removal of about 300,000 g.t. of aged capacity annually between 1985 and 1987, reducing the fleet tonnage by about 1 million g.t.

1.25 The net result of the SIRP is that 15 shipping groups have been formed out of the existing 63. The remaining 3 firms in the core industry declined to participate in the rationalization program. Firms were encouraged to sell off nonshipping assets in addition to disposing of antiquated tonnage.^{13/} In this respect, the government has acted in ways similar to traditional creditors in enforcing "workouts." This may not be inappropriate since the KDB is the major domestic creditor for the industry, at least for debts arising out of ship purchases. It is not clear, however, what rules were applied to conglomerate owners of shipping companies (such as Hyundai,

^{12/} Outstanding indebtedness of the industry is reported (Korea Herald, July 21, 1985) to be W 2,828 billion, so the guarantee applies to almost 10% of total debt.

^{13/} As a result of the rationalization program, about 440,000 tons of capacity has been disposed of, 540 local and overseas branches have been closed, and 900 workers have been laid off. Combined efforts to sell assets resulted in only W 72 billion in new funds compared with losses of W 158 billion in 1984 alone, prompting Government to amend the tax provision as noted in para. 2.6.

Daewoo, and Hanjin) and whether these subsidiaries benefitted from the SIRP bailout pari passu with other firms.

Assessment of Intervention

1.26 There are a number of possible approaches for assessing interventions. One can ask how effective the action was in bringing about the desired objective. Or one can compare the ultimate outcome to the counterfactual case of nonintervention. Or one might propose alternative interventions which might produce similar or clearly superior (normative) outcomes. Taken one by one, the measures introduced served to achieve the short-run objectives of policymakers, i.e., bailing out struggling firms, forcing mergers in an industry with too many small firms, prodding some scrapping of obsolete or redundant capacity (reportedly 385,000 g.t. in 1985), and maintaining a vital public service. But this was brought about at a substantial cost.

1.27 The direct cost includes implicit subsidization of banking institutions, primarily the official KDB which holds a large share of the total outstanding debt of the shipping industry, but also privately owned commercial banks to permit them to rollover debts of as much as W 546 billion in 1985. In the near term the question is whether the SIRP reorganization will produce sufficient efficiency gains to produce profits in 1986 and 1987.^{14/} Firms are being encouraged to divest themselves of other assets, but these often are insufficient to cover the losses of smaller or nondiversified firms.^{15/} Moreover, divestiture of aging vessels will produce far less than is required to repay the respective loans on these ships. Thus, the Government has (i) essentially invested permanently in this troubled industry and (ii) turned much of the industry over to conglomerates.

1.28 Government's actions were clearly aimed not only at bailing out firms, and implicitly lenders, but also in assuring continued shipping services of various kinds. This concern with the public goods aspect of shipping led it to explicitly design the industry's postbailout structure. The approach is not too dissimilar from the Japanese approach to industrial restructuring, where Government and industry design industrial units using efficiency and financial criteria as well as criteria relating to geographic employment and industrial needs. The normative question is how good government is at designing industrial structure and how different that managed is structure from unimpeded market structure.

1.29 The first observation is that in the presence of neutral incentives, firms should themselves see the merits of agglomeration, if they exist, and

^{14/} Debt service due is reported to be at least W 352 billion in 1986 and W 288 billion in 1987.

^{15/} One large firm, for example, disposed of W 20 billion in real estate and securities but this does not even match the W 24 billion won in current year losses incurred.

the industry itself should move to capture the economies of scale and positive rents. Why did this not happen in Korean shipping, an industry in which many new firms entered over the past 5 years and most lost money? In an industry with large capital requirements and economies of scale, there are normally financial barriers to entry. In the Korean case, many new firms were allowed to borrow with low equity at relatively inexpensive rates. Shippers could borrow for Korean or imported ships at approximately 10% over 10 years, rates presumably not reflective of the actual credit risks involved. In addition, special loans to shipowners were authorized to assist in debt service repayments between 1977 and 1979 and again in 1982 for foreign currency loan repayments.^{16/} Government also provided shippers with short-term working capital loans, subject to conditions,^{17/} equal to W 225 billion in 1983, compared with roughly W 200 billion in 1982 and W 140 billion in 1981.

1.30 Some conclusions to be drawn from the existence and scope of these support programs are that they were pervasive, somewhat unpredictable or on-off in nature, and apparently targetted on the specific problems of the moment. As such, the incentive structure was not consistent or far-sighted enough. A second conclusion is that the SIRP and the relief programs that preceded it neither got to the roots of the problem nor forced firms to stand on their own two feet. Therefore, one might expect additional relief measures to be needed. This prognosis relates to a third conclusion, which is that the efforts made to avoid bankruptcy of firms may serve to produce a suboptimal industry structure.

1.31 In container shipping, for example, the top 30 operators worldwide each have a fleet capacity in excess of 10,000 TEUs (20-foot equivalent units). A legitimate issue might relate to the appropriate economic size of the Korean container fleet and the process by which industrial size is determined. Over time, to be competitive internationally it is likely that Korean container companies will have to achieve economies of scale in feeder-relay traffic and intermodal transport. This should and can be accomplished by the private sector, but will probably mean even less competition. Merely for comparison, it should be noted that total Korean capacity combined would only place Korea sixteenth internationally in fleet size. All of the top 30 operators have fleet sizes in excess of 11,000 TEUs and Korea's largest company (KSC) has about 10,000 TEUs in capacity. Moreover, given current technology, viable international container-ship firms need to achieve economies of scale in both land and ocean sides of transport, particularly since

^{16/} Loans to help shippers repay mortgages totaled 8.2 billion won over the 1977-79 period and W 172.5 billion over the 1982-83 period. Loan terms were 3 years (1 year grace), interest rate of 16%, maximum of 50% of total debt service in any year, limited to certain types of shipping services which excluded liners in Japan and South East Asia trade as well as tankers, and extendable after 1983 if shippers are SIRP participants.

^{17/} The terms of these 90-day loans were 10% and the loan amount was subject to 10% of annual freight revenue.

higher profit margins will require investments in the upstream and downstream aspects of shipping, such as terminals and land transport.

1.32 In bulk shipping, it is widely recognized that the incentive structure encouraged the entry of too many firms and that capacity needed to be reduced. Voluntary mergers (and scrapping) or bankruptcies (and forced sales) are very viable alternatives to managed restructurings, in particular since it is more likely in both cases that the more efficient, and ultimately more profitable firms, might survive. Forced mergers involving a neutral organizer can be justified in a market characterized by predatory competition if it is deemed in the national interest to prevent bankruptcies. This apparently was the public policy decision in Korea. The acid test is whether the newly created groups can regain profitability and ultimately repay their loans.^{18/} The second important issue relates to Government's future actions with respect to these rescheduled debts if they cannot be repaid. And a related and equally important issue concerns what future government policy towards the industry will be, particularly in light of KMPA's announced plan to see Korean shipping capacity more than doubled by the year 2000. These forward-looking issues are discussed in C below.

C. Industry Outlook, Strategy, and Issues for Industrial Policy

Industry Outlook

1.33 Forecasting medium-term supply is far easier than forecasting demand inasmuch as shipbuilding has a relatively long gestation period and demand factors are a function of global growth performance. Still, forecasting of both supply of and demand for shipping services is done and does provide some clues as to the appropriate balance between the two.^{19/} On the basis of global shipping projections, one can reach some very tentative conclusions concerning the outlook for the Korean industry. Since more than half of Korea's capacity is in dry bulk carriers, this is the most important market segment. It is predicted that the demand/supply ratios will continue to fall in the mid 1980s from their 1982 levels, especially for smaller ships (which

^{18/} Looking to the future, there is a projected oversupply in the 10,000-80,000 g.t. segment of bulk shipping, which is particularly acute for Korea. The largest remaining bulk shipping company, Pan Ocean, with roughly 20-25% of the Korean fleet, absorbed losses in 1984 almost equal to its equity and is reported to have a debt-equity ratio of 20 to 1. Business Korea reports Pan Ocean liabilities of W 700 billion (August 1985) and equity of W 35 billion (October 1985).

^{19/} See, for example, Temple, Barker & Sloane, 1985.

characterizes the largest part of Korea's bulk fleet).^{20/} While Korea is quite competitive with other fleets with respect to vessel costs, these amount for only 20% of total costs, as capital expenses are about 40% and voyage costs a similar percentage.

1.34 It is not at all clear that Korea will increase its share of the all important cross-trade market. Indeed, the recent bankruptcy of Sanko, the largest Japanese shipping firm, which began a program of acquiring 125 new bulk carriers in 1984, casts a dark shadow over the industry in East Asia. Financial problems have spread throughout the shipping industry; for example, Hong Kong shipping firms of considerable magnitude are seeking restructuring agreements from their creditors.^{21/} It is also reflected in the record pace of tanker scrapping, which reported totalled 26.6 million tons in 1983, 20 million tons in 1984, and 30 million tons as of November 1985.^{22/}

1.35 One of the important issues to be addressed is whether or not the maintenance of the current share of Korean and cross-trade cargo by Korean bulk carriers is a national priority. If it is, then the normal accretion of trade volumes and the rather high rate of scrapping which would occur between 1984 and 1990 (in part due to the high average age of the fleet) would necessitate an investment of \$2.3 billion to rebuild obsolete tonnage.^{23/} If second-hand tonnage is purchased, the replacements would cost less than half that much. In order to remain price competitive, however, shippers would have to receive substantial financial assistance in the purchase of ships, adding to the burden being placed on the government and perpetuating the debt servicing difficulties of the industry.

1.36 In the technologically more advanced container market, in which Korean ships command 30% of Korean export trade (1979-83 average) and 38% of Korean import trade, estimates for the 1983-1990 period indicate that overall demand may increase by about 7.3% annually.^{24/} Since 1978, transpacific container rates have fallen dramatically ^{25/} and given the known new supply coming on-stream in the next few years, capacity utilization rates are expected to fall. Since the largest container companies (i.e., US and those

^{20/} Of 7.66 million dead-weight tons (DWT) of dry bulk capacity in 1983, only 2.40 (31%) was larger than 80,000 DWT. DWT is the usual measure of capacity and includes maximum cargo plus stores, while gross tonnage refers to the vessel's weight.

^{21/} See Far Eastern Economic Review (December 5, 1985).

^{22/} Much of this involves the very large crude carriers (200,000-300,000 tons) or the ultra large crude carriers (over 300,000 tons).

^{23/} Korea Maritime Institute and TBS (1985).

^{24/} Ibid.

^{25/} From an indices of 100 to 70 (Eastbound) and 53 (Westbound), as of 1984.

of a nearby Asian island economy) have invested in fuel-saving ships and are achieving new economies of scale by use of round-the-world (relay system) routes, it is unlikely that Korean shippers will be gaining market shares. Indeed, inasmuch as land transport feeder systems and marketing factors favor the large firms,^{26/} Korea will have to strive to maintain its existing share. It is estimated that investments of between \$300-500 million are needed to maintain a 30-40% share of the Korean container trade by 1990.^{27/}

1.37 It does not appear that shipping is an industry in which Korea has a natural comparative advantage, nor can one be easily developed. There are no large cost differentials to exploit and decisions will have to be made to either accept smaller market shares (and presumably risk continued non-payment of debt obligations) or invest once again to try and maintain market shares. Investment in second-hand ships will perhaps make it harder to compete technologically and with respect to price, while the alternative of investing in new ships is very costly, risky, and difficult for an over-indebted industry to handle. In the immediate future, the reorganized shipping groups must reduce redundant capacity because a continuation of the past "ship-at-any-price strategy" is not viable. Over the 1979-83 period, for example, Korean bulk carriers were losing money (negative returns as sales), while the industry average was positive. The same picture existed in container shipping. It is fairly self-evident that losses must be taken on some of these assets vis-a-vis their book values and some debts will go unpaid. In light of these factors, it is difficult to separate the industry's strategic planning from public policy, since the public sector is the major creditor of shipping firms and because Government continues to see significant public merit in the industry's preservation.

Strategy

1.38 By all accounts, Korea is not inclined to abandon its shipping industry. It has placed restraints on its medium-term expansion, however, sanctioning "new bottoms" (capacity increases) only if they are matched by assured future cargoes. A case in point is automobile-carrying ships, which will be needed to move Korean cars to North America. In a departure from past practices, Korean shipyards are to be given preference in new ship orders, and the Planned Shipbuilding Program invisions about W 200 billion in support for 1986.^{28/} Based on the evidence of 1985 in terms of new tonnage added (for the transport of cars and steel), it appears that the retrenchment will focus on

^{26/} Although there are almost 200 container operators, the top 30 (each with 10,000 TEU capacity or more) account for 75% of total volume shipped.

^{27/} Korea Maritime Institute and TBS (1985).

^{28/} This would be financed by W 160 billion from the National Investment Fund and W 40 billion from the KDB. Borrowing costs are now 11.5% for NIF loans and 13.0% for KDB loans. Financing is available for up to 90% of ship price. Preference is given to firms in the SIRP and those with guaranteed cargoes.

carrying Korean traded commodities and reconsider cross-trade secondarily (if and when world demand recovers) but on a long-term reservation basis if possible. New tonnage in 1984 was 626,000 g.t., which is certainly not indicative of an industry in rapid decline. Since scrapping estimates are 385,000 g.t., Korea's fleet actually expanded by 441,000 g.t. during 1985.

1.39 The second aspect of Korea's future strategy which appears quite clearly is the increasing reliance on large firms. This means that the industry will not only be more concentrated, but also that it will in large measure involve the conglomerates. In container traffic, in particular, there will be only three majors, now that Hyundai has taken over a heavily indebted Korea Maritime Transport Company; the other being Hanjin and Korea Shipping Corporation. In noncontainer business, wholesale mergers have also taken place, either managed by Government as part of the SIRP or privately (viz., Pan Ocean and Daeyang recently merged to form Korea's largest shipping line).

Public Policy

1.40 Shipping poses an industrial policy problem for Government. On the one hand, an examination of the operating subsidies, preferential credit, and bank rollovers shows an industry highly dependent on public resources. This kind of resource drain is contrary to government's expressed desire to wean industries from perpetual support and force them to survive in a more competitive market environment. On the other hand, because of the extent of Government's direct intervention, to the point of dictating the industry's organizational structure, it now continues to have a stake in the industry's success. At some point, however, the viability of separate components of the industry must be assessed, the realization reached that sunk costs are not retrievable, and a judgment reached as whether further investments of public monies are warranted. At the moment, the bulk carrier market is being bolstered on the demand side by the reservation-waiver system and on the supply side by financial assistance. There is a legitimate issue concerning the desirability of maintaining these props over time. The former might be justified on national security grounds, and it serves to guarantee a certain minimum level of demand for bulk cargoes. The latter is difficult to justify over time and does not serve to promote the infusion of new equity which is needed.

1.41 Some of the steps which would be desirable include: (i) a clear timetable for the withdrawal of direct financial support to the industry; (ii) debt rescheduling conditionality including mandatory profit plowbacks, divestiture, and a halt to further highly leveraged ship purchases; (iii) the tying of any new tax incentives to infusions of new capital, particularly from parent firms; (iv) a clear signal that bankruptcies will be tolerated; and (v) writeoffs of nonrepayable government loans to prevent the continued lending of resources to nonprofitable enterprises. Similar to the case of Sanko in Japan, banks will have to absorb losses. Unlike Japan, however, the banking sector in Korea relies heavily, and in the first instance, on Government for its economic health.

1.42 In a way, shipping provides clear lessons for the conduct of industrial policy in other sectors of the economy. First, past government interventions should not lead to perpetuation of costly actions. At some point, all creditors cease investing new funds. Second, the merits of discontinuing the management of inefficient units of economic activity should be considered. In the near term, losses and dislocations will inevitably occur, but in the long term, economic efficiency will be enhanced by market-based rather than administratively convenient solutions. Third, the financial sector, which is on a path towards greater managerial autonomy, needs to be extricated in some fashion from the errors of the past, and, must objectively consider the costs and risk-adjusted benefits of its investments. Shipping is a good case where Government's role needs to be more clearly delineated and reduced.

KOREAN TEXTILES: AN INDUSTRY IN TRANSITION

A. Introduction

2.01 The production of textiles and clothing in different countries has tended to follow the product cycle sequence associated typically, but not exclusively, with the growth of income and wages. A country begins this sequence as an importer of a good; it then moves to an import-substitution stage as its labor force acquires the skills and technology to produce the good domestically; the third stage is one of exports as the country, having moved up on the technological learning curve for the product, begins to take advantage of its relatively lower production cost. Through these stages the standard of living rises and wage costs rise correspondingly. As these costs rise beyond a certain point, the country begins to lose its comparative advantage in the product and must yield its export market share to other countries which are a stage behind in the product cycle sequence. Competition in foreign markets is only the first volley of a barrage that typically lays siege to the domestic market also. It is at this point, when export markets are slipping and the domestic market is threatened, that a hard public policy choice has to be made between protecting the industry from competition or allowing international market forces to restructure the industry with the ensuing displacement of labor and capital. If the latter course is chosen, the country moves on to the fourth stage where it becomes an importer of the product once again.

2.02 Korea's textile industry is somewhere in the third stage now and finds itself facing a struggle to maintain export shares in some major products and markets. Competitive forces within the country have already begun to allocate resources away from the sector. That a difficult part of the third stage has arrived can be judged from the following recent developments. Korea's share of the imports of clothing in the United States, by far its most important market, has been virtually stagnant for the past five years. The rate of growth of textile output has slowed to a crawl of only 5% (during 1979-84) from an average of 20% between 1970 and 1978 (see Table 2.1). Capacity has declined or remained stationary in large segments of the industry. The ratio of profits to assets has slipped from an average of 2% (during 1973-77) to less than 1.0% (during 1979-84). The industry's share in manufacturing value added, employment and exports has declined steadily over the past five years. The index of revealed comparative advantage (RCA) of Korea's major manufactured products indicates that textile and clothing products have suffered the biggest relative decline since 1973.

2.03 At this point it is useful to note three caveats. First, the industry is considerably heterogeneous with respect to product and process characteristics and different subsectors have evolved differently and face different prospects. In particular, the clothing subsector must be distinguished from the others. Second, the product-cycle concept is more of a heuristic device than a predictive one. Comparative advantage in a product is affected by a host of factors and it is very difficult to distinguish between cyclical and

structural changes in competitiveness. The former are transitory and may be influenced by macroeconomic policy whereas the latter are permanent and denote the onset of major changes in output and employment structure. Third, the industry may be in relative decline but it is not yet in absolute decline. Output and exports continue to rise although employment appears to have peaked in 1982.

**Table 2.1: REAL GROWTH RATES OF THE TEXTILE INDUSTRY,
MANUFACTURING SECTOR AND GNP, 1968-84
(%)**

Year	GNP	Manufacturing sector	Textile industry
1968	11.2	27.2	22.5
1969	13.7	21.6	20.3
1970	7.6	19.9	21.6
1971	8.8	18.7	25.7
1972	5.7	14.7	28.6
1973	14.7	29.9	38.9
1974	7.5	15.7	9.3
1975	6.9	11.9	18.9
1976	14.1	23.9	22.5
1977	12.7	16.0	4.7
1978	9.7	21.3	13.1
1979	6.5	10.3	3.2
1980	-5.2	-1.1	5.1
1981	6.2	7.2	14.7
1982	5.6	4.0	-1.1
1983	9.5	10.9	5.8
1984	7.6	14.6	4.0
1970-78 (A)	9.9	18.9	19.8
1979-84 (A)	4.9	7.5	5.2

Notes: Growth rates are based on value-added in 1980 prices.

A = Average annual growth rates

Source: Economic Planning Board.

2.04 These caveats notwithstanding there is an increasing sense of malaise about the industry in Korea. It is often openly referred to as a sunset industry and public policy initiatives to manage a "soft landing" for this

erstwhile high flier are being actively debated. This paper reviews the policy options that Korea faces with respect to the future evolution of the textile industry.^{1/} This review is based partly on an assessment of the factors that have influenced the past development of the industry and those that govern its future prospects and partly on an assessment of the experience of developed countries in dealing with the problems of their textile industries over the past two decades. The paper is organized as follows. Section A provides a quick overview of the industry and its role in Korea's economy. Section B examines the factors that have influenced the recent evolution of the industry. Sections C and D review the private and public sector aspects of the adjustment strategy that seems to be emerging. Section E describes the main elements of the adjustment strategies followed in Japan, West Germany, Italy, the UK and the US. Section F discusses the future prospects of the Korean industry. Section G summarizes the lessons for public policy that one may derive from the preceding sections.

B. Overview

2.05 The textile industry's share in manufacturing value added and employment has declined steadily from 16.7% and 26.5% (in 1981) to 13.8% and 22% (in 1984), and its share of total exports has slipped from 29.9% (in 1979) to 24.2% (in 1984). Despite its recent decline the industry remains an important force in Korean manufacturing and exports (see Appendix Table 1). In 1984 it contributed almost a seventh of value added in manufacturing and close to one fourth of total exports (\$7 billion out of \$29 billion). It also provided employment for 738,000 persons out of a manufacturing work force of 3.3 million, making it the largest single sector for nonagricultural employment in the country. The industry also has significant linkages with other sectors, especially the machinery and chemical sectors (42% of textile machinery used in 1980 was of domestic origin).

2.06 The textile industry in Korea consists of four major subsectors distinguished by process and output: spinning (yarns); weaving and knitting (fabrics); apparel (clothing and other made-up goods); and artificial or chemical fibers. All these subsectors grew rapidly during the 1970s (the industry grew at an annual rate of almost 20% in real value added terms between 1970 and 1978) and virtually all have experienced a sharp slowdown in recent years (the industry has grown at only about 6% during 1979-84). Variations in recent growth performance, however, can be seen by examining the behavior of the physical output at the subsector level (see Appendix Table 2). During 1979-84, the production of textile yarns has grown between 5.2% (cotton yarn) and 10% (woolen yarn), that of fabrics has ranged from 8.0% (cotton) to a decline of 16.6% (rayon), and that of chemical fibers from 19.1% (polyester) to a decline of 10% (viscose). The relatively slow growth of the industry as

^{1/} Unless otherwise specified, the textile industry will denote both textiles and clothing in this report. Detailed statistics pertaining to output, capacity, employment and other indicators are provided in the appendix.

a whole is an average of the fairly high growth of some products and sharp declines in the output of others.

2.07 Developments in production capacity suggest a similar story. Over the period 1979-84, capacity has remained virtually stationary in spinning, has declined in knitting and weaving but has grown fairly rapidly in sewing (garment-making) and producing chemical fibers (see Appendix Table 3). All this reinforces the view that while some causes of the recent slowdown may apply to the entire industry a more productive line of inquiry would focus on subsector-specific causes and issues.

2.08 The intensification, in recent years, of the problems besetting the industry has had a noticeable effect on its profitability. The ratio of profit to assets for the industry has slipped from an average of 3.6% (during 1973-77) to about 1.0% (during 1978-84).

2.09 The industry has always been export driven in that exports have always accounted for a significantly larger fraction of output than domestic consumption. In recent years (see Appendix Table 5) almost 62% of the output of fibers, yarns, fabrics and clothing has been exported. One measure of its export orientation is the fact that Korea is now the third largest textile exporter in the world (behind Italy and West Germany and ahead of Japan).

2.10 There is considerable variation in economic characteristics across subsectors. For example, over 50% of the employment in the industry is accounted for by the apparel subsector (see Appendix Table 6). This subsector is characterized by a large number of small, often family-owned, firms who work as subcontractors to large General Trading Companies and operate with relatively simple technology and limited cash. The average firm employs about 40 workers (see Appendix Table 7).

2.11 At the other extreme are spinning, weaving and knitting mills. These tend to be large-scale and generally capital-intensive operations. The average mill size in cotton spinning in Korea is about 150,000 spindles.^{2/} The artificial fibers subsector is also characterized by a small number of large-scale firms using advanced technology and employing few people per unit of capital.

^{2/} This is larger than the average cotton spinning mill in the US and in Europe. In terms of employment, spinning, weaving and knitting mills together account for about 35% of total employment in textiles. As could be expected these subsectors have few firms. There are only 23 cotton spinning mills in Korea (as of 1983) and about 90 woollen and worsted mills. The average cotton spinning mill employs about 2,300 workers and the average woollen mill about 650 workers.

C. Factors Affecting Recent Evolution of Industry

Protectionism

2.12 An important global development of recent years has been the upsurge of protectionism in developed countries (DCs), especially directed against textile and clothing imports from developing countries. The growth of such protectionism can be seen in the nature of the various multilateral agreements to restrict imports which go under the name of the Multifiber Arrangement (MFA). Since the early 1970s such agreements have become increasingly restrictive and there is no prospect of more liberal agreements in the near future. This upsurge in protectionism can be traced back to the generally sluggish performance of the OECD economies in the 1970s. Slow growth has meant little room for job creation and relocation of displaced workers. This has both increased pressure from industry associations and trade unions in these countries and softened government resistance to protectionist arrangements. Textiles remain an important, though declining, component of the manufacturing sectors in most OECD countries and textile lobbies enjoy considerable political power and influence.

2.13 The rise in protectionism has affected Korea's exports in the past but will probably be of more significance in the future.^{3/} Textile exports grew at a rapid pace of 43.5% per year (compounded nominal rate) during 1972-78 but have since slackened, in the face of world recession and protectionism, to an average of under 10% p.a. (simple nominal rate) during 1979-84 (see Appendix Table 8). Successive MFA's have widened the range of products covered and reduced the scope for quota growth for many of Korea's textile products. Bilateral arrangements have also been forced upon Korea by several of its major trading partners to further restrict the scope for export and output growth.

Aging Machinery and Technical Developments

2.14 There are two noteworthy aspects related to machine vintage in the Korean textile context. The first is that a large and rising proportion of existing stock is old by engineering standards. While only 31% of spinning machines in operation were over 10 years old in 1980, almost 45% were in this category by 1983. Similarly, the proportion of looms over 10 years old rose

3/ A review of Korea's quota utilization rates indicates that, as a rule, quotas are not fully utilized (see GATT, 1984, pp. 92-96) Does this indicate that such bilateral agreements do not actually restrict trade? There are several reasons to avoid making such an inference. There typically are mismatches between demand and supply; rapid changes in fashion may make some quotas, based on historical demand patterns, redundant while others are quickly filled. The average quota utilization rate may not capture this phenomenon adequately. Redundancy may also occur when a recession in the importing country leads to a sharp reduction in demand (as in 1981-82). Therefore, an underutilized quota need not indicate that the restriction does not affect trade.

from 31% to 51% during 1980-83 and that of (false) twistors from 33% to 65% (see Appendix Tables 9 and 10). The second is that significant technical innovation has taken place in the art of spinning and weaving during the past two decades in several OECD countries. The confluence of these two trends with rising domestic wage costs has jeopardized Korean competitiveness in certain textile items. The threat from the technology side is greatest in spinning and weaving operations and least in garment-making.^{4/}

2.15 These developments have a number of implications for Korea: (i) the labor cost advantage, especially in spinning and weaving, is no longer as great as it used to be; (ii) developed countries can divide textile processes into two activities: the spinning and weaving can be done at home with the new machines while the garment-making can be done abroad in LDCs, thereby cutting costs and also tying in Korean competitors to lucrative OECD markets; and also (iii) while Korea can take advantage of the availability of new machines this does threaten the linkage between domestic machinery suppliers and the textile industry.

2.16 The increase in the age of spinning and weaving machines is surprising because the average factory is large and ought therefore not to have any problems with financing. Perhaps the problem here is not the availability of finance but "diseconomies of scale" arising from largeness of size. What these mills may need is not just better machines but a change in product mix together with a change in the production technology. They may not have yet mastered the necessary concomitant changes in management, design and marketing which would make new machines a worthwhile investment.

2.17 Even the apparel industry where Korea used to enjoy a great cost advantage, has come under pressure from cost and quality concerns. Labor costs have risen sharply in Korea and rapid changes in tastes and fashions have also occurred. Total orders per piece have dropped substantially (from 20,000 to less than 1,000 per design according to one estimate) thereby placing companies with high volume machines at a disadvantage. Given present quality demands, it is estimated that over 30% of the sewing machines in the industry's stock are outmoded.

^{4/} There have been some dramatic technological developments in the industry during the past 20 years or so. These developments include: open-ended rotor spindles which lead to a 40% saving in manpower requirements over traditional ring spindles in spinning operations; shuttle-less multiphase looms in weaving that significantly reduce labor requirements, breakages and weaving time; high-speed knitting machines which can be patterned via computer controls and offer both reduction in time and increase in flexibility; special purpose machines which perform operations as button holing, patch pocket stitching, decorative stitching, cloth cutting and high speed sewing -- all these have made clothing manufacture much less labor intensive than previously; and computer controlled design facilities which have increased the speed and range of design innovations.

Competition from China and Others

2.18 After a long period of self-imposed exclusion from world trade in textiles China, the world's largest textile producer, has begun to make its presence felt in world trade. China was not among the top 15 clothing exporters in 1963 and was the 15th in 1973; ten years later it had risen to 6th place. China possesses two advantages over Korea: (i) it has much lower labor costs and can oust Korea from markets for low quality textile goods and garments; and (ii) it has not yet been subjected to very restrictive quotas since it is a new participant. While the latter source of advantage will undoubtedly be reduced by protectionism in OECD markets, the former source will continue to threaten Korea's position. Furthermore, if world trade in textiles slows or is restricted greatly by protectionism, giving China a bigger slice than it has had historically will mean giving already established exporters like Korea a smaller slice.

2.19 China's share of the Japanese import market doubled in the last decade from 8.4% in 1971 to 16.8% by 1980. Its penetration of the US market has been even more spectacular (see Table 2.2). In 1973, Korea's share of

Table 2.2: COMPETITION FROM CHINA IN THE US MARKET /a
(%)

	1963		1973		1978		1982	
	T	C	T	C	T	C	T	C
Japan	23.7	26.5	19.1	11.5	21.3	5.1	19.4	3.1
UK	8.3	5.9	6.6	2.3	5.7	1.4	4.1	-
Italy	7.1	24.3	6.3	5.5	9.1	3.2	8.4	2.5
Two major Asian producers /b	3.2	17.7	7.3	37.0	8.8	41.9	10.2	43.0
<u>Korea</u>	-	1.0	1.3	11.3	2.7	17.3	6.5	17.3
<u>China</u>	-	-	-	-	2.9	1.1	8.6	7.8

/a Share of selected suppliers in import market for textiles and clothing in US, 1963-82.

T = textiles; C = clothing.

/b Includes Hong Kong.

Source: GATT, 1984, Tables 2.19, 2.20

the US import market for textiles was about 1.3% while China's was non-existent. By 1978 both Korea and China possessed about 2.8% of the market. By 1982 China had taken a clear lead as its share rose to 8.6% while Korea's rose to 6.5%. This experience was repeated in an even more striking fashion in the US import market for clothing. While Korea's share stagnated at 17.3% over 1978-82, China's grew sharply from 1.1% to 7.8% (Hong Kong's share also

stagnated in 1978-82). Just as East Asia ousted Japan from the US market for clothing, so does China now threaten the East Asia group.^{5/}

2.20 Another threat on the horizon is India whose potential power in exports is similar to China. India's strength lies in clothing exports, hitherto of ethnic specialties but, in the future, also of mill made fabrics and clothes. The reason India will be a force to reckon with in the future is because of recent changes in its industrial and trade policies which should make its products competitive in export markets.

2.21 One adjustment measure that many textile companies in developed countries have taken progressively through the 1970s is relocation of some activities to low-cost areas. This has resulted in a large amount of outward processing trade (OPT). In particular, German firms have made increasing use of East European countries for OPT, French firms of the Mediterranean rim countries, and American firms of ASEAN countries and Central America. Mexico, in particular, has long provided a location for American garments manufacturing. Export processing zones in Malaysia, Sri Lanka and Mauritius have also attracted DC investors in significant numbers. Korea faces competition from many of these countries to the extent that its labor costs are higher than theirs, its machinery not superior to that installed by DC foreign investors in these "overseas" operations, and its location not as favorable to serve many major consumer markets.

Declining Credit Availability

2.22 The Korean manufacturing sector has been built on commercial bank debt more than on any other source of finance. Debt to equity ratios tend to be high in Korea relative to the three other major Asian producers (including Hong Kong and Singapore). The textile industry was built in the sixties through easy access to credit provided through the government-run banking system. Not only was the industry favored in obtaining finance for investment and working capital it was further supported at the marketing stage by export promotion loans made available to export activities. In the mid-seventies, however, the Government shifted priorities away from light industry to heavy industry in such a massive way that the textile industry was starved of funds. Declining profitability since the late seventies has aggravated the credit access problem. Loans and discounts of commercial banks to the textile industry have declined since the mid 1970s (see Table 2.3). Loans and discounts of the SMIB to this sector, a major source of credit for the bulk of the industry's firms, have also declined in similar fashion (see Table 2.4). The cost of capital for the textiles sector has gone from an average of 9% during the early 1970s to around 15% over 1980-84. It used to be lower than the average cost of capital in manufacturing in the early seventies but has generally been higher since 1978 (see Table 2.5). This has come about because textile firms have been forced to borrow more and more from the curb market

^{5/} The areas in which China is competitive are: silk yarn and fabrics, wool sweaters, cotton fabrics, garments, work gloves, etc. It has also begun entering the synthetic fiber/products market.

where interest rates are much higher, on average, than in the formal banking sector.

**Table 2.3: SHARES OF CREDIT ALLOCATION BY BANKS /a
(%)**

	Textiles and clothing	Heavy and chemical industry	Light industry
1973	42	36	64
1974	35	32	68
1975	13	66	34
1976	35	56	44
1977	27	61	39
1978	23	56	44
1979	19	59	41
1980	17	60	40
1981	20	53	47
1982	11	69	31
1983	14	59	41
1984	26	56	44

/a Figures refer to the percentage share of the net credit increase of deposit money banks and the Korea Development Bank.

Source: Bank of Korea, Economic Statistics Yearbook.

**Table 2.4: OUTSTANDING LOANS AND DISCOUNTS OF THE SMALL AND
MEDIUM INDUSTRY BANK, /a
(Million won)**

As of end of period	All industries		Textile, wearing apparel and leather		B/A
	(A)	Growth rate (%)	(B)	Growth rate (%)	
1975	190,673		57,695		30
1976	230,612	21	76,212	32	33
1977	300,754	30	91,812	20	31
1978	426,968	42	129,015	41	30
1979	645,331	51	168,926	31	26
1980	970,538	50	239,838	42	25
1981	1,434,365	48	328,367	37	23
1982	1,759,426	23	408,624	24	23
1977-82 /b		40.7		32.5	

/a Small and medium industries are industries employing less than 300 employees.

/b Average annual growth rate.

Source: Small and Medium Industry Bank.

Table 2.5: COST OF BORROWING /a

	1970	1975	1978	1980	1982	1983	1984
Textiles	9.4	9.6	15.4	17.4	16.9	14.6	13.6
Clothing	6.7	17.5	15.1	21.0	9.8	10.6	14.6
Manufacturing	14.6	11.3	12.4	18.7	16.0	13.6	14.4

/a Cost of borrowing is measured by ratio of financial expenses to total borrowing.

Source: Bank of Korea, Financial Statement Analysis.

2.23 One consequence of declining profitability, reduced access to credit and increased costs of credit has been a sharply rising debt equity ratio in textiles. This ratio rose from 5.06 in 1976 to 21.55 in 1982 in the clothing subsector and from 4.52 in 1977 to 7.82 in 1980 in the textile (spinning, weaving, knitting) subsector (see Table 2.6). Another consequence has been a decline in the ability to finance new investments in machinery, a step that may be needed for the survival of small and medium firms.

Table 2.6: AVERAGE DEBT EQUITY RATIOS IN TEXTILES AND CLOTHING, 1976-84 (%)

	Manufacturing	Textiles	Clothing
1976	364.6	492.2	505.7
1977	367.2	451.8	1,034.3
1978	366.8	496.8	1,117.8
1979	377.1	592.0	927.3
1980	487.9	782.0	1,586.6
1981	451.5	536.6	1,750.2
1982	385.8	530.2	2,155.2
1983	360.3	496.7	1,863.8
1984	342.7	480.6	

Source: Bank of Korea, Financial Statements Analysis.

Rising Wage Costs

2.24 The effect of rising wage costs varies across subsectors with respect to the share of labor costs in total costs and the extent to which real wages rise faster than productivity in each subsector. In the textile industry the most labor-intensive subsector is apparel. The production of yarns and fabrics from natural and artificial fibers are, on the other hand, relatively capital-intensive processes. It should also be kept in mind, however, that increases in wage costs in the cloth production process are fed through to the garment-making stage and affect factor proportions choices there also.

2.25 Real wages in the textile and clothing industries have generally risen at the same rate as average earnings in manufacturing over the last decade or so. On this count, therefore, no inter- or intraindustry trend is observable. However, both textiles and clothing experienced increases in wages over and above productivity increases through the 1970s (see Table 2.7) and this affected the industry's competitive position in the world. The average earnings per hour in spinning and weaving doubled during 1980-82 bringing Korea's wages up to par with its major East Asian competition and far beyond South Asian competitors (see Table 2.8). While some of these changes can be explained by changes in exchange rates^{6/}, the fact remains that rising wage costs have systematically eroded Korea's competitive position in all segments of the textile industry.

Table 2.7: NOMINAL WAGES AND PRODUCTIVITY GROWTH
(Annual % change)

	Nominal wages			Productivity	
	Textiles	Clothing	Manufacturing	Textiles	Clothing
1976	37	42	35	12	1
1977	24	28	34	4	15
1978	31	33	34	7	20
1979	32	32	29	12	17
1980	23	21	23	19	18
1981	19	20	20	21	33
1982	14	14	15	12	-18
1983	8	14	12	9	12
1984	7	10	8	8	3

Source: Wage data are from Economic Planning Board. Productivity data are from Korea Productivity Center.

^{6/} It should also be noted that in recent years contractionary macroeconomic policy has reduced the rate of nominal wage growth in Korean manufacturing below that of productivity growth while a steady depreciation of the won has also occurred. These policies have improved the competitiveness of Korean textiles and clothing, a development reflected in recent Korean trade performance.

Table 2.8: COMPARATIVE WAGE COSTS IN TEXTILES (SPINNING AND WEAVING)
(Gross earnings in US\$/hr)

	1980	1981	1982
Netherlands	11.68	9.16	10.17
Fed. Rep. of Germany	10.65	8.17	8.38
US	6.37	7.03	7.53
Italy	9.12	7.23	7.06
France	8.57	6.40	6.36
Japan	4.35	4.90	5.64
UK	5.75	5.57	5.39
Korea	0.78	1.35	1.53
Hong Kong	1.91	1.42	1.40
India	0.60	0.69	0.66
Pakistan	0.34	0.42	0.37
Sri Lanka	-	0.16	0.32

Note: Changes in US dollar wage costs can also arise from exchange rate changes. Gross earnings include basic wage plus fringe benefits.

Source: Survey conducted by Werner International Management Consultants; cited in Cable, V. and Baker, B. (1983, Table 49).

2.26 Wages in textiles have been rising for both economy-wide and sector-specific reasons. Korea is now faced with a general shortage of unskilled labor, a shortage brought about by falling birth rates and rising education levels. In addition, workers are being attracted away from textiles, where working conditions are relatively harsh, into other sectors. Korea's high rate of economic growth has also created high rates of labor turnover and cross-sector mobility.

7/ The labor shortage and rising wage cost issue for textiles and clothing should not be confused with the recent concern regarding rising unemployment. The latter is a concern with a possibly temporary glut of university graduates arising from an increase in university enrollment rates four years ago. These graduates are not relevant for the blue-collar, low-skill, relatively low-pay jobs offered by the textile and clothing sector.

D. Private Sector Adjustment Strategy

2.27 The problems besetting the textile industry have not crept up suddenly but have been festering for several years. The textile industry has therefore had much time to examine the nature of its predicament and to undertake appropriate adjustments. The adjustment strategy that has emerged aims at changing the product mix, the cost and productivity relationships, the technology and the product market composition that characterizes the industry.

Product Mix Considerations

2.28 There is a consensus that the industry should move "upmarket" towards higher value-added, higher quality items. This should soften the consequences of increasing competition in the lower quality end of the market from lower-cost Asian textile producers as well as maximize the value of quotas placed on Korean exports in the US and the EEC. Moving up market will require investments in new machinery, in design facilities and in marketing arrangements. So far, progress in quality improvement appears to have been slow. The rate of replacement of old by new machines has been considerably below expectations (see Table 2.9). Some local textile companies have begun to develop their own patterns and fashion designs but the bulk remain dependent on buyer provided instructions or on standard or traditional designs. This places them at a disadvantage because demand in the upmarket segment changes frequently and buyers are wary of relying on producers who have little indigenous capacity to handle design changes. The industry is also hampered by the lack of marketing experience in this segment. Unlike in the market for standardized basic textiles, producers cannot always wait for buyers to come to them but must reach out and establish markets for themselves either through their own outlets or through close and quick connections with retailers.^{8/}

Cost and Productivity Considerations

2.29 Since rapidly rising labor costs have been one of the industry's major problems there is an obvious need to control them. The industry has had limited success in controlling wage costs directly since the level is set by the economy at large. The high demand for labor outside textiles and the relatively poor working conditions within textiles limit the ability of the

^{8/} The product-mix choice is rendered difficult by several uncertainties. Fashions change quickly as far as apparel design is concerned. They may also change with respect to materials -- witness the trend away from synthetics towards natural fiber in the 70s. Thus pursuing man-made fiber production in the future carries risks. On the other hand, improvements in technology have led to significant reductions in the cost of producing synthetic cloth and in the quality (feel, texture, ease of ironing, resistance to shrinking) of such cloth. Furthermore, the decline in the price of oil has also reduced industry costs. Investment choices with respect to product mix will have to contend with all the uncertainties of demand, input costs and production technology.

industry to cut labor costs directly. What has occurred instead is a retrenchment of labor from a level of 760,000 persons employed in 1981 to 720,000 persons in 1984. The bulk of the retrenchment has been in the spinning and weaving subsectors. Productivity has been a weak point in recent years. It has been plummeting in both clothing and textiles and in the former it has not been keeping pace with nominal wages. It would appear that the bulk of the adjustment in costs and productivity is yet to come, and that it will very likely mean reduced employment.

Technology Considerations

2.30 The desired changes in product mix and cost structure call for more reliance on small, flexible production technology as opposed to large, high volume machines. To some extent this puts such subsectors as spinning, weaving and knitting at a disadvantage since their present stock of machines is of the latter kind. At the same time technological developments in the garment industry have reduced the labor cost advantage enjoyed by Korea in the past. Adjustment in all subsectors will require an increase in the number of new, more advanced technology. Present indications are that little progress has been made on the technology front. Small producers have blamed the lack of credit availability for their failure to switch to the new machines. As far as larger firms are concerned, indications are that their profit margins have been so squeezed in recent years that they too have not had adequate resources to finance new machinery purchases. The rate of investment in the industry has been partly because of depressed profits, but also because of the great uncertainties that continue to characterize the future of the industry. Investment in new machines may not be enough if design and marketing arrangements are not also simultaneously improved. Not all firms will be up to the latter task and a period of shake-out and mergers may be necessary. This does not seem to have happened as yet as far as one can tell from data on the number of firms in the industry.^{9/}

Product Market Diversification

2.31 Through most of the 1960s and early 1970s Korea textile exports went mainly to Japan and the US, these two countries absorbing as much as two-thirds of the total on average. The onset of more and more restrictive MFAs and bilateral quota agreements provided a spur to greater diversification through the 1970s as Korea sought new markets in the EEC, in the Middle East and in Hong Kong as well as in Africa and Latin America. By 1980 the individual shares of US and Japan had dropped considerably (to 22.2% and 17.6%, respectively) (see Table 2.11). Nevertheless, Korea's vulnerability to a reduction in demand from those two sources remains great. Further diversification will be constrained by three factors: (a) a considerable part of

^{9/} Data on comparative profitability (see Table 2.10) indicate that the textile sector (but not clothing) has consistently fared poorly relative to manufacturing in general since the mid-1970s. This suggests an additional reason for the lack of enthusiasm for capacity expansion in the textile business. The larger units in the business tend to be owned by conglomerates who may find it more profitable to divert their financial resources progressively into other industries.

the world remains in a state of low growth; (b) the Middle East market is no longer as lucrative as it has been in the 1970s; and (c) most of the OECD countries have raised high barriers to Korean exports and further growth in these markets is unlikely. Korea's problem is similar to that of other developing country textile exporters: the quota areas offer less scope for growth than before while the nonquota countries are generally too poor to allow much scope for growth.

Table 2.9: GROWTH IN EQUIPMENT INVESTMENT IN THE TEXTILE INDUSTRY, 1978-82
(% change in nominal values)

	1978	1979	1980	1981	1982	1983	1984
Textile industry	-16.6	49.8	-74.3	90.2	-4.3	28.3	19.0
Manufacturing sector	55.7	14.9	-24.4	-24.8	14.6	28.2	70.3

Source: Survey of Equipment Investment (December 1984), Korean Development Bank.

Table 2.10: PROFITABILITY TRENDS /a

	1975	1978	1980	1982	1983	1984	1973-77	1978-84
Textiles	0.25	3.69	-1.09	-0.66	0.59	1.19	3.2	0.6
Clothing	3.87	-0.55	0.99	2.79	5.08	5.46	3.8	1.8
Manufacturing	3.88	4.98	-0.23	1.03	3.27	3.41	5.3	2.3

Note: Profitability measured as ratio of normal profit to total assets.

Source: Financial Statement Analysis, Bank of Korea. Various issues.

Table 2.11: TEXTILE EXPORTS BY COUNTRY
(US\$'000)

Country	1980	1981	1982	1983	1984
<u>Total Textile Exports</u>	<u>5,014,323</u>	<u>6,185,807</u>	<u>5,924,541</u>	<u>6,050,879</u>	<u>7,078,571</u>
U.S	1,113,480	1,468,201	1,619,003	1,981,146	2,585,108
Japan	884,987	1,018,528	974,102	721,660	1,018,927
EC	1,041,016	1,146,935	1,045,604	949,805	952,574

Source: Ministry of Trade and Industry.

E. Public Sector Role in Textiles

2.32 The Government's attitude towards the textile sector was very encouraging throughout the sixties and early seventies when it was the main foreign exchange earner and industrial employer. During this period the industry was supported by liberal credit facilities (through the nationalized banking system), generous rebates on import costs, and preferential tax and depreciation treatment. In the mid-seventies, however, the Government began to develop a heavy and chemical (HCI) industry sector in anticipation of a shift in Korea's comparative advantage, and to diversify the base for growth and exports. The implicit assumption was that Korea would lose competitiveness in light industries soon and that the light industry sector did not have enough steam left in it to power the country's future growth needs. The manner in which the switch to HCI was engineered proved detrimental to the textile sector. The two factors that most determine the industry's performance, capital and wage costs, were both sharply increased in the late seventies. Capital costs rose as the flow of relatively cheap bank credit to the sector dried up and firms were forced on to the curb market for larger and larger proportions of their financing needs. Wage costs rose as the massive investment in HCI and the inflation that was generated by this policy bid up the economy wide level of wages.

2.33 As of the early eighties, however, the Government has reduced its emphasis on HCI development and resurrected textiles as an important sector. Government policy towards textiles currently consists of the following: (i) contributions to a Textile Modernization Fund; (ii) capacity control regulations; (iii) preferential financial arrangements; and (iv) import protection and encouragement of R&D.

Textile Modernization Fund

2.34 This fund was set up in 1981 with the purpose mainly of providing loans with which to modernize factories. The main beneficiaries were intended to be the SMI's that form the bulk of the industry. The Government planned to contribute W 60 billion to the Fund over the period 1981-86 to match an expected contribution of W 60 billion from the industry itself and specific targets for the use of new machinery were set up. So far the performance of this Fund has not matched original expectations. By mid-1985 only about W 27 billion had been collected and loaned -- both Government and the industry have failed to provide the hoped-for contributions. The Government has been following a tight fiscal policy for macroeconomic stabilization reasons since 1981 and has not given the Fund a high enough priority to merit the release of resources from a tight budget. The industry has suffered from low profits in recent years and has apparently not pulled together in the way hoped for.

2.35 To some extent the Fund has suffered from poor design. Private industry contributions could not be expected to be large given that there is a heterogeneous mix of firms in the industry, of varying size and resources, with varying private adjustment strategies, and with varying prospects. The incentives to participate in the Fund probably differ significantly across these firms. At the same time the Government has not been in a position to

bolster the Fund partly because of its fiscal policy and partly because of its professed intention, since 1981, to adopt a hands-off approach to industrial policy, especially at the industry-specific level. Furthermore, the Fund, even if fully capitalized, would be insufficient to meet modernization needs and hence private resources and initiatives must be relied upon ultimately. It is estimated that about W 600 billion is required to reduce the ratio of aged machines from present levels to a tolerable ratio of 20%.

Capacity Control Regulations

2.36 Government is now using an investment permit or licensing system to control investment in all segments of the textile industry except garments. It is not clear why the Government must control investment and capacity. If individual firms, in full knowledge of market conditions, still desire to expand capacity in a particular area and their banks are willing to finance them why should the Government stand in their way? The behavior of some firms may damage the profits of other firms but, to the extent that this is done by reducing costs and prices in the industry at large, there would seem to be a social benefit involved.^{10/} Of course, some firms would have to close and some unemployment would result. But it is likely to be the relatively inefficient firms that go under. Also the resulting unemployment should be dealt with through retraining and redeployment programs and not by artificially propping up inefficient firms through guaranteeing their market share.

2.37 Perhaps capacity control could be exercised in a way that allows inefficient firms to exit the business gradually rather than suddenly. This has been the Japanese approach. In this case, a clear time limit should be specified for the duration of the capacity control regulation.

Textile Sector Financing

2.38 Currently the textile sector is being financed through regular commercial bank channels. Two special provisions affect the flow of finance: one applies to exporting firms and the other to SMIs. Since most textile firms are exporters and most clothing firms are SMIs these special incentives apply to the bulk of the industry. All exporters in Korea are given easier access to credit and can take advantage of easier financing terms (though not concessionary interest rates) and import tariff rebates. Similarly, SMI are given access to credit through a regulation that compels commercial banks to allocate 35% to 55% of their loans to SMIs. While the first set of incentives may translate into a significant source of advantage,

^{10/} This benefit is, of course, smaller to the extent that Korea's textile output is exported under quota arrangements such that domestic cost reductions simply translate into lower profits and lower foreign exchange earnings. Even in this case, however, a policy superior to capacity control would be to allow domestic competition to reduce costs and to slap on an export tax so as to capture the cost-reduction benefit domestically and prevent it from being passed on to quota-controlled markets abroad.

especially for larger firms who do most of the direct exporting, the latter set of incentives is not likely to be very effective. This is because the regulation covers all SMIs and not only textile and clothing units. As business prospects have deteriorated for textiles, banks have reduced their loans to this sector. Thus loans to the textile sector have declined from 31% of bank portfolio in 1974-76 to 23% in 1983-84. In particular, the Small and Medium Industry Bank has reduced its exposure to textile SMIs from 33% in 1976 to 23% in 1982 (see Table 2.4).

Import Protection for Textiles

2.39 Domestic producers are protected by high tariffs; these are likely to remain even as more and more items are removed from the list of import restricted items and therefore domestic producers will not feel the heat of competition for some time to come. The major competition is in low-grade or basic textiles and clothing and the main competitors are low-wage Asian producers such as China and India. The industry has been lobbying for continued protection in these market segments. At present the weighted average of ad valorem import duties on textiles and clothing is about 34% (see Table 2.12). The highest average duty is levied on clothing and made-up articles and fabrics (45% to 50%); lower duties are levied on fibers (15%)

Table 2.12: AVERAGE NOMINAL TARIFF LEVELS IN KOREA'S TEXTILE SECTOR
(%)

	%
<u>Clothing</u>	50
<u>Made-Up Articles</u>	47
All	45
Industrial	50
<u>Fibers</u>	
All	15
Wool	27
Cotton	12
Man-made	30
Other	24
<u>Yarns</u>	
All	30
Wool	30
Cotton	30
Man-made	30
Other	30
<u>Fabrics</u>	
All	49
Wool	50
Cotton	50
Man-made	46
Other	50
<u>Textiles and Clothing</u>	34

Source: GATT (1984), Table 3.22.

and yarns (30%). Nontariff barriers are also present. These follow the pattern of intensity of tariffs in that they tend to keep out competitive labor intensive products such as garments.^{11/} As of 1985, 105 out of 1,089 items connected to the textiles sector remained on the restricted import list. Government plans to reduce this number by 31, 32 and 19 in successive years from 1985 to 1987, by which time almost 98% of textile sector imports will be on a quota or restriction-free basis. However, some will still be subject to tariffs and special procedures.

R&D in Textiles

2.40 The Government promotes R&D work in textiles in three ways:

- (a) support to the Korea Advanced Institute for Science and Technology (KAIST) budget for general R&D, including textiles;
- (b) support/contributions to Korea Federation of Textile Industries (KOFOTI); and
- (c) tax exemptions for R&D expenses to companies.

2.41 It is difficult to quantify the extent of government support for R&D work. It is clear, however, that Government attaches high priority to R&Ds work in general in Korea. It has been increasing its own expenditures on R&D since 1980. Also R&D by companies is on the rise even though it is still behind advanced countries. Thus R&D expenditure relative to total sales has risen from 0.33% in 1979 to 0.80% in 1982; however, this is below Japan's (at 1.65 in 1981).

F. Adjustment Strategies in Selected Countries

2.42 The textile industry in most OECD countries has been under pressure for over two decades now. In fact, during this time at least one country, Japan, has gone from having been a source of pressure for the others to an affected country itself. The problems in each case have been similar and have been connected essentially to the declining competitiveness of the domestic industry vis a vis textile exports from developing countries. The adjustment strategies followed have been one or more of the following:

- (a) seek government support through protection (US, EEC) and subsidies (UK, Italy, France);
- (b) seek to reduce production costs by modernizing equipment (UK, Fed. Rep. of Germany, Japan), by horizontal and vertical integration into

^{11/} Tariffs and purchase controls are also applied to man-made polyester fibers. This has caused some distress among local users. Apparently they have to buy domestically up to some specified level before being allowed to import.

mass-producing units (US, F.R. Germany, UK) and by use of immigrant labor and outward processing trade (F.R. Germany, France, US); and

(c) seek product innovation and process flexibility (Italy, Japan).

Governments have been deeply involved in the adjustment process through the extension of protection, subsidies, and special tax and depreciation measures.

UK Experience

2.43 The UK has had a long history of government assistance for the textile industry dating from 1959 when the Cotton Industry Act was introduced offering financial assistance for machinery modernization to increase productivity and to counter low wage imports from former colonies and from Japan. The rationale was that British textile firms, being mostly family run and not of large scale, would be unable to re-equip from their own (or the private sector's) resources and also that this would ward off demands for greater protection. This strategy was not successful. The uncertainty with regard to the competition from imports and the Government's attitude towards protection affected investment strategy with regard to retooling. The retooling that was done was not sufficient to restore competitiveness. A different approach was then emphasized. In the early 1960s, the private sector, led by Courtaulds and ICI, began restructuring through horizontal and vertical integration on a large scale but demanded higher "temporary" protection while the restructuring process was underway. The objective was to achieve economies of scale through integration and mass production of standardized items. Government bought this strategy and extended "infant industry" or, more appropriately, "born again" protection to the industry.

2.44 While a great deal of scrapping, re-equipping, merging and rationalising has been accomplished and while productivity has greatly increased, the intervention program must be judged a failure by the fact that the industry has not been rendered viable -- there remains continuing pressure to retain and even to extend trade protection and other forms of assistance. Under cover of protection, the industry has become concentrated, it has laid off many workers and many companies have moved away from textiles into nontextile areas. It has not been rejuvenated through adjustment; it has been changed. The costs of financing this change have been very high. This type of adjustment, with its emphasis on process technology and lowering unit costs, may distract from more viable or efficient forms of adjustment such as the ones noted below for the Federal Republic of Germany (hereafter Germany) and Italy.

German Experience

2.45 The Federal Government has not generally intervened to help declining textile firms. Its major assistance to the sector has been in the form of acquiescence in EEC import regulations and MFA restrictions. More direct and substantial assistance has come from banks and regional governments. German banks often have equity positions (in addition to loans) in corporations and thus have more of an incentive to help firms survive. Regional governments are sensitive to local politics and often come to a

sector's assistance if the employment and income impact is likely to be substantial.

2.46 Two sharply contrasting adjustment strategies have been followed in Germany. Most of the larger producers have attempted to adjust to competition by increasing capital intensity, sharpening product standardization and emphasizing volume of production. They have attempted to achieve economies of scale by vertical and horizontal integration and standardization and to reduce labor costs by using ultra-modern spinning and weaving technology. An alternative approach, followed by medium sized firms, has been in an almost opposite direction. Instead of integrating the firms have sought to become reorganized into smaller, flexible production units. Instead of focussing on volume these firms have sought to produce limited quantities of outputs with a heavy quality, design and marketing emphasis. However, these firms have also introduced a high degree of automation into their processing to avoid high labor costs.

2.47 Between these two strategies the former appears to have been less successful. The high volume/standard product strategy based on extensive automation has simply not been able to reduce labor costs enough to compete with Asian exports. The diffusion of new machines to competitors is fairly rapid and hence the advantage gained is short lived. Furthermore domestic wage costs have continued to rise. The alternative strategy has been more successful because it has exploited a comparative advantage based on the availability of good designers, the nearness to a consumer market in which quality is desired and fashions change quickly, and marketing ability in a market where needs must be created through advertising and satisfied through quick service.

2.48 Another element in Germany's adjustment approach has been the use of outward processing trade (OPT) whereby intermediate textile products have been sent abroad to lower wage countries on the Mediterranean rim (Yugoslavia, Tunisia) and in East Europe to be "made up" into apparel and semifinished goods and have been reimported into Germany for finishing and for final sales. The Government has helped by reducing tariffs on the import of goods under the OPT system.

2.49 The chief lesson of the German experience is that adjustment support, either government sponsored or private bank sponsored, to the industry segment that had lost comparative advantage was unsuccessful. West Germany has not been able to reestablish competitiveness in standardized basic textiles. It has been successful in precisely those market segments where, even without trade protection, further growth would have taken place. (The virtues of easy finance because of banking sector equity participation should not be overlooked).

The Italian Experience

2.50 Italy's experience reinforces the lessons drawn from the German experience. Italy has supported its textile sector in a far more interventionist and substantial fashion than Germany but the industry has been successful largely in those areas where a comparative advantage in design, quality and marketing could be exploited.

2.51 Government support for the industry has ranged from trade protection under EEC guidelines to specific subsidies to the industry such as (i) nationalization of large, ailing textile firms; (ii) concessional loans to firms through a Textile Modernization Fund; and (iii) rebates on labor costs arising from social security taxes and overtime payment rules. Nevertheless, the good performance of the Italian industry (it is the largest net exporter in the world) has been due largely to private initiatives. While the taken over firms remain a net drain on government resources to the tune of \$100 million p.a. and while many large firms remain stuck with relatively inefficient labor forces kept in place by rebates on labor costs, small and medium firms have thrived. These firms have emphasized product quality and differentiation, flexibility of production and technical innovation in production. Smallness has been a source of advantage because it has allowed the flexibility in production that is required in making specialized, differentiated, high quality products the demand for which changes quickly. Smallness has allowed Italian firms to be run as family operations without labor unions and with low absenteeism. This has also allowed management decisions to be taken quickly and implemented swiftly to take advantage of shifting market fashions and demands.

2.52 The Italians have also been fortunate in having a textile industry concentrated in a few regions. This has allowed them to achieve central coordination (through cooperatives) in finance and marketing as well as in R&D. Nevertheless, the distinctive feature of the Italian experience has been private sector led decentralization and deconcentration in textiles and exploitation of market segments in which a comparative advantage could be seen. The Italian experience has been one of the success of small scale private enterprise amidst the failure of large scale nationalized units.

The US Experience

2.53 The US textile sector adjustment experience has been dominated by the prevalence, throughout the past two decades, of a high level of protection. From 1960 to 1980 less than 8% of domestic textile consumption was accounted for by imports. The industry has, therefore, responded not as much to competition from abroad but to internal changes in relative prices, to technological developments, and to domestic competition. Only very recently has import competition become the most important source of pressure and led to calls for even higher levels of protection. The clothing industry, however, has been under stress for a longer time despite high protection.

2.54 Over the years the textile industry has developed a high degree of product standardization and mass production. The existence of a large (and protected) domestic market has made it profitable to emphasize long runs and a small number of final products. Combined with a relatively modern stock of machines this sort of mass-production strategy has long kept American labor productivity higher than that of the European countries and Japan. Furthermore, pressure from rising real wages has been handled by a geographical shift of the industry from the unionized high wage areas of the northeast to the nonunionized lower wage areas of the south. The degree of unionization has also been lower than that found in the European countries. For all these reasons a mass-market strategy has been successfully followed in the US while it has failed to a large extent in the UK and in Germany.

2.55 While the dominant corporate strategy has been the one described above, the industry has not neglected product innovation and marketing. It has been a leader in the production of synthetic textiles and in establishing household textiles as a fashion sector. It has also featured substantial horizontal integration across the textiles and chemicals sectors. This combination, however, has not proved to be a successful one.

2.56 The evolution of the industry may also have been affected by exchange rate developments but there is no consensus on this point. It is thought that the weakness of the dollar relative to the European currencies throughout the 1970s kept the industry competitive (with Europe if not with East Asia). The subsequent rise in the value of the dollar in the 1980s may have had the opposite effect and led to an erosion of the industry's competitiveness. This may explain the industry's current protectionist fervor. The specific consequences of exchange rate changes for the industry as a whole are difficult to assess because of simultaneous changes in production technology and costs, variations in demand and competitors prices, and also because of process and product diversity within the industry.^{12/}

2.57 Despite high average levels of labor productivity the US textile industry would probably not have fared well in direct, unprotected competition with East Asia. Protection has been important, perhaps even critical, to the industry's survival in its present form. In particular, the apparel sector and the mass-production yarn and fiber sectors have probably benefited enormously from protection. When this benefit is set against the cost that US consumers have had to pay to support the industry in this fashion it becomes obvious that protection has been extremely costly. According to one recent estimate, the efficiency loss to the US of restrictions on clothing imports amounted to \$1.5 billion dollars (in 1980) or \$170,000 per job saved. This compares with average labor compensation of \$12,600 per year in this sector (Kalantzopoulos, 1986). Studies also indicate that society would have been much better off if adjustment assistance had been offered to the industry to promote a process of restructuring. Workers could have been retrained and re-employed in alternative occupations at far lower cost per head than that entailed by trade protection. Furthermore, while trade restrictions impose a continuing cost over the duration of the protection, adjustment assistance typically involves a one-shot grant or, at worst, obligations that decline over time as the adjustment progresses. Furthermore vigorous competition in the large domestic market available to American firms has offset some of the debilitating consequences of protectionism in reducing incentives to upgrade and innovate. Other countries, with far smaller domestic markets, cannot afford the luxury of protectionism in the long run.

^{12/} There are few rigorous studies of the effect of exchange rates on trade in specific products. One such recent study done by the USITC examined the impact of the dollars exchange rate on US trade in polyester staple fiber and denim fabric over the period 1977-82 and concluded that "although changes in exchange rates influenced trade, other trade factors were more important" (USITC, 1983, pg. 1).

The Japanese Experience

2.58 The Japanese began feeling the pinch of competition in the textile business towards the end of the 1960s first in their export markets (the US and the EEC) and very shortly thereafter in their domestic markets. Japan's share of world textile exports shrank from 10% to 5.5% between 1970 and 1980 as the East Asian trio (including Korea and Hong Kong) virtually ousted it from some segments of the market, particularly those characterized by labor-intensity (e.g., apparel) and/or standardized products (e.g., yarns and lower-grade fabrics). Identifying a secular rise in real wages as being the main cause of declining comparative advantage, the Japanese authorities undertook a series of measures designed to prod as well as assist the industry into adjusting in the direction of greater knowledge-intensity and higher productivity.

2.59 The prodding came in the form of a trade policy that gradually liberalized the import of textiles even in the face of industry opposition. Textile tariffs were substantially reduced through the 1970's and at present Japan's average textile tariff is lower than that of the US and the EEC. Quota restrictions have also been substantially reduced and Japan compares favorably in this regard also with the US and the EEC. However, while pressure was maintained on the domestic industry through trade liberalization adjustment assistance was also offered. Under the Special Textile Act (1967-74) this assistance took the form of (i) low interest loans to promote machinery modernization (scrapping and re-equipment), and (ii) special loans and grants to induce firms to merge (and reduce overall capacity) or to leave the industry altogether and set up in new lines of business. Under the New Structural Improvement Act (1979-84) the focus of attention shifted to small and medium textile industries and assistance was provided to help these industries switch to the higher value added segment of the market and to change lines of business. At the same time the emphasis on R&D was intensified for the industry as a whole. Finally, a major element of the Japanese adjustment strategy has been investment by Japanese companies in the textile sectors of their major competitors, primarily in East and Southeast Asia, so as to take advantage of the lower wages there and to survive as corporate entities if not as a national industry. Government has encouraged this trend.

2.60 The results of the Japanese adjustment experience may be summarized as follows. Firstly, the knowledge-intensive sector of the industry has continued to grow and prosper. Government support for R&D and the industry's move into R&D-intensive products appears to have paid off. Japan is now a major producer and exporter of certain types of synthetic fibers and fabrics. Japan's share of the US import market for textile (excluding apparel) has remained at around 20% for the last ten years largely because of a changing product mix based on a changing process mix. Second, the labor-intensive segment of the industry (primarily apparel) has shrunk domestically and virtually disappeared from overseas export markets. For example, Japan's share of the US import market for clothing shrank from 26% in 1963 to 11% in 1973 to only 3.1% in 1982. Its own imports of textile products (including apparel) jumped from \$383 million in 1971 to \$1,715 million in 1973 and proceeded to rise to over \$3.8 billion by 1980. Its ratio of imports to domestic consumption has risen from less than 5% in 1970 to around 18% in the early 1980s. Third, the

mass-producing yarn and fiber makers have either diversified out of the textile business or moved to overseas locations. Japanese firms are prominent in the production of synthetic fibers and yarns in particular in a number of East and Southeast Asian countries. While this move has not helped textile sector employment in Japan it has probably been the most productive use of Japanese textile capital. Fourthly, small and medium-sized firms have moved into the production of high quality high value-added items. Government help in marketing and financing has probably been of great use in retooling and reorienting this sector. In overall terms, the industry has shrunk in terms of output, employment and exports all of which peaked in the early 1970s. However, the reduction in size and relative importance has been managed without serious economic or social dislocation and there is certainly no sense of a permanent and continuing malaise concerning this sector in Japan as there is, for example, in several OECD countries.^{13/}

G. Summary of Lessons of OECD Experience

2.61 The chief lessons of the adjustment experiences described above can be summarized as follows:

- (a) While trade protection has lengthened the time available for adjustment and has maintained incomes in the textile sector, it has failed on two counts. It has not protected jobs in the industry and it has been extremely costly. Trade protection has not prevented the industry from shedding labor and from relocating away from the regions that were supposed to be the beneficiaries of the protectionist measures. By weakening the incentives to upgrade, innovate and invest, protection can become a problem rather than be a solution in the long run.
- (b) Precisely those segments of the industry have prospered where the need for protection was least or, to put it another way, where a genuine comparative advantage was available. In Japan the knowledge-intensive segment of synthetic filament-based fibers and yarns has grown and prospered. In Italy and Germany the design and quality oriented segments have prospered while the mass-produced basic textile yarn segment, which has been the chief beneficiary of protection and subsidies, has not regained competitiveness.
- (c) The high-volume, standard-product, mass-market strategy has been a failure despite heavy automation because of quick diffusion of

^{13/} The relative smoothness with which the Japanese industry appears to have adjusted should not be taken to mean that there have been no costs involved. Indeed the costs may have been high and may have fallen disproportionately on taxpayers and consumers. While nominal textile sector tariffs and quota restrictions may appear to be modest the restrictive effect of other nontariff ("invisible") barriers may have been quite significant. The ratio of imports to consumption is far lower in Japan than in the EEC countries even if intra-EEC trade is excluded.

advanced technology to competitors and continuing rise in labor costs. The large scale vertically and horizontally integrated companies of the UK, France and Germany have been unsuccessful in achieving economic viability without government support. The large-scale units of the US have done relatively better but they would also not be competitive in a free trade environment.

- (d) Small-scale units which have emphasized process flexibility, product diversity, and product quality have been very successful. The most lucrative segment of the product market has been the high quality fashion and design intensive segment. In order to be successful here decentralization and specialization of production units has been useful since this has allowed for flexibility to respond to fashion trend changes, small batch production to meet the limited (and changing) consumer demand for high quality, high fashion products, and for an emphasis on craftsmanship.

2.62 While it is obviously impossible to lay out a blueprint for success in adjusting to competition and changed circumstances, case studies allow a pattern of corporate strategies and behavior to be identified which is associated with a high degree of success. This pattern emphasizes flexibility and innovation. To quote from one review of such a pattern:

"...successful textile or clothing firms in the developed countries usually exhibit some or all of the following features: professional management in an environment frequently characterized by family ownership; strong emphasis on cost and quality control, notably continuous modernization of the production process, internationalization of production and of marketing (OPT; foreign direct investment); a high standard of industrial engineering; substantial investment in training and motivating employees; emphasis on the high quality/high fashion/brand label edge of the market in both, design and marketing; and attractive "service package" for customers." (GATT, 1984, p. 171).

H. Future Prospects of Industry

2.63 The outlook for Korean textile and clothing exports is closely linked to the degree to which the developed countries will allow further inroads into their markets. In recent years they have shown little inclination to do so. A rather surprising degree of structural rigidity has characterized their economies through the past decade. This rigidity is partly explained by the fact that the textile and clothing industries are large employers and tend to be geographically concentrated and politically powerful. This means that their adjustment problems are likely to attract more attention than those of industries who may be hurt by measures taken to protect them. It is also the case that world demand for textiles and clothing has been growing at a slow pace, a fact related to the demographic dynamics of the developed countries, and hence it has been more difficult to make room for new producers. For example, while consumer expenditure on clothing increased at 4%, 4% and 7% for the US, the EEC and Japan, respectively, during 1963-73, the rates of growth for the next ten years (1973-82) were only 4%, 0.5% and 1%

respectively (Table 2.9, GATT). This is reflected also in the figures for growth of world trade in textiles and clothing. The average annual increase of textile and clothing exports declined from around 11.5% during 1963-73 to about 4.8% during 1973-82 (GATT, p. 36). While Korea has expanded its share of this trade in the latter, slower-growing period there is little hope that it can continue to do so in the future, especially considering the rise of protectionism and competition.

2.64 The history of the evolution of various restrictive arrangements concerning trade in textiles in clothing since 1962 does not lead to much hope for other than a narrow, domestic industry-oriented approach to the issue. Successive trade arrangements following the LTA and MFA I (i.e., MFA II and III) have been much more restrictive than the earlier ones. Moreover, in practice, these arrangements have been applied against exports from the developing countries rather than against mutual trade among the developed countries. What were intended to be temporary adjustment measures when first introduced have now been in force for 24 years and the clamor for further restrictions has not subsided. The scope for restrictions has been broadened by the introduction of the nebulous concept of "market disruption" a concept that has been applied in a fast and loose manner to violate, in spirit if not in letter, other agreements within the MFA protocol that are more favorable to exporting by developing countries [GATT, pp. 102, 103].

2.65 The extension of the MFA to 1986 contains provisions which enable importing countries to negotiate agreements which limit or eliminate greater growth and flexibility (i.e., carryovers, carry forwards and swings) from major suppliers such as Korea and Hong Kong. There are also provisions reaffirming less restrictive treatment for new suppliers (to the US) and small suppliers. This means that there will be little room for growth, especially in the major apparel categories, for Korea.

2.66 The US market, while large in absolute terms, offers little flexibility to the Koreans. The latest textile trade agreement, negotiated in 1982 and to run through 1988, covers 92% of all textile and apparel exports and provides only for a 2.5% p.a. growth subject to an average tariff of 22.3%. Under some protectionist bills now pending in Congress, US imports of Korean textiles would be cut by 35% (in some categories by 90%).

2.67 Korean textile exports may be able to keep growing by using third party quotas (i.e., by investing in Bangladesh and other countries) or by developing exports of non-MFA items such as leather gloves, silk fabrics, burlap fabrics among others. In 1980, \$1.3 billion or 16% of US textile and apparel imports were not covered by MFA. There may be room for growth also in MFA-covered but less sensitive items where the share of imports to consumption is less than 30% and where, therefore, less strict monitoring applies.

2.68 There is also growing competition in Korea's main textile export lines from low-cost producers in Asia. The Chinese threat has already been documented. The crux of the matter lies in wage costs rather than in technology or in energy and capital costs. One can expect increasing mobility of textile technology and of capital in the future. Such mobility has worked to the disadvantage of the large-scale mass-production units of the UK and of

Germany in the past decade and Korea cannot expect to use technological sophistication alone as a source of future comparative advantage. Other countries can buy the same technology off the shelf also. Nor does Korea have any advantage in energy costs. While the recent decline in oil prices will certainly benefit Korea it will not necessarily increase its competitiveness relative to other textile and clothing exporters. Rising wage costs have already been referred to as a contributing factor to Korea's declining competitiveness in the late 1970s. While macroeconomic policies have helped rein in the explosive rate at which wages had been rising, the long term structural outlook is not favorable. Comparative population and labor force growth trends across Korea and her LDC competitors indicate that there will be more pressure on Korea's wages from the supply side than on those of her competitors. Consequently, Korea will continue to lose competitiveness in products with a low-skill and labor-intensive character.

2.69 While real wages have not been rising as rapidly in the eighties as they did in the seventies and while Korea has a tradition of good industrial relations in general, there is little room for maneuver on the wage front. There is little likelihood of competitiveness with other lower wage countries being enhanced by reducing real wages in Korea. If real wages begin to fall it is very likely that workers will leave this sector for others. The political consequences of falling real wages are also sobering. The most probable outcome is a reduction of employment in the textile sector together with an increase in real wages and in automation.

2.70 Pragmatic Korean adjustment to present and anticipated conditions in the global market for textiles would be to move in a direction consistent with the following goals/outcomes: (i) a change in the product mix of the industry in favor of higher quality and higher value added items, and (ii) a change in the factor proportions employed in the industry away from labor intensity towards greater mechanization and automation.

2.71 The desired change in product mix may require changes in production unit size. Since flexibility and variety of design are necessary for the production of high quality fashion items smaller spinning and weaving units are preferable to larger ones. At the same time such outputs will require sophisticated machinery for their production and hence high capital costs will have to be borne. Also, because such products rely on high pressure marketing for their success high per unit advertising and associated marketing costs will also have to be met. Finally, such products require expenditure on design which will also raise per unit costs. The ideal firm for such products would very likely be one which is large enough to meet the higher start-up and running costs and yet small enough to operate flexibly in response to constantly changing demand. Given access to credit some of the medium-sized firms in the business could switch to such new product lines successfully. Similarly, if the larger firms reorganized their businesses away from monolithic units producing standardized items and towards a number of smaller production units handling a variety of items, that too could work.

2.72 This path, emphasizing smaller firms, flexible production technology, and design and fashion orientation, has been successfully followed by Italy over the last two decades. Italy is the world's largest exporter of

textile products and has thrived despite its wage-cost disadvantage vis-a-vis the East Asian countries by emphasizing its advantage in design and technology.

2.73 The upmarket move is not without its risks. Three may be most readily identified. First, there is limited room in the upmarket segment and manufacturers cannot move en masse into this area. Mergers, bankruptcies, retrenchment will necessarily be involved in the process. Second, there is much competition up there and it is of a nature that LDC's are not particularly strong in. Retailing networks are important. Advertising is important. Price is not the sole consideration. Hence production efficiency may be necessary but not sufficient. Third, the demand for upmarket products is highly income-elastic and, therefore, more prone to large swings over business cycles. Recessions hit upmarket firms hard (unless they are very, very upmarket).

I. Scope for Public Policy

2.74 The scope for industrial policy vis-a-vis the textile industry in Korea will be determined by (i) the Government's ability correctly to assess the nature of the industry's predicament and the directions in which the industry should move, and (ii) the costs and benefits of various kinds of government interventions to encourage changes in the necessary directions. Comparative experience from other countries suggests that governments are rarely well placed to assess and anticipate industry needs and long-run prospects. They react typically to representations from narrow industry groups who highlight problems and solutions in a selective and self-interested way. Typically the adjustment measures that they support turn out to be very costly and disproportionately beneficial to a few groups and, more often than not, fail in their attempt to block market forces. This is probably the chief general lesson of the experience with textiles of the EEC and US governments.

2.75 Guidelines for appropriate industrial policy vis-a-vis the textile sector in Korea may be drawn from the experience of the OECD countries. However, they must be modified to take into account the fact that Korea's predicament is partly due to a decline in competitiveness and partly to an increase in protectionism. Korea's policy towards textiles is currently a blend of support for process innovation, trade protection, preferential financing and capacity control.

2.76 The support for process innovation takes two forms, access to credit given through the Textile Modernization Fund and indirect support through encouragement of R&D work. It may be recalled that direct government support of textile process innovation in the OECD countries has been unsuccessful in restoring industry viability or maintaining jobs and market shares. Part of the problem there has been support for a high-volume/standard-product strategy which was undermined by continuing wage increases, and the quick adoption by competitors of the advanced technology. Korea may be more successful with this strategy if labor cost increases can be kept in check and to the extent that its major competitors are not yet in a position to use advanced technology. Since the strategy's outcome is uncertain there should not be any undue encouragement of it. The speed at which to scrap and re-equip and the

type of new equipment chosen should be left largely to private initiative. The Government's policy of modest contributions to the Textile Modernization Fund is, under the circumstances, a prudent one. Industry has taken a wait-and-see approach to retooling. Government should not rush in where industry has feared to tread.

2.77 Tax incentives for firm-level R&D work are both desirable and helpful. Many of the uncertainties in the field can be reduced through R&D work and since the social benefits are usually greater than the private benefits government support for this sort of work can be justified on externality grounds. Promotion of R&D should help in matters of machinery use and adaptation as well as in product design and quality enhancement. There are likely to be positive externalities also in government support of training facilities for textile design and for marketing. The industry is likely to benefit more than any single firm from improvements in the quality and image of Korea's textiles.

2.78 The OECD countries have chosen to protect their textile sectors from competitive imports by raising tariff and quota barriers. This has been an extremely costly move. Job-saving has been minimal since firms have used the rents from protection to install labor-saving machinery or, in some cases, to move into non-textile products. All in all trade protection has proved to be always costly and often ineffective. Furthermore protection requires a large domestic market if its cost is to be reduced. Korean policy towards the import of textiles from lower cost countries should be framed with this lesson in mind. Should greater import protection become necessary for political reasons the best procedure would be to implement a declining tariff. Of course, it is hard to argue for free trade when export markets are being closed by protection. Nevertheless, for small economies the best solution is usually to remain open even if some of their partners are moving away from free trade. Korea can ill afford a textile sector that is a pensioner of the Government. The best way to deal with the loss of jobs that would occur in the sector were import to be considerably liberalized would be to ease the movement of displaced workers into new occupations and industries. A sound macroeconomic policy combined with some government-sponsored training programs should prove to be the socially least-cost way of managing the textile employment problem.

2.79 Credit availability has been a factor in the ability of small and medium firms to prosper in the textile sector of Italy and Germany. It is likely to be critical in the future development of the Korean industry also. In this regard the Government's policy of reserving a portion of bank credit for SMIs is a step in the right direction. At this stage in the development of Korea's financial markets a certain amount of positive discrimination in favor of SMIs is desirable. Moreover, the measure is not industry-specific and hence not as likely to misallocate resources. However, the financing of the industry must be subject to rational financial decision-making.

2.80 It must be kept in mind that the optimal-size question remains unresolved. While the EEC experience has revealed the strengths of small to medium firms it is possible that future technological developments in textiles may prove to be more supportive of large scale units, especially if synthetic

material based production continues to grow or if the sewing process is further automated. Furthermore, even in the EEC experience, centralized financing and marketing (through cooperatives and regional banks) have played an important role. Given the uncertainties regarding optimal size the Government should not influence the scale decision unduly through credit allocation policies or through capacity control legislation. The Government's current scale-based policies should be re-examined at regular intervals in order to prevent serious distortions from accumulating.

2.81 The goal of public policy should not be to preserve capital and employment in the industry at all costs but to ease adjustment towards other uses of the industry's factors of production. This could change the character of the industry (in terms of product mix and factor proportions, for example) but that is, in itself, not an undesirable consequence. The important thing is to undertake measures which reduce the overall costs of adjustment. This requires that the interests of sectors other than textiles and clothing also be kept in mind and the notion of a shifting comparative advantage be accepted and indeed converted to one's benefit. Public policy should not be used to block the signals being given by the international marketplace but rather to make use of them.

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Table A.1: THE RELATIVE IMPORTANCE OF THE TEXTILE INDUSTRY

Function	Category	Unit	1971	1976	1982	1983	1984
Value-added	GNP (A)	W bln (1980 prices)	18,797	29,804	41,737	45,718	49,180
	Manufacturing sector (B)	"	2,918	6,974	11,933	13,235	15,172
	Textile industry (C)	"	458	1,304	1,899	2,007	2,089
	C/A	%	2.4	4.4	4.5	4.5	4.2
	C/B	%	15.7	18.7	15.9	15.2	13.8
Exports	Total (A)	US\$ mln	1,068	7,715	21,616	24,445	29,245
	Textile products exports (B)	"	452	2,740	5,925	6,051	7,079
	B/A	%	42.3	35.5	27.4	24.8	24.2
Employment	Total economy (A)	Thousand persons	10,066	12,556	14,424	14,515	14,417
	Manufacturing (B)	"	1,336	2,678	3,047	3,275	3,351
	Textile industry (C)	"	163	641	746	736	738
	C/A	%	1.6	5.1	5.2	5.1	5.0
	C/B	%	12.2	24.0	24.5	22.5	22.0

Source: Bank of Korea and Korea Federation of Textile Industries (KOFOTI).

Table A.2: PRODUCTION OF TEXTILE YARNS, FABRICS AND CHEMICAL FIBERS

Classification	Year	1979	1980	1981	1982	1983	1984
Yarns (M/T)	Cotton yarn	349,610	381,386	383,872	403,608	420,681	437,762
	Worsted yarn	21,181	17,940	23,964	23,116	51,833	27,970
	Woolen yarn	15,290	17,487	17,024	18,769	22,563	22,866
Fabrics (1,000 m ³)	Cotton fabrics	940,386	1,016,528	1,032,502	982,813	1,016,046	1,315,139
	Worsted fabrics	34,428	36,020	33,660	35,457	36,190	40,175
	Woolen fabric	15,222	13,525	11,577	10,190	11,450	12,634
	Silk fabrics	49,828	58,066	52,044	49,911	44,327	41,007
	Rayon fabrics	109,466	127,566	62,624	34,414	17,341	18,371
	Synthetic fabrics	680,470	792,566	914,822	1,028,690	1,133,396	959,046
Chemical fibers (M/T)	Nylon	114,599	119,897	124,260	119,490	123,928	133,283
	Polyester	230,479	277,080	332,073	338,713	387,586	451,094
	Acrylic	132,159	139,436	153,847	154,867	152,304	162,660
	Viscose	21,541	25,438	24,673	13,594	10,749	10,569
	Acetate	7,758	7,466	7,910	8,067	8,164	8,088
	Others	7,685	3,892	3,123	2,100	554	952
	Total	514,321	573,214	645,886	636,831	683,285	766,646

Note: Cotton Yarn and Fabrics include Cotton Blended Yarn and Fabrics
Worsted Yarn and Fabrics include Wood Blended Yarn and Fabrics.

Source: KOPOTI.

Table A.3: SPINNING FACILITIES AND CAPACITY FOR CHEMICAL FIBERS

Classification	Year	1979	1980	1981	1982	1983	1984
Spinning facilities (spindles)	Cotton spinning	3,074,892	3,167,124	3,192,212	3,128,809	3,243,040	3,251,342
	Worsted spinning	713,044	823,924	839,080	837,216	895,412	849,036
	Woolen spinning	98,630	111,996	115,264	123,890	131,059	144,837
	<u>Total</u>	<u>3,886,566</u>	<u>4,103,144</u>	<u>4,146,556</u>	<u>4,089,915</u>	<u>4,269,511</u>	<u>4,245,215</u>
Capacity for chemical fibers (MT/D)	Nylon	262.5	262.5	264.3	374.0	384.0	394.8
	Polyester	495.0	580.5	611.0	1,041.6	1,054.1	1,132.6
	Acrylic	320.5	345.5	345.5	439.0	459.0	419.0
	Viscose	59.2	59.2	109.2	109.2	109.2	109.2
	Acetate	15.5	15.5	15.5	22.5	22.5	22.5
	Others	26.0	29.9	23.5	21.8	9.5	9.5
<u>Total</u>	<u>1,178.7</u>	<u>1,299.7</u>	<u>1,369.0</u>	<u>2,008.1</u>	<u>2,038.3</u>	<u>2,127.6</u>	

Source: KOFOTI.

Table A.4: TEXTILE FACILITIES FOR LOOMS, KNITTING MACHINES AND OTHERS
(Unit: Set)

Classification	Year	1979	1980	1981	1982	1983	1984
Cotton loom		52,768	55,179	51,699	47,817	45,448	49,489
Filament loom		84,337	85,286	85,709	84,976	74,387	65,118
Wool loom		3,759	3,439	3,555	3,084	3,890	3,154
Embroidery loom		448	448	294	318	300	204
Towel loom		1,808	1,935	1,882	2,086	2,117	2,156
Knitting M/C		52,735	43,085	48,311	41,129	41,445	41,486
(Circular knitting)		18,172	14,871	20,378	13,683	12,017	12,045
(Flat knitting)		22,265	15,026	14,047	15,639	15,202	15,705
(Warp knitting)		560	1,008	2,605	810	808	463
(Socks & stockings)		7,899	8,364	7,946	7,680	9,344	9,520
(Gloves)		3,849	3,816	3,335	3,316	4,074	3,753
Sewing M/C		225,642	275,414	321,694	359,308	359,781	318,736
Dyeing M/C		3,778	3,621	4,122	4,043	3,975	4,025
Twisting M/C (spindle)		155,000	158,500	167,500	155,804	134,000	125,000

Source: KOFOTI.

Table A.5: DEMAND AND SUPPLY STATUS
(Unit: M/T)

Classification	Year	1979	1980	1981	1982	1983	1984	
Import	Fibers	370,931	390,210	391,165	411,659	435,121	451,096	
	Yarns	36,682	25,335	41,137	46,510	43,960	45,592	
	Fabrics	33,803	33,099	33,889	31,700	42,029	44,684	
	Clothing	1,036	744	504	269	112	220	
	Others	100	94	59	54	94	181	
	Subtotal	442,551	449,482	446,754	490,192	521,316	541,773	
Input	Production	Man-made fibers	562,574	617,613	696,056	680,571	741,420	830,362
		Natural fibers	11,870	12,990	9,500	6,945	5,372	5,062
		Subtotal	574,444	630,603	705,556	687,516	746,792	935,424
	Total	1,016,995	1,080,085	1,172,310	1,177,708	1,268,108	1,377,197	
Output	Export	Fibers	12,457	34,453	34,408	26,735	26,047	73,631
		Yarns	123,472	178,605	170,232	153,731	184,261	193,276
		Clothing	188,816	178,955	230,068	230,425	251,028	242,877
		Others	1,114	1,802	2,588	2,923	2,067	2,963
		Subtotal	543,278	666,518	754,051	706,702	798,476	848,279
	Domestic consumption	339,325	340,062	335,106	358,419	370,771	388,280	
	Inventory & others	134,403	73,505	83,153	112,587	98,861	140,638	

Source: KOFOTI.

Table A.6: TEXTILE EMPLOYMENT BY SECTOR
(Unit: Persons)

Sector	Year	1980	1981	1982	1983	1984	1984/ 1983 (%)
<u>Total</u>		<u>731,963</u>	<u>760,333</u>	<u>746,012</u>	<u>735,620</u>	<u>719,357</u>	<u>97.8</u>
Garment		368,013	382,156	383,355	384,448	383,936	99.9
Spinning		118,905	117,063	111,584	112,374	1091294	97.3
Weaving		97,840	99,561	94,901	91,543	80,664	88.1
Knitting		60,030	54,839	51,910	51,551	59,520	115.5
Others		87,175	106,714	104,263	95,704	85,943	111.4

Source: KOFOTI.

Table A.7: SIZE STRUCTURE OF THE TEXTILE INDUSTRY, AS OF END OF 1983

	<u>Textiles</u>		<u>Clothing</u>		<u>Textile industry</u>	
	<u>Small & medium</u>	<u>Large</u>	<u>Small & medium</u>	<u>Large</u>	<u>Small & medium</u>	<u>Large</u>
No. of establishments	5,454 (97.4)	144 (2.6)	3,343 (96.4)	125 (3.6)	8,797 (97.0)	268 (3.0)
No. of employees	215,403 (56.3)	167,056 (43.7)	135,002 (60.5)	88,313 (39.5)	350,405 (57.8)	255,369 (42.2)
Output (W bln)	2,373.7 (39.0)	3,713.1 (61.0)	951.2 (43.1)	1,256.5 (56.9)	3,324.9 (40.1)	4,969.6 (59.9)
Value added (W bln)	1,001.9 (44.8)	12,032.5 (55.2)	456.1 (50.9)	439.4 (49.1)	1,458.0 (46.6)	1,671.9 (53.4)

- Note: 1. The survey covered all business establishments with at least 5 workers. Figures in parentheses denote % relative shares.
 2. Small and medium industries are those industries that employ less than 300 employees.

Source: Report on Mining and Manufacturing Survey, 1985.

Table A.8: GROWTH IN TEXTILE EXPORTS, 1976-84
(US\$ mln)

	Textiles	Clothing	Total textile /a
1976	954.4	1,845.5	2,740.1 (46.5)
1977	1,081.7 (13.3)	2,061.7 (11.7)	3,039.3 (10.9)
1978	1,533.3 (41.7)	2,574.7 (24.9)	3,981.9 (31.0)
1979	1,814.5 (18.3)	2,849.4 (10.7)	4,501.3 (13.0)
1980	2,197.5 (21.2)	2,946.9 (3.4)	5,014.3 (11.4)
1981	2,449.7 (11.5)	3,862.7 (31.1)	6,185.8 (23.4)
1982	2,237.7 (-8.7)	3,773.9 (-2.3)	5,924.5 (-4.2)
1983	2,413.4 (7.9)	3,707.3 (-1.8)	6,050.9 (2.1)
1984	2,601.5 (7.8)	4,499.5 (21.4)	7,078.6 (17.0)

Notes: Figures in parentheses denote annual growth rates.

Source: Bank of Korea, Economic Statistics Yearbook; and Ministry of Commerce and Industry.

Table A.9: AGE OF TEXTILE MACHINES (1980)

	Over 20 years	Over 15 years	Over 10 years	Under 10 years	Total
Spinning machines	497,454 (11.7)	720,941 (16.9)	1,326,175 (31.1)	2,936,009 (68.9)	4,262,184
False twisters	838 (0.4)	2,154 (1.0)	70,416 (32.9)	143,932 (67.1)	214,348
Dyeing machines	363 (5.3)	1,100 (16.1)	3,275 (47.8)	3,571 (52.2)	6,846
Looms	17,293 (9.1)	27,354 (14.4)	59,402 (31.3)	130,233 (68.7)	189,635
Knit machines	2,107 (2.9)	9,217 (1.5)	38,477 (52.1)	35,366 (47.9)	73,843
Sewing machines	2,892 (1.8)	14,662 (8.9)	54,911 (33.4)	109,638 (66.6)	164,549
Embroidery machines	20 (0.9)	221 (0.8)	1,313 (58.1)	945 (41.9)	2,258

Note: Figures in parentheses denote % ratio to the total.

Source: KOFOTI.

Table A.10: AGE OF TEXTILE MACHINES IN FEBRUARY 1983

	Over 20 years	Over 15 years	Over 10 years	Under 10 years	Total
Spinning machines	661,730 (15.6)	1,064,031 (25.1)	1,881,019 (44.4)	2,355,739 (55.6)	4,236,758
False twisters	4,224 (2.0)	34,346 (16.6)	135,264 (65.4)	71,462 (34.6)	206,726
Dyeing machines	894 (11.2)	2,366 (33.4)	4,237 (59.8)	2,843 (40.2)	7,080
Looms	19,604 (9.9)	40,246 (22.9)	89,463 (50.9)	86,332 (49.1)	175,795
Knit machines	6,306 (9.9)	27,962 (43.9)	47,577 (74.7)	16,120 (25.3)	63,697
Sewing machines	15,080 (9.6)	37,599 (23.8)	88,110 (55.8)	69,7908 (44.2)	157,900
Embroidery machines	71 (5.1)	284 (20.4)	1,102 (79.3)	288 (20.7)	1,390

Note: Figures in parentheses denote % ratio to the total.

Source: KOFOTI.

ELECTRONICS IN KOREA: A STUDY OF AN EMERGING INDUSTRY

A. Introduction

Overview

3.01 The electronics industry in Korea dates back to 1959 when firms began assembling radios from imported parts and components. Since then it has grown more rapidly than any other industry in the country and has become highly diversified, its products classifiable into three subsectors: (i) consumer electronics; (ii) industrial electronics; (iii) electronic parts and components. Traditionally, Korea's electronics industry has been heavily oriented toward consumer electronics, in particular, television receivers and audio equipment as well as semiconductor assembly for export. The industrial electronics subsector (computers and peripherals, communications equipment, instruments and controls) has represented a small share of total industry output, however, in recent years that share has been increasing markedly, as a number of firms, building upon their experience in consumer electronics, have been diversifying into industrial electronics production. While communications equipment constitutes the bulk of such production, production of computers and peripheral equipment has also been expanding dramatically. Although Korean computer production remains largely oriented toward low-end peripherals like dumb terminals and monitors, there has been a trend recently toward the production of more sophisticated products, including whole systems. For example, a number of Korean electronics firm have been successfully marketing IBM PC-compatible systems in the United States, either under their own brand names or as an OEM (original equipment manufacturer) supplier to the US firms. Within the broad category of telecommunications equipment, there has been an effort in recent years to upgrade technologically, for example, by designing and developing an indigenous digital public switching system as well as by acquiring the know-how to manufacture fiber optic-based systems and components.

3.02 There has been a parallel trend in the component subsector toward the production of more sophisticated components as well as the introduction of more complex processes. The most outstanding instance of this has been the large scale investment by Korean firms in semiconductor wafer processing since 1983. From 1974 through 1981 cumulative fixed investment in semiconductor operations amounted to US\$211 million. In 1983 alone it totalled US\$300 million, then climbed to US\$469 million in 1984 and was expected to reach US\$487 million in 1985. (In 1986 it is expected to decline slightly to US\$412 million.) Unlike in the past, the overwhelming share of new semiconductor investment has gone into wafer fabrication as opposed to assembly. This decision to place a high priority on the acquisition of semiconductor technology has exposed the Korean industry to probably the most serious competitive risk of its history. Given the potential importance of semiconductor technology for the future development of Korea's electronics industry, it is valuable to examine the Korean industry's strategy in this area in more detail (see Section II below).

3.03 The explicit thrust of Korean government policy toward the electronics industry since at least 1982 has been to promote the development of a technologically more advanced and autonomous industry. While the GOK recognizes the critical importance of continued access to foreign technology for the Korean industry's development, it also realizes that indigenous technology development not only enhances Korea's ability to absorb foreign technologies but also makes foreign firms more willing to transfer their state-of-the-art technologies to Korea. To what extent the technological upgrading of the electronics industry would occur without the implicit promotion of the government is an important question, although the recent foray of Korean semiconductor firms into very large scale integration (VLSI) memory production has occurred for the most part independently of government initiative.^{1/} In the Korean industry today, the Government is confronted with a situation of having to decide, ex post facto, whether to lend its support to private sector initiatives, to adopt a laissez-faire approach, or actively to discourage firms from pursuing the high risk strategy some of them have chosen.

3.04 Despite Government's reorientation in favor of functional industrial incentives and greater neutrality, its continuing role in the domestic financial sector as well as its policies towards conglomerates will put it to some extent into the future path of the electronics industry. For that reason, it is valuable to investigate the characteristics of that industry in further detail.

Characteristics of the Industry

3.05 The output of the electronics industry in 1984 totalled US\$7.17 billion, 58.6% of which was directly exported and another 10.9% of which was incorporated in end products destined for export. Between 1970 and 1984 the industry grew at an average annual rate of 35%. The output structure of the industry has undergone a marked change over the period. In 1970, electronic components accounted for 55.7% of output and consumer electronics 28.3%. Industrial electronics made up the remaining 16%. By 1979, the share of consumer electronics had risen to 41.9% and that of components had fallen to 48.4% (see Figure 3.1). The industrial electronics share, meanwhile, had slipped to 9.7%. After 1979, a significant reversal began, with the consumer electronics share shrinking and that of industrial electronics rising. By 1984, consumer electronics accounted for only 33.8% of output while industrial electronics had slightly surpassed its 1970 share. For purposes of comparison, Table 3.1 contains a breakdown of the output structures of the electronics industries of Japan, US and Europe. Japan has an intraindustry structure most like Korea's, although the marked difference is the much higher share of industrial electronics in total output in Japan. Conversely, Korea has a much higher component share than any of the other producers, reflecting the heavy weight of semiconductor assembly in Korea's overall output structure.

^{1/} The Government did have some role to play in early experiments with commercial scale wafer fabrication, and it still plays a small role in supporting joint research efforts with private industry.

Production of Electronics Industry

Unit: \$ Million

Consumer Industrial Components & parts

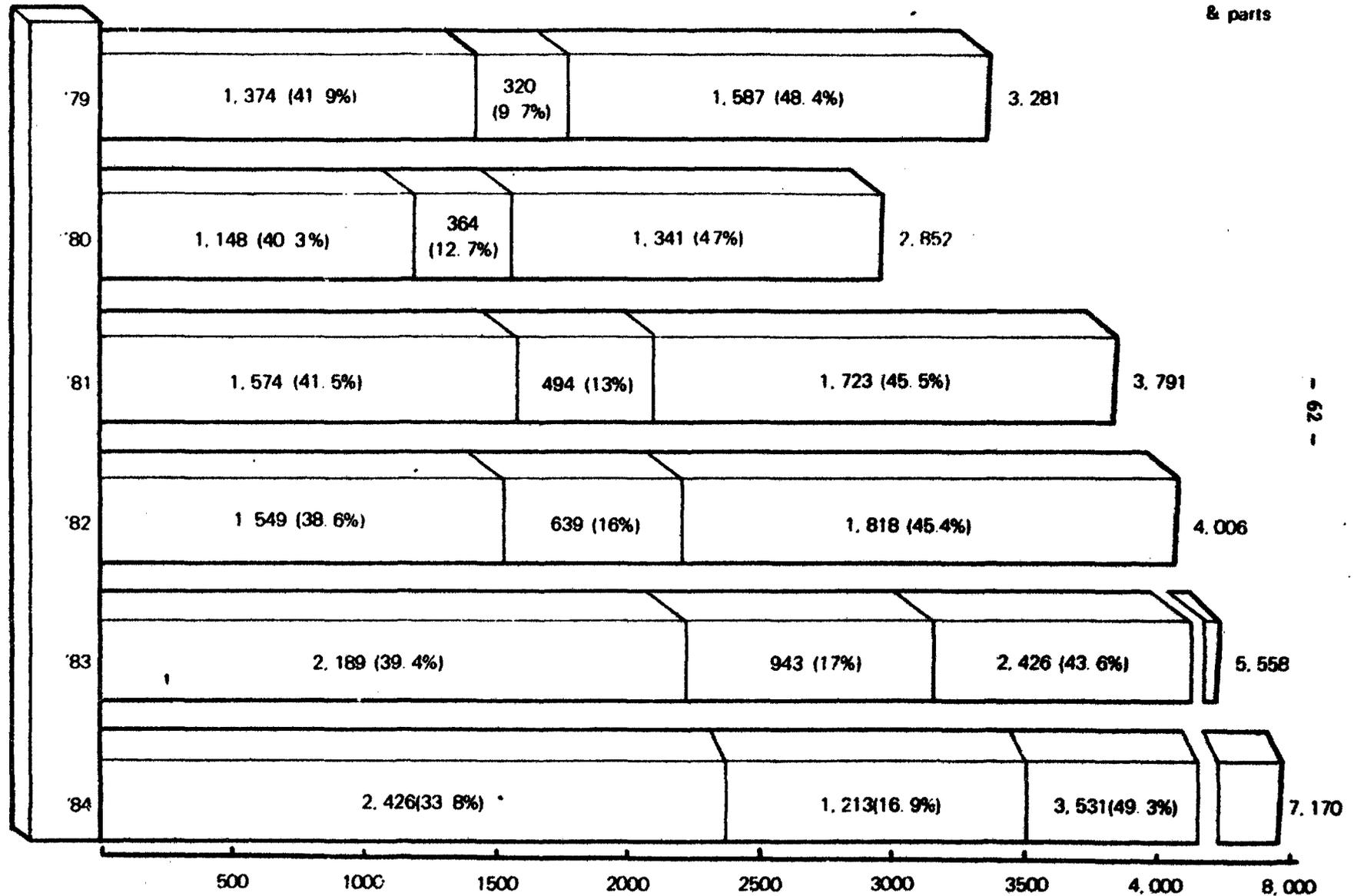


Figure 3.1

Source: Electronic Industries Association of Korea

Table 3.1: OUTPUT STRUCTURE OF THE ELECTRONICS INDUSTRY

	Korea		Japan		US		Europe	
	1978	1984	1978	1983	1978	1983	1978	1983
TOTAL (US\$ m.)	2,271	7,170	30,063	53,405	64,944	143,831	41,587	57,782
of which:(%)								
Consumer	40.8	33.7	34.7	30.2	14.3	9.9	27.4	23.8
Industrial	9.2	16.9	36.3	36.3	68.1	68.6	52.8	58.3
Components + parts	49.9	49.2	29.0	33.5	17.5	21.5	19.7	17.9

Source: Electronics Industry Today and Tomorrow, 1985 (Electronic Industries Association of Korea).

3.06 Nevertheless, within the component subsector a noticeable restructuring has occurred over the last decade and a half. In 1971, semiconductor devices (transistors and integrated circuits) accounted for 56% of total component production and two thirds of exports; by 1979, the semiconductor production share had fallen to 29% and the export share to one half (see Table 3.2). By 1984, the semiconductor production share had risen again, but to only 36% of total component production; semiconductor exports had risen somewhat more steeply, to 61% of component exports. In large part the performance of semiconductors in 1984 reflected buoyant world market conditions. In any event, the slight recovery in the production and export shares of semiconductors does not negate the dominant trend in the component sector toward higher levels of integration with domestic equipment manufacture. In particular, the rapid growth in consumer electronics production during the 1970s stimulated local demand for electronic tubes, capacitors, resistors, transformers, audio parts, TV tuners, etc. As the Korean industry moves toward integrated semiconductor production, and if Korean firms should become major exporters of memory chips, the IC share of component production and export may well continue to rise through the remainder of the decade.

The Role of Electronics in the Economy

3.07 Korea's electronics industry contributes significantly to overall economic -- and in particular to industrial -- activity. Table 3.2 contains a summary of certain key economic ratios for Korea's industry, as well as the comparable figures for Japan.

Table 3.2: KEY ECONOMIC RATIOS OF KOREA'S ELECTRONIC INDUSTRY, 1983

	<u>Korea</u>	<u>Japan</u> (1982)
(1) Electronics industry output as % of mfg. output (W 4,036,134 mln)	6.67	4.55*
(2) Electronics industry value added as % of mfg. VA	7.24	8.78
(3) Electronics industry VA as % of GDP (W 1,514,093 mln)	2.54	2.48
(4) Electronics industry employment as % of mfg. employment (187,628)	8.33	8.91
(5) Electronics exports as % of mfg. exports	13.07	15.69*
(6) Electronics exports as % of industry output	58.56	51.25

* 1981 data.

Source: Report on Mining and Manufacturing Survey

The most striking difference between the Korean industry and that of Japan is the share of value added (VA) in output. From Table 3.1 it is apparent that the VA/output ratio in Korea is significantly lower than that in Japan. This is explainable in large part by the different degrees of import dependence, i.e., whereas Korea electronics imports amount to roughly 46% of production, in Japan it amounts to only around 6%. The high import dependence of the Korean industry is attributable in considerable measure to the sizeable semiconductor assembly industry which still imports the bulk of material input requirements. In addition, electronic equipment manufacturers still import most of their semiconductor needs, though that may change with the expansion of domestic wafer processing activities. By one estimate,^{2/} Korean firms must still import 80% or more of their microelectronics and other sophisticated parts requirements. A second explanation for lower VA/output ratios in Korea may be the lower R&D intensity of output vis-a-vis Japan. By producing products at an earlier stage of the product cycle, Japan may be able to earn larger rents.

^{2/} US Department of State (Commercial Section, US Embassy, Seoul).

Table 3.3: KOREA: ELECTRONICS EXPORTS, IMPORTS AND TRADE BALANCES BY SUBSECTOR, 1984

	Exports	Imports	Trade Balance
Consumer Electronics	1,523	174	1,349
Industrial Electronics	552	892	(340)
Electronic Components	2,129	2,097	32
<u>Total Electronics</u>	<u>4,204</u>	<u>3,163</u>	<u>1,041</u>

Sources: Statistics of Electronic and Electrical Industries; Import Statistics of Electronic Products and Electrical Appliances (Electronic Industries Association of Korea, 1985).

3.08 Despite the import dependence of Korea's electronics industry, the industry is a net exporter. In 1984, for example, Korea registered net electronics exports of \$1.04 billion. Consumer electronics accounted for the bulk of the trade surplus. Table 3.3 summarizes trade data for 1984 by subsector. The industrial electronics subsector continues to be a major net importer, though the size of the deficit in relation to imports has been declining over time. Whereas in 1976 the deficit on industrial electronics trade came to 45% of imports, by 1984 the ratio had fallen to 38%.

3.09 While exports have been a critical source of demand for the output of Korea's electronics industry, by no means have they been the only one. The domestic market for electronic equipment has grown at the average rate of 32% a year between 1972-84 (see Table 3.4), compared to a 39% per year growth in exports. At the same time, the domestic market share of Korean-made electronic equipment has been rising considerably. Whereas in 1972 imports still accounted for 58% of equipment sales in Korea, by 1984 the import share had declined to 41%. The reduced import dependency was most dramatic in the case of consumer electronics, where the local production share increased from 45% to 84% between 1972-84.

Table 3.4: DOMESTIC AND EXPORT MARKET SALES OF ELECTRONIC EQUIPMENT (US\$ m)

	1972		1984		CAGR(%)	
	Domestic	Export	Domestic	Export	Domestic	Export
Consumer	44	35	1,077	1,523	30.5	36.9
Industrial	53	4	1,553	552	32.5	50.8
<u>Total</u>	<u>97</u>	<u>39</u>	<u>2,630</u>	<u>2,075</u>	<u>21.7</u>	<u>39.3</u>

Source: Based on production and trade statistics of Electronic Industries Association of Korea.

3.10 In terms of employment, the absolute contribution of the electronics industry to manufacturing sector employment is quite significant. Due to a combination of domestic and world market conditions, electronics employment began falling after 1978. By 1982 some 30,000 jobs had been eliminated, a 16.3% decline from the 1978 level of 183,635 employees. (Production increased over the same period by 76%.) Employment rose steeply again in 1983 and 1984, reaching a level of 218,000 workers by the latter year. By 1985 employment was approaching 300,000. The structure of the workforce has undergone a dramatic shift since 1978. Whereas in that year factory workers accounted for nearly 80% of total employees, by 1982 this share had fallen to 55%. Meanwhile, the share of engineers and technicians in total employment rose from 18% to 27%. Much of that shift is attributable to rising automation levels, especially in semiconductor assembly. The increasing R&D intensity of Korean electronics has also contributed to the shift toward skilled labor. The trend toward a higher ratio of engineers and technicians to direct production workers is expected to continue through the early 1990s at least (see Table 3.5).

Table 3.5: EMPLOYMENT BY ELECTRONICS INDUSTRY, ACTUAL AND PROJECTED
(1,000 persons; %)

	<u>1981</u>	1986 (projected)	1991 (projected)
Specialized Engineers (including R&D staffers)	12 (4.7)	62 (10.9)	114 (15)
Engineers	54 (21.8)	113 (19.9)	190 (25)
Skilled Workers	143 (57.9)	300 (52.9)	357 (47)
Others	38 (15.6)	92 (16.3)	99 (13)
Total Number of Employees	247 (100)	567 (100)	760 (100)

Source: Electronic Industries Association of Korea

Global Developments

3.11 The redirection of Korea's electronics industry has been precipitated by a combination of changing world market conditions, shifting perceptions of dynamic competitive advantage and explicit government policy. Since Korea's electronics industry has historically been and continues to be

export-oriented, global developments have an especially significant impact on the structure of the domestic industry. One important factor accounting for the relative deemphasis of certain consumer electronics products has been the imposition of restrictions on imports of Korean consumer electronics goods into the United States, Korea's major overseas market. With the imposition of antidumping duties on Korean color televisions in late 1984, electronics manufacturers have been undertaking intensive development efforts aimed at introducing new models such as PAL-type color TVs (for the European market) and new products like video tape recorders (VTRs) and microwave ovens. In addition, Korean firms have established a number of overseas plants for manufacturing various consumer electronics items within the final market area in an effort to preempt trade restrictions or circumvent trade barriers.

3.12 The production shift in the direction of industrial electronics is likewise attributable in part at least to the anticipated high growth in world demand for various industrial electronics products in the future. Korea's own market for such products is also expected to grow rapidly in coming years as the country's economy continues to industrialize. Between 1987-92 for example, the domestic market for computer equipment of all types is projected to grow on average 14% per year (in constant 1982 dollars). Meanwhile, computer exports are projected to grow 22% a year on average.^{3/} At present telephone subscriber equipment accounts for the largest portion of both industrial electronics production and exports. Computers and computer peripherals, however, constitute a rapidly growing segment of industrial electronics in terms of both output and exports. Korean firms have been able to utilize their expertise in television and cathode ray tube (CRT) production to move into markets for various types of computer terminals for example. In 1984, total terminal exports amounted to \$198.08 million, a 234.4% increase over the previous year and more than one third of total industrial electronics exports. The surge in computer-related exports in 1984 led to Korea's first trade surplus ever in computer products, with \$285 million in exports against \$247 million in imports. Computer and peripheral exports rose to \$467 million in 1985 and are expected to reach \$680 million in 1986.^{4/}

3.13 The strategies of Korean firms in the electronic component sector also reflect changes in the global industry. Traditionally, the primary emphasis of many Korean firms had been on the development of an in-house chip supply for their own consumer electronics products. Some had become competitive exporters of discrete transistors and relatively simple consumer ICs as well. Since the early 1980s, however, the emphasis has shifted to large scale production of more sophisticated memory ICs for sale on the open market. The rationale underlying this strategy would appear to be that, like their Japanese counterparts, the Korean electronics firms expect to be able to compete effectively in world markets for mass produced memory chips and other standardized products based on low cost manufacturing methods, given relatively low cost skilled labor and capital and low overheads. Foreign investors in

3/ Korea Institute for Economics and Technology.

4/ Ministry of Trade and Industry projections.

Korea's component sector, however, have thus far made no move to integrate from their assembly/test operations backward into wafer fabrication. Nevertheless, they have been investing heavily in automated assembly and test equipment in their Korean plants.

B. Electronics Industry Strategy, Outlook and Issues

Constraints on the Industry's Development

3.14 While the electronics industry has performed exceptionally over the last decade, there remain certain weaknesses in the industry's structure which need to be addressed if that performance is to be sustained in the future. One major weakness is that the industry remains principally an assembly industry based on productive, low-cost labor. While in certain areas like televisions and audio equipment production has become more highly integrated, nevertheless there has generally been little innovative product design and development activity in the past. For the most part Korean firms have concentrated on the low cost manufacture of foreign-designed products. In the past the technology needed to make such products was readily available via technology imports either in the form of licensing agreements or joint ventures, or by reverse engineering of imported products. Currently, however, it is more difficult to gain access to certain foreign technologies since their suppliers are also potential competitors with the Korean firms in major export markets. Moreover, miniaturization has also rendered reverse engineering more problematical. Hence, the restrictions (now expired) placed by Japanese video cassette recorder (VCR) manufacturers on sales by Korean licensees of their products in the US market.

3.15 Historically, investment by Korean firms in research and development activities has been low by comparison with the Japanese and US averages. In 1979 Korean electronics firms spent 1.52% of sales on R&D while Japanese firms spent roughly 5.4% and the US industry approximately 5.8%. (By 1983 the Korean ratio for electronics/electrical firms had risen to 3.1%.)^{5/} In the context of an increasingly competitive global industry where firms protect ever more carefully their technological know-how, the Korean electronics industry needs to be able to generate technologies indigenously to a far greater extent than in the past. This will necessitate substantial additional investments in R&D activities in the future.

3.16 Another constraint to the industry's development is its continued heavy reliance on imported components and parts, where manufacturers of consumer electronics products have had to import critical components due either to their unavailability locally or to the nonconformity of local components to the quality standards required for export production. Since component and material costs represent a substantial percentage of ex-factory costs of most electronic equipment, however, dependence on foreign supplies has reduced

^{5/} Korea Development Bank. The Japanese figures, meanwhile, rose to 7.1% in 1983. (Electronic Industries Association of Japan.)

domestic value added. In addition, due to delivery delays, especially during periods of peak demand, Korean equipment manufacturers have occasionally faced problems in meeting their own production and shipment schedules, causing them to forfeit market share. To ensure reliability of supply without having to stock large inventories of costly components, it is advantageous to maintain close geographical proximity as well as close technical links to suppliers. Furthermore, Korean electronics manufacturers are heavily dependent for their components on the same firms (often Japanese) with which they must compete in end equipment markets.

3.17 Despite the fact that productivity has been increasing rapidly in recent years, the Korean industry's performance still compares unfavorably with the industries of the advanced industrialized economies. In 1982, for example, value added per employee in Korea's electronics industry totaled \$9,464 while in Japan VA per employee was roughly three times as high, or \$28,779. Although wage cost differentials still more than offset productivity differentials (hourly compensation in Korea being roughly one fifth that in Japan as of 1984), Korea faces potential competition in labor intensive types of electronics operations from still lower wage countries of the region (see Table 3.6 for wage cost comparisons). In effect then, the Korean industry is under pressure from both sides. In higher value added products, it is still not able to compete on an equal footing with firms from the advanced industrial countries; in lower value added products, it may be losing its competitive edge to still lower cost producers. As suggested earlier, changes in electronics manufacturing technologies -- in particular assembly automation -- may alter the parameters within which the Korean industry competes but the basic challenge to become internationally competitive in higher value added, higher technology products still remains.

Table 3.6: HOURLY COMPENSATION (WAGE RATES PLUS BENEFITS) FOR PRODUCTION WORKERS IN 1984 (US \$)

Asia		Americas		Europe	
Japan	6.35	US	12.59	Belgium	8.87
<u>Korea</u>	1.36	Canada	11.51	France	7.43
Major Asian competitor	1.70	Mexico	1.70	Germany	9.57
Hong Kong	1.60	Brazil	1.23	Ireland	5.46
Singapore	2.43			Netherlands	8.60
Malaysia	0.50-1.00			Spain	4.68
Thailand	0.88			U.K.	5.87
India	0.70-1.00				
Philippines	0.39 /a				

/a Minimum rate.

Source: Electronic News, September 23, 1985.

Private Sector Strategy

3.18 The private sector consists of firms characterized by a variety of ownership arrangements: wholly foreign-owned subsidiaries, joint ventures, and wholly domestic enterprises. For the purposes of this discussion, attention is focused principally on the locally owned industry. Within that grouping, however, there is also considerable heterogeneity. While there are a growing number of large-scale enterprises with employment in excess of 1,000 persons (5.9% of total firms in 1983), the majority of firms (70%) still have fewer than 200 employees. While certain of the small-scale enterprises are independent entities which plot strategy on their own, a large number are primarily involved in supplying parts and components, subassemblies, and services to the large electronics conglomerates. In effect then their strategies are conditional upon the strategies of their principal customers. For this reason, the discussion of corporate strategies tends to be directed largely to the strategies of the five or six largest domestic electronics enterprises in Korea. Of course, those enterprises cannot be considered strictly domestic in all cases, since they or their affiliates/subsidiaries are often engaged in joint ventures, licensing agreements, or other forms of technical collaboration with foreign partners. Indeed, the nature and extent of such foreign linkages can significantly affect a particular firm's growth strategy.

3.19 Broadly speaking, three different types of private sector strategies can be identified. The major electronic firms in Korea pursue some mix of these strategies with differing degrees of emphasis. The first has been referred to frequently as the "leapfrog" strategy. Its rationale is that the nature of technological change in the electronics industry is such that firms are able to bypass certain intermediate stages of technological development and move directly to the mass production of certain high technology products. This logic is usually invoked in defense of efforts by some Korean semiconductor manufacturers to bypass intermediate levels of circuit integration in order to begin producing very large scale integrated (VLSI) circuits -- in particular computer memories -- in direct competition with the Japanese and, to a lesser extent, the US and Western European industries. A further elaboration of this strategy argues that dynamic RAMs (random access memories) in particular are the "process drivers" which enable firms to refine mass production techniques for eventual transfer to the fabrication of other types of devices. Thus, if a firm becomes competitive in DRAMs, it should have better prospects of penetrating other segments of the "commodity" (i.e., standardized) chip market.

3.20 A second strategy is to focus instead on moving into the intermediate range of electronics technologies in which Japanese, US and Western European firms are no longer able to maintain a technological edge and in which they might therefore be forced to concede considerable market share to Korea or other new entrants. This is an extension of the strategy which many firms have followed in consumer electronics. Indeed, to varying degrees Korean electronics firms are already pursuing such a strategy with considerable success. For example, as previously noted, Korean firms have become major exporters of "dumb" computer terminals and telephones instruments.

Korean firms have also been able to capture a sizeable share of the world market for low end oscilloscopes and digital multimeters. In the case of components, some Korean firms are highly competitive in black-and-white picture tubes and others in simple semiconductor products like discrete transistors. Yet, in integrated circuits (ICs) this strategy has not been as widely adopted. While Korean firms do process a large number of intermediate ICs (i.e., medium- and large-scale integrations, or MSIs and LSIs), they do so primarily to satisfy their own internal consumption requirements. When it comes to production for the merchant market the principal emphasis would appear to be on a "leapfrog" approach.

3.21 A third strategy is to focus on market niches rather than on high volume markets for standardized products. Such an approach requires considerable sophistication in terms of indigenous design capabilities as niche-oriented firms must be able to customize their equipment to satisfy specialized user needs, a design-intensive process. In the component sector such a strategy implies focusing on semicustom and custom IC products rather than standard memory and/or logic. At least one Korean firm (Lucky Goldstar) has pushed a variant of this strategy, linking up in a technical collaboration with a leading semicustom IC house in the US. The latter supplies the designs to the Korean partner which then fabricates the wafers in volume and ships them back to Silicon Valley for final metallization. The strategy may also involve a degree of vertical integration wherein a niche-oriented equipment manufacturer or systems vendor designs application specific ICs in-house to incorporate in the specialized equipment. Frequently this approach is suited to the design and development of complete production systems, and those firms which have large internal requirements for such systems may produce them initially for in-house use, marketing them to others only after they have demonstrated their effectiveness in their own operations. It is a human capital as opposed to a physical capital intensive process, with a substantial software component and relatively low volume hardware manufacture.

3.22 The Korean electronics industry attaches high priority to the development of its semiconductor capabilities. It has channeled enormous resources over the last few years (since 1983) in to building up its semiconductor manufacturing capacity and has plans to continue the high investment levels in integrated circuit (IC) wafer fabrication (fab) over the next few years. If for no other reason than the massive commitment of resources to this sector, the strategies of the major Korean players in the semiconductor field merit closer examination. In fact there is another important reason to examine these strategies critically, namely, the very risky nature of certain types of semiconductor activities in light of intense international competition.

3.23 As previously noted, 1983 marked the beginning of a first major round of investments in wafer fabrication facilities in Korea. Between now and 1988 the major Korean semiconductor producers (basically Samsung, Gold Star and Hyundai) are expected to invest an additional US\$1.2 billion in VLSI chip production. Much of the investment capital for the first round consisted of loans from the Korea Development Bank (KDB), although some semiconductor

manufacturers have also utilized international capital markets.^{6/} Financing will be a critical consideration in future development of Korea's semiconductor industry given the large scale of investment required on an ongoing basis if Korean firms are to keep abreast technologically. Since the firms which have invested heavily in mass memory (e.g., 64K and 256K DRAM) production are already facing severe downward price pressures and cannot expect to realize a profit on these chip sales, it remains to be seen whether outside financing will be as forthcoming for the next generation of investments (such as the one megabit DRAM). The GOK has indicated its intention to make maximum use of the National Investment Fund and new venture capital sources to finance the growth of the semiconductor industry, but neither source can provide the large sums required.

3.24 The three major semiconductor manufactureres in Korea are all pursuing the high-volume VLSI memory market to varying degrees and with slightly different product mixes. They have relied either on licensing or outright purchase of foreign chip designs. The leader in this field (Samsung) entered mass production of 64K DRAMs just as the market began its nosedive and was forced to switch some of its wafer fab capacity to other memory products. It is planning to begin volume shipments of its 256K DRAMs for the first half of 1986. This product, too, has been experiencing precipitous price declines, though there is likely to be an upward adjustment as a result of measures taken by the US Government to counteract alleged dumping by Japanese firms. The second major DRAM contendor (Hyundai) has bypassed the 64K generation and plans to move directly into 256K DRAM production. In the meantime, it has licensed technologies for certain other memory products from foreign sources and is currently producing them, though the quantities are unknown. It is handicapped by the lack of prior experience in the semiconductor business, but it remains to be seen how serious that handicap will prove to be.^{7/} The third major chip manufacturer (Lucky Goldstar) has adopted a more cautious approach to its semiconductor investment strategy. This may be partially a function of its joint venture with a major US telecommunications and semiconductor firm and partially a function of the fact that its chip production is geared principally to the domestic rather than the export market. Where it does export, it has chosen to rely principally on a "buy back" strategy with its joint venture partner or with other technology licensors (e.g., the gate array manufacturing agreements alluded to above). At the same time, it is pursuing

^{6/} Recently, Samsung, the leading semiconductor manufacturer in Korea, issued convertible bonds worth US\$20 million in the Eurobond market. While the capital raised was intended primarily for expansion of consumer electronics production facilities abroad, this represents a departure for Korean electronics firms in that it is the first instance in which foreigners have been permitted to invest directly in Korea's stock market.

^{7/} Already it has encountered serious technical and cost problems in its Silicon Valley-based production line, which it has been forced to shut down as a result.

R&D on one megabit DRAMS and may be one of the first Korean firms to have a mass production capability in the next generation of memory chips.

3.25 In computers and peripherals Korean firms are slightly less advanced on the whole than in semiconductors. Until very recently the industry has consisted largely of two sets of activities: local firms producing computer peripherals like monitors for export on an OEM basis; local firms producing microcomputers to supply a protected domestic market. In the case of the latter, the GOK has also supported local computer manufacture through its procurement policy, for example, by ordering 5,000 personal computers in 1982 from 5 local firms for dissemination to educational institutions. More recently, the GOK has contracted with several local firms to supply supermini-computers for incorporation in a planned nationwide government computer network for handling the information processing needs of the various municipal and lower level administrative units.

3.26 In the last two years significant changes have occurred in the Korean computer and peripheral industry. First, the GOK's attitude toward foreign direct investment in this sector has become somewhat more positive, with the result that a number of foreign computer firms have invested in local production -- in some cases through wholly owned subsidiaries but more commonly through joint ventures -- to gain access to the Korean market as well as to provide a base for regional exports and for local sourcing of components and peripherals to supply their global operations. While the domestic market for personal computers is still protected, the GOK is committed to the liberalization of imports of small- and medium-size computers by 1988. Meanwhile, local firms have met with growing success in exporting fully configured personal computers, in particular to the US market.

C. Public Sector Role

The System of Incentives and Government Attitudes

3.27 Government policy has played a critical role in the electronics industry's development since 1969 when the Electronics Industry Promotion Law was promulgated. That law designated electronics a strategic export industry, which made it eligible for a number of special incentives. Specific measures to promote the sector's development were incorporated in the Eight-year Electronics Industry Development Plan (1969-1976) and the successive Five-year Economic Development Plans. In 1981 the Government revised the Electronics Industry Promotion Law and drew up an executive plan for making electronics a highly advanced industry in Korea. Among the proposals in that plan was the establishment of an Electronics Support Fund, to be financed by public and private sector contributions. The size of the ESF was to be W 7.5 billion and the money was to be lent at preferential rates to firms investing in high priority areas. In particular, firms establishing R&D subsidiaries overseas were to be given preferential access to loans. This fund was recently abolished, as Government has shifted in focus to functional incentives.

3.28 In view of the fact that the electronics industry in Korea has developed principally as an export industry, it has also benefited from the basic export incentives which were instituted beginning in the early 1960s. The systems of incentives are of two types: one granting duty-free and unrestricted access to imported intermediate inputs needed for export production, including for firms which are merely suppliers to export manufacturers; the other granting automatic access to bank loans for working capital requirements associated with export activity. Besides those incentives and other measures intended to foster export competitiveness in general, the electronics industry has been the target of a number of other promotional policies relating to trade and tariff, procurement, patent and licensing, fiscal and financial incentives, and foreign investment.

3.29 Trade and Tariff Policy. As of 1984 there were some 185 electrical and electronics goods whose import into Korea was restricted (37% of all electrical/electronics products listed). Most of the goods on the restricted list are considered infant industry products requiring temporary protection. Under the import liberalization plan all electronics items currently restricted will be freely importable by 1988. The move to liberalize electronic imports has resulted in part from mounting pressure from Korea's major trading partners to open up its own markets as a condition for ensuring entry of its products into foreign markets. While electronics firms -- as well as other strategic industries -- no longer enjoy the special tariff preferences they once did, there are certain generic preferences which have particular relevance to electronics firms. For example, firms pay a lower tariff rate on equipment which is imported for R&D purposes. Since electronics is increasingly R&D intensive in Korea, this provision is of special benefit to firms in this sector.

3.30 Procurement Policy. The role of government procurement policy in fostering the computer industry's development is important, particularly for the telecommunications equipment industry. The GOK has supported the joint development by the Korea Telecommunications Authority's (KTA) research arm, the Electronics and Telecommunications Research Institute (ETRI), and four private sector firms of an indigenous electronic switching system for eventual incorporation in the domestic public telecommunications network. It has licensed those firms to produce the switching equipment for sale to the KTA. Such procurement practices also constitute indirect support for the component industry, in particular the IC industry which is a major supplier to the telecommunications equipment as well as the computer industry. As purchaser, the Government will need to exercise caution so that foreign firms can begin to compete in the Korean market.

3.31 Patent and Licensing Policy. The protection of intellectual property rights (IPR) has become a controversial issue within the Korean electronics industry. While products patents have never represented a particularly effective means of protecting technology from duplication in the case of electronics products, the issue of protection for computer software is especially sensitive to would-be suppliers of technology to Korea. It is also sensitive to the Korean software industry, which has relied extensively on translation or simple modification of imported software in the past. While recognizing the contribution that protection of software property rights would

make to the acceleration of technological development in Korea's computer industry (e.g., by inducing Korean firms to do more innovative software design), Korean entrepreneurs are nevertheless reluctant to endorse such protection because of the potential diminution in their profits on software sales that might result from increased royalty payments abroad. While not presently a major issue, copyright protection for integrated circuit designs may well become a critical concern as the Korean semiconductor industry develops. Such protection is apt to be a concern not simply to foreign semiconductor firms but to Korean companies themselves which undertake their own design work and stand to lose potential revenues to imitating rivals.

3.32 Tax Incentives. Since 1982 incentives to promote the development of specific industries have been substantially reduced. Nevertheless, special incentives continue in effect for six strategic industries, among them electronics. This industry (along with the industrial machinery sector) has a choice between two options for fiscal relief for facilities investments: tax credits of 3-5% of the amount invested or accelerated depreciation (other strategic industries have only the latter incentive available). Besides these limited incentives targeted specifically at electronics, the industry also benefits from a number of functional incentives, for example, technology and manpower development. One of the most important incentives is the allowance of firms to set aside a percentage of profits in a reserve fund (exempt from taxation for a fixed time period) for eventual investment in R&D activities. In the Sixth Five Year Plan the GOK has chosen to rely more extensively on such activity-specific -- as opposed to industry-specific -- incentives to promote technology development and manpower training.

3.33 Financial Policy. The GOK provides a number of financial inducements to investment in the electronics industry. First, it requires that commercial and state-owned banks reserve a certain portion of their loanable funds for R&D lending, a fact which in the context of persistently tight credit conditions constitutes an effective incentive. Furthermore, the Government has instituted measures in the last several years designed to stimulate technology related lending and venture capital activity. It was instrumental, for example, in the establishment of the Korea Technology Development Corporation (KTDC), which lends to R&D projects as well as taking equity positions in technology-oriented start-up firms (though its equity investment portfolio remains fairly limited). Approximately one third of KTDC's portfolio projects are in the electronics field. More recently, the GOK has adopted a new law for the promotion of venture capital activities with a view to encouraging greater risk-taking activity among Korean financial intermediaries. While it is not yet known how effective the law will be, to the extent that it does encourage greater entrepreneurship in the manufacturing sector, it should stimulate new investment -- especially start-up investment -- in electronics.

3.34 The Government's National Investment Fund (NIF) has played a relatively small role in the development of electronics compared to other strategic industries. From the Fund's establishment in 1974 through 1982, NIF loans were made available to strategic industries at preferential rates; however, since 1982 preferential interest rates on NIF loans were essentially abolished. Presently, electronics is one of the major recipients of NIF

loans, but the total size of the NIF is about \$600 million and the GOK intends to continue to reduce its size. Between 1976 and 1986, NIF funds lent to the electronics industry amounted to roughly 4.2% of the industry's total capital investment.

3.35 Through collaborative research projects between government-affiliated research institutes and private sector firms the GOK has also contributed financial as well as technical resources to electronics R&D efforts. The Electronics and Telecommunications Research Institute (ETRI) is involved in several collaborative projects with the private sector, including public switching systems, VLSI design and process technologies and advanced computer system architecturing and design. The GOK allocates budgetary funds each year to the financing of certain high priority "national projects," many of which involve collaboration between sector R&D labs and public research institutes.^{8/} Another nonfinancial incentive which the GOK grants to stimulate R&D activities is the exemption of R&D personnel from military service.

3.36 Foreign Investment Policies. Korea has historically sought to limit wholly foreign owned direct investment in its industries. To the extent that foreign direct investment has been permitted, it has usually been in the context of majority Korean owned or 50:50 joint ventures (see Table 3.7). Of all electronics-related foreign invested projects between 1962 and 1983, 63% were in those two categories. Those projects, however, represented only 30% of the total equity in foreign invested projects. Wholly foreign-owned projects on the other hand, while only a quarter of the total number of projects, accounted for 61% of the total equity invested.

3.37 In recent years, the GOK has liberalized considerably its foreign investment law. The Revised Foreign Capital Inducement Law of December 1983 is designed to encourage greater foreign direct investment (FDI) through the streamlining of approval procedures and the reduction of restricted areas. Once again this has special significance for electronics, given the importance of FDI as a means of technology transfer in this sector. The most significant change was from a positive to a negative list. Almost all restrictions on capital and profit repatriation have been removed under the revised law. Certain restrictions remain on foreign investors, however. For example, they are not eligible for subsidized credit unless they are in a high-priority industry or are part of a majority Korean-owned joint venture (of course high technology electronics is a high priority area). Moreover, in the electronics field, 100% foreign owned manufacturers are required to export at least 50% of

8/ Here again, due to the strategic significance attached to electronics, this industry is the recipient of substantial government support through various national R&D projects. In 1983 some 182 research projects of 131 industrial firms were selected as national R&D projects and about US\$28 million was contributed by the GOK to these projects. In addition, the GOK is supporting seven special projects in semiconductors and bio-engineering with funding of W 35.7 billion (approx. US\$40 million).

**Table 3.7: ELECTRICAL AND ELECTRONICS: FOREIGN EQUITY INVESTMENT
(APPROVALS) BY SHARE OF FOREIGN OWNERSHIP, AS OF AUGUST 1983
(cumulative from 1962)**

	Value (US\$ million)	Percentage of total	No. of new projects
1-49%	63.8	24.3	58
50%	15.8	6.0	62
51-99%	22.0	8.4	23
100%	161.3	61.4	48
<u>Total</u>	<u>262.9</u>	<u>100.0</u>	<u>191</u>

Source: Ministry of Finance.

their output. (Most joint ventures on the other hand can sell all of their product domestically.) Despite the remaining restrictions, the liberalization has led to an upsurge in foreign direct investment in Korea's electronics industry in recent years.^{9/} (Of course, other factors have contributed to the expansion of FDI as well, such as the growth in Korea's domestic market and its low manufacturing costs.)

9/ Among the major foreign investments in Korea's electronics industry in the last few years are:

- Oriental Telecommunications Company (OTELCO), a 50:50 joint venture between Ericsson (Sweden) and Oriental Precision Company, established in November 1983 to supply digital switching equipment to the Korean Telecommunications Authority;
- Fujitsu Ltd. (Japan), which plans to build a factory to make personal computers;
- IBM (USA), which gained permission in early 1985 to establish IBM Korea Systems Inc. to manufacture and sell IBM personal computers;
- Hewlett-Packard (USA), which has a joint venture with Samsung to assemble the HP 3000 minicomputer and an "Asian personal computer," established in June 1984;
- Gold Star Fiber Optics, a 50:50 joint venture between Lucky-Goldstar and AT&T (USA), established in January 1984;
- Gold Star-Honeywell, a 50:50 joint venture between Lucky-Goldstar and Honeywell (USA), established in November 1983.

Industry Prospects

3.38 Access to Capital. As the electronics industry has evolved, many segments of it have become more capital intensive. This has been the result of increasing competitive pressures to automate production as well as the increasing sophistication of the production equipment required to make ever more complex electronics products. As minimum capital requirements for entry into particular types of electronics production have risen, the importance of access to capital at competitive rates has increased correspondingly. On the one hand, Korea's electronics industry has been compelled by the need to adjust to rising wage levels to introduce automated equipment into existing operations. (It should be noted, however, that wage levels have stabilized in recent years and the electronics industry still remains relatively labor-intensive.) On the other hand, it has chosen to diversify heavily into semiconductor processing, an operation whose capital intensity has been rising steeply over the last decade. The latter development in particular has thus made financing considerations increasingly central to the health of Korea's electronics industry.

3.39 The Electronics Industry is a High-risk Business. The risks involved are of both the commercial and technological variety. In the past, Korean electronics firms have tended to avoid the latter risk to a large degree by concentrating their activities on the replication and mass production of products which have already passed through the initial stages of the product life cycle and have thus been tested in the market. As Korean firms restructure their activities toward more technology-intensive products and processes, increased exposure to technological risk becomes inevitable. Korean firms are now being forced to increase spending on R&D, design engineering, prototype production and testing, and other precommercialization activities and as this happens, the nature and level of risk changes. The financing of investments in such high risk activities may prove problematical within the existing capital market structure. In the Korean context, the difficulties stem from the overall inadequate capitalization of the very large firms and the inability of commercial banks to either adequately assess the riskiness of loans or to charge a sufficiently high risk premium if they considered it sound bank practice to do so. See Chapter 5 on the immaturity of the Korean capital market.

3.40 Policymakers have perceived the need for public sector involvement in this area. That involvement has taken a variety of forms. For example, the Korean Technology Advancement Corporation (K-TAC) has served as a source of investment capital for the development to the commercial stage of new products/processes generated by the research of the Korean Advanced Institute of Science and Technology (KAIST) and other government research institutes. Similarly, with Bank support, the Korean Technology Development Corporation (KTDC) has made funds available to the private sector for investment in specific R&D, technology acquisition and other precommercial investment projects. Recently KTDC has expanded its operations to include venture capital-type equity and other risk sharing investments in certain high technology enterprises. Moreover, the GOK is actively encouraging other financial intermediaries to undertake venture capital operations, especially in support of technology intensive projects in electronics and other fields.

3.41 Human Capital. The evolution of the industry has altered the structure of demand for labor towards higher-skill categories. Technicians and engineers are in especially great demand. The changing composition of the electronics labor force is the result of a combination of the increasing automation of electronics production on the one hand and the relative increase in nonproduction activities (e.g., R&D, design, engineering and marketing) on the other. As automation occurs, the number of direct operators needed to produce a given level of output diminishes while the number of engineers and technicians needed to supervise, service and maintain the automated equipment increases. Thus the Korean electronics industry has come to the point where the availability of skilled scientific, engineering and technical labor represents the single most critical potential constraint to its future development. Indeed the industry currently suffers from a shortage of high level engineers experienced in R&D activities.

3.42 In human capital investments, Government performs a crucial function. Educational institution building is necessarily a long-term process, however. In the interim, there are a variety of ways by which the Government as well as the industry itself can seek to prevent the emergence of serious bottlenecks in the supply of certain categories of skilled labor. One widely employed method is the granting of scholarships for foreign study in high priority disciplines. Another is the hiring of foreign technical consultants in fields where Korean expertise is lacking. Still another widely used by Korea is the establishment of foreign R&D and design facilities to tap into overseas supplies of skilled engineering and technical labor.^{10/}

3.43 Access to Foreign Technology. Somewhat paradoxically, as Korea's electronics industry develops technologically, the need for access to foreign technology is apt to increase rather than decrease; Korean firms are no longer able to rely on proven product and process technologies, but rather must begin

^{10/} Korean firms have had mixed results with the last strategy. For there may be constraints to hiring the highest quality personnel in the United States. Certain employers are reluctant to hire professionals who have gone to work for foreign firms. Moreover, the most talented engineers generally expect stock options as part of their benefit package, something that closely held Korean jaebol generally are unable to offer. At the technician level the time horizon for building up effective local training institutions may be somewhat shorter. The scope for private sector involvement may also be greater. To a greater extent than is the case with engineers, the training of technicians occurs on the job rather than in the classroom. Nevertheless, the Government may still perform a valuable role in building up technical training institutes which, while responsive to the needs of the private sector, do not suffer from the deficiency of some in-house training programs, viz., that the skills imparted are so firm specific that they defy transfer across firms if and when a skilled employee chooses to change employers. The Government may also have greater incentive to invest in the development of skills which are not currently in great demand but are expected to experience growing demand in the future.

to master more sophisticated, less mature production processes and product designs if they are to remain internationally competitive. They are not, however, in a position to generate all the necessary products and processes based on their own indigenous R&D and design capabilities. Rather, they must be able to acquire the most advanced product and process technologies abroad so as to be able to assimilate and, where appropriate, adapt them to local industry requirements. While licensing agreements served Japanese electronics firms well during their period of accelerated learning as an avenue for acquiring the basic technologies they first reproduced and later refined, those agreements have diminished usefulness in the context of the present day industry. This follows because the major international electronics firms -- including, or perhaps especially, the Japanese -- are increasingly reluctant to license advanced technologies to potential competitors. On the other hand, the intense pressure which Japanese firms have exerted on their foreign competitors in the semiconductor markets, for example, has enabled Korean firms to license or purchase foreign technologies which would not have been available to them under different circumstances.

3.44 Moreover, there may be a symbiotic relationship between technology transfer from abroad and indigenous technological development. The Korean industry is in a better position to bargain for favorable terms in technology licensing or other transfer agreements inasmuch as foreign technology suppliers have reason to be convinced that the Korean industry is close to being able to generate the technology on its own. Moreover, technology suppliers are apt to be more forthcoming with proprietary technological know-how when the buyer/licensee has some technological expertise of his own from which the supplier may derive benefits.^{11/} Indeed, amongst developed country electronics firms cross licensing and technology exchange agreements are increasingly common.

Effects of Market Structure

3.45 While there were some 700 electronics firms in Korea as of 1983, the three largest account for approximately 40% of electronics exports and production. The high degree of concentration in this and other industries has given rise to a policy debate regarding an appropriate market structure which is both economically efficient and socially beneficial. In the case of the electronics industry, there are both benefits and costs associated with the existing market structure. The large size of the leading Korean electronics firms has enabled them to reap economies of scale as well as giving them sizeable financial resources from which to fund the increasingly large investments required to remain competitive in the electronics business. Their diversified product portfolios has also permitted a degree of

^{11/} The willingness of a leading US semiconductor manufacturer to grant a second-source license to a Korean firm for one of its popular microprocessor lines, for example, was contingent on the latter's ability to meet the former's stringent quality and reliability requirements. At the same time, it has now licensed its most advanced microprocessor line to the Korean firm.

cross-subsidization of investments in higher risk projects with low or negative margins from the revenues earned on established product lines with high profit margins. In addition, their large asset bases have given them privileged access to capital markets to raise funds for major new projects like the recent wave of VLSI wafer fab investments.

3.46 Many of the small- and medium-scale enterprises in Korea are suppliers to the large conglomerates. In certain instances they may be direct competitors with the latter but normally SMIs are more specialized whereas the conglomerates are mass producers of a wide range of products. The absolute size of small- and medium-scale producers has been increasing steadily, suggesting that those firms are able not only to survive but to grow in a market dominated by a half dozen large scale enterprises. They have grown, moreover, in an environment in which those supplying the export market (whether directly or indirectly) have had to meet international quality standards at competitive prices.

3.47 Nevertheless, there remain certain weaknesses in the infrastructure of supplier and support industries in Korea. These weaknesses have been highlighted by the rapid expansion of semiconductor manufacturing capacity in recent years. The materials and other suppliers of inputs for wafer fabrication have often lagged behind their customers technologically; in some cases -- e.g., certain electronics grade chemicals, lead frames, precision tools and dies, etc. -- few if any local suppliers have been able to meet the precise specifications of semiconductor firms. Thus, many direct production materials have continued to be imported. Another potential problem area in Korea is the tendency for the electronics conglomerates to internalize much part and component production which could be undertaken more efficiently by specialized SMIs. The large electronics conglomerates maintain networks of dedicated suppliers while at the same time sourcing on a competitive basis from many others. The former group have the benefit of their single customer's technical assistance, quality control, training and financial guarantees on bank loans. The independent suppliers, however, are in a more precarious position and may require bolstering if they are to overcome their technical and financial constraints.

3.48 R&D Issues. If the electronics industry is to become and remain competitive in sophisticated products like VLSI memory ICs and high performance mini- and microcomputers, it will need to augment considerably its R&D activities. Already that process has begun. For example, the number of research laboratories in electronics increased from 11 in 1980 to 28 in 1983. Similarly, the research staff, comprised of college graduates and above in the electrical and electronics industries, doubled in the 2 years from 1981 to 1983 from about 700 to 1,400. Presently the major electronics firms in Korea spend roughly 4% of sales revenues on R&D investments. They have plans to raise that by several percentage points in the next few years to bring their R&D:sales ratios into line with those of their major developed country competitors. Still, given their smaller revenues, the absolute amounts spent on R&D are likely to continue to remain well below those of many developed country electronics firms. (Indeed, in 1982 total Korean R&D expenditures for all purposes were smaller than the individual R&D budgets of each of the three largest U.S. computer manufacturers.)

3.49 Public Sector's Role in Other Countries. The Korean Government has drawn lessons in the past from the experiences of other countries in the promotion of their electronics industries. Presumably it can continue to learn from those experiences in the form of both positive and negative lessons. Korea is neither the most interventionist nor the least interventionist in terms of public policy toward electronics. In some countries public sector corporations (or parastatal enterprises) are the main producers of electronics hardware. In others the government has adopted an almost purely laissez-faire stance vis-a-vis this and other industries.

3.50 Among developing countries, India historically and Brazil currently are examples of significant state intervention in electronics. China likewise fits into this category. Like India, China has been involved in a process of reassessment of the degree of direct government involvement in electronics, though in the two countries the terms of the discussion differ considerably. Both have begun to liberalize, in particular, government restrictions on foreign participation in their industries. In addition, India at least has been reviewing procurement policies with a view to stimulating more private sector involvement in supplying telecommunications equipment and components as well as other electronic equipment to the public sector. It has removed limitations on production capacity for most types of electronic equipment and components. Procedures for import of raw materials needed in electronics manufacture have also been streamlined.

3.51 Brazil has followed a markedly different course in recent years, extending rather than limiting government intervention in the electronics industry, in particular in computer related activities. The main thrust of its policies has been to create a protected market within which the domestic private sector can earn rents by restricting foreign participation in a broad range of market segments. The public sector is not itself a major producer in Brazil as it is in China and India, so it is not a potential competitor with the domestic private sector. By reserving the local market for domestic producers Brazil expects to stimulate the development of indigenous technology over the long run.^{12/}

^{12/} In the short run there may be substantial costs inasmuch as local computer users must pay higher prices for equipment whose performance oftentimes does not match that of foreign equipment. Whether the cost is justifiable depends on the size of the price differential for machines of equivalent performance and the length of the learning period needed to reduce costs to levels comparable to those of imports. Limited evidence suggests that for low-end microcomputers at least, Brazilian firms have been able to lower prices to a relatively small margin above their foreign equivalents in a timeframe of two to three years. For medium manage systems (e.g., IBM-PC compatible systems) the price differential has remained relatively high. The classic form of import-substitution is based in part on the size of the domestic market, but it involves clear costs to domestic consumers and risks retaliating trade actions. See, e.g., Claudio Frischtak, "The Informatics Sector in Brazil: Policies, Institutions and the Performance of the Computer Industry," Paper prepared for National Science Foundation Symposium, August 1985, pp. 28-31.

3.52 Countries lying at the opposite end of the intervention spectrum include Hong Kong and, to a somewhat lesser degree, Singapore. The governments of those two city-states have maintained their economies as free ports with unrestricted trade and investment flows. This has led to a massive inflow of foreign capital into their electronics industries, which have been almost exclusively export-oriented. The result of this laissez-faire approach has been rapid growth in electronics output and exports, but with the locally owned industry lagging behind and generally dependent upon foreign-owned ventures. (At the same time, both industries have been highly vulnerable to fluctuations in the world market for specific electronic products.) The level of indigenous technological development remains low in both locations, though in recent years the Singapore Government has adopted a more interventionist stance in an effort to strengthen the indigenous skill and technology base.^{13/} The far more liberal approach of Hong Kong has retarded the process of technological development to a degree, inasmuch as investments have been made with a view primarily to short-term profitability. The Hong Kong Government has sought, however, to promote the application of microelectronics-based technologies to certain traditional industries like textiles and garments.

3.53 Future Directions. There is no doubt that the Government has sought explicitly to encourage the development of high technology industries like computers and semiconductors by designating them "strategic industries" entitled to certain preferential treatment. In effect the singling out of these two subsectors of the electronics industry for special status constitutes a policy to reconfigure the electronics industry as such away from low value-added, low-technology products and activities to high-skill, high-value added ones. While the extent of direct Government intervention in support of the electronics industry is relatively limited in Korea, the combination of support measures and activities directed at technology and R&D intensive activities in general and electronics in particular does suggest that Korean industrial policy is functionally nonneutral with respect to this sector. The priority that electronics projects receive among national R&D projects discussed above, the Government's budgeting support for public R&D institutes in this field, and its use of procurement policy to encourage development of certain production technologies all corroborate the government's efforts to foster the emergence of a technologically more advanced and relatively more autonomous electronics industry in Korea.

^{13/} The Government's initiatives have been directed primarily at altering the market signals to which private investors -- both local and foreign -- respond. For example, it initiated a sharp increase in wage rates in the early 1980s in an effort to induce firms to invest in labor-saving technology and higher value added activities. (It has partially reversed that policy in the wake of recent economic difficulties and the slump in the electronics sector in particular.) It has also offered generous incentives (e.g., interest free loans) to firms willing to invest in specific types of production (e.g., IC wafer fabrication).

3.54 The rationale given for government intervention to promote the electronics industry is that, in the context of Korea's export-led growth strategy, the Government must anticipate changes in the country's comparative advantage in order to smooth the adjustment process which will prove necessary to sustain export competitiveness. More specifically, it is argued, Korea's comparative advantage in labor-intensive assembly activities is likely to be eroded as wage levels rise with the general standard of living. In effect Korea is seeking to create a comparative advantage in those activities which are intensive in human capital, i.e., in skilled labor.^{14/} In the case of government support for R&D intensive activities, it has been argued that, due to market failures, there is a tendency for private firms to underinvest in such activities.^{15/} While the approach may sound reminiscent of the HCI experience of the 1970s where Korea opted to develop its capital-intensive industries, these are both more sound reasons for some functional industrial interventions in the areas of human capital and R&D (as described in Appendix 7) as well as greater experience on the part of policymakers in terms of avoiding heavy-handed industry-specific or product-specific public involvement. The major dilemma which will face Government will be whether to underwrite losses if the industry either fails in its gamble or succeeds but fails to earn sufficient profits.

3.55 There is little doubt the industry must continue to upgrade itself technologically. Questions abound, however, on the limits of that development. The first question is whether Korea can realistically expect to acquire competitive advantage in high technology segments of the industry. It is plausible to assume that, if the Korean electronics industry were to continue

^{14/} While unskilled labor supply is a simple function of demographic trends and labor force participation rates, the supply of skilled labor is created through education, training and experience. In the first area the primacy of the Government's role is hardly subject to question. In the area of training there would appear to be ample scope for both public and private initiatives, while in terms of experience the private sector will almost invariably be the principal supplier. The issue for the Government then becomes how to induce the private sector to create the kinds of jobs which will provide the requisite experience to add to the skill pool of the labor force.

^{15/} This is attributed to the fact that the social benefits exceed the benefits accruing to the private firms. In other words, the individual firm weighing the private gain from R&D investment against its cost would choose a lower level of such investment than would the public at large, assuming the public possessed adequate information about both costs and social benefits. The reason for this divergence between private and public gain is the fact that R&D enjoys externalities inasmuch as the technical know-how generated cannot be contained effectively within the individual firm but inevitably diffuses to other firms. It contributes to the reservoir of technical expertise and skills from which other firms and the society at large stand to gain. Hence, the rationale for an active government role in encouraging R&D activities.

producing the same products with the same techniques, it would eventually be undercut by lower cost competitors. The industry no doubt recognizes this eventuality and would take certain measures independently of government encouragement to prepare for it. Of course, one option open to the industry is to phase down operations and shift resources to other industries. It is not at all obvious, however, which industries could fill the void left by electronics. Moreover, the firms active in the electronics industry have accumulated considerable expertise and experience which would not be readily applicable to other industries. While the industry could postpone the loss of competitiveness perhaps by successive upgradings of technology to diminish the importance of labor and other relatively costly inputs in existing product lines, the prospects of the industry would continue to be linked to one of the slower-growth markets, viz., consumer electronics. Thus, if the Koreans are to remain in the electronics business, they are faced with formidable pressures to reorient their operations toward more skill- and technology-intensive sectors like computers and semiconductor wafer processing. To say that is not to answer the question of whether they can survive in those markets in the face of developed-country competition.

3.56 If they are to face that competition however, they may in the short run at least find themselves at a competitive disadvantage by virtue of their limited experience and narrow technology base. Can that disadvantage be remedied in an acceptable time frame and at acceptable cost? These are the questions the Government may ultimately have to face in deciding whether and to what extent to intervene in the electronics industry. Presumably the Government's intervention would have as one of its primary objectives the acceleration of the process of technological learning by private sector firms. In the advanced industrialized countries government intervention in the form of support for R&D, procurement, and implicit production subsidies has proven instrumental in accelerating the process of technological learning in electronics. In effect, it has partly socialized the enormous risks of many state-of-the-art technology development projects while to an extent also bringing the research results into the public domain (at least with regard to precommercial research). Based on the effectiveness of such intervention in many developed countries, one might expect a similar sort of government involvement to be considered in Korea.

3.57 At the same time one needs to bear in mind certain differences between the developed country experience and that of Korea and other NICs. First, government support for electronics R&D is building on a much firmer technological base in the US, Japan and Western Europe.^{16/} Second, there is a

^{16/} The latter all have well developed infrastructures of research establishments -- whether in the universities, government laboratories, or private sector firms -- pursuing basic and applied research in a number of fields (e.g., metallurgy, solid state physics, materials science, chemistry, etc.) with important implications for technological development in electronics. Korea has similar institutions (e.g., in KAIST -- the Korea Advanced Institute of Science and Technology), but the scientific research tradition is much shorter lived. Much so-called R&D performed in Korea continues to be of the product modification/adaptation variety.

major difference between Korea and the advanced industrial economies in the financial resources at the disposal of the public sector to support R&D and government needs to be very selective in its choice of project support with public monies not to merely subsidize private efforts.^{17/} As a general rule, intervention should be limited to those activities where there are significant externalities and should be geared to the extent possible to stimulate private sector initiative. Third, since Korean firms are much more poorly capitalized than say US firms, Government must be careful to avoid becoming a risk partner in the high-tech electronics field. A major difference in risk-bearing exists between Korea and its more developed competitors, inasmuch as Korea's capital (and in particular equity) markets are still immature. Therefore, Government must clearly signal to the industry that moral hazard behavior will be penalized. This may of course prove to be very difficult inasmuch as the government has certain industrial objectives in mind.

D. Concluding Issues

3.58 The outcome of Korea's high-risk electronics strategy remains to be determined. In semiconductors the major Korean producers began gearing up production just as the world market went into its worst slump in history. The Korean firms initiated their investments in 64K DRAM technology with the expectation that they would not be profitable but would provide valuable learning experience for rapidly moving into still more sophisticated memory markets (e.g., the 256K and one megabit DRAM). Even there the prospects for profitability are small. While they were able to borrow heavily to finance the first and second rounds of VLSI processing investments, it may prove far more problematical to raise the substantial sums needed for the next round (the one megabit DRAM), especially if the initial investments are not generating profits. Thus, financing considerations loom on the horizon as a major issue which will confront the government if it is committed to the long-term viability of Korea's semiconductor industry strategy. It must weigh the potential costs to the economy of the strategy's failure against the cost of future intervention. The consequences of failure might be sufficiently severe that the Government would choose actively to dissuade private firms from pursuing such a high risk strategy, perhaps by informing the private sector of the Government's determination not to rescue firms which may encounter

^{17/} In the first instance, the revenue base of the GOK is relatively small compared with that of the US or Japan. Moreover, the magnitude of expenditures which would be required to close the technological gap separating Korea from the latter two countries in basic and applied research in electronics would strain even a much larger government budget, given the competing demands for public sector resources. For this reason, it is imperative that, to the extent that the GOK should choose to support R&D activities, it be highly selective in its choice of projects in an effort to maximize the effectiveness of its expenditures and ensure that its resources are not too thinly spread over a wide range of R&D projects with the result that none receives sufficient support to achieve a critical mass of R&D effort and expertise.

financial difficulties as a result of their unsuccessful pursuit of this high risk strategy.

3.59 A second issue which policymakers in Korea are already being forced to confront, but which should become more pressing in the future, is how to effect the transition to a more skill and technology intensive electronics industry while minimizing one adjustment burden on the current electronics workforce. As the industry upgrades technologically, employment opportunities for the semiskilled production will be rendered superfluous by automation. The Government may need to consider the promotion of retraining programs to enable existing workers to upgrade their skills so as to qualify, for example, for the growing number of technician positions. The Government will also need to keep abreast of trends in the electronics industry to be able to anticipate changes in the skill composition of labor demand over time. Without sufficient foresight in manpower planning, the Korean industry could be handicapped in its efforts to exploit new technological developments and new market opportunities.

3.60 Over the long term, if the Korean electronics industry is to maintain its dynamism, greater attention will need to be given to the strengthening of the small- and medium-scale component suppliers and service industries supporting the activities of the large conglomerates. Of course, large Korean firms cannot be expected, on a long-term basis, to purchase inputs from local component suppliers if the latter cannot meet price, quality and reliability requirements of internationally competitive production. Thus, it may be necessary to assist the upgrading of capabilities of component suppliers as a precondition for promoting local sourcing. In the case of those components where scale economies obtain, there may be a need for lenders to regulate entry to ensure that the market does not become overcrowded with inefficient producers. As the market expands, new firms can be permitted to build up capacity.^{18/} Perhaps certain of the small and medium scale component suppliers, given appropriate incentives, could become major international competitors in their own right.

3.61 Pressures for protectionism in Korea's major export markets could very well intensify if Korea succeeds in its electronics strategy. Already the Japanese semiconductor industry, by virtue of its exceptional effectiveness in capturing VLSI memory markets, has been confronted with strong pressures from of the US semiconductor industry. The Korean electronics industry has already confronted such protectionism in consumer electronics and should be prepared to face it, perhaps with far greater intensity, in areas like

^{18/} An additional problem confronting the local component industry which may also argue in favor of a controlled entry policy is that many foreign electronics investors are reluctant to do business with very small enterprises due to concerns about reliability and adequacy of supply. A proliferation of small scale enterprises might render the development of strong linkages between local component suppliers and foreign-invested electronics equipment manufacturers problematical.

semiconductors and computers.^{19/} Whatever the economic rationale for continued tariff protection of certain segments of the electronics industry, Korea will most probably be confronted with the necessity of gradually reducing tariff levels on most if not all electronics products if it is not to face possible retaliation by its major trading partners in the electronics field, in particular the United States.

3.62 There are relatively few countries from which Korea can derive useful lessons in this particular phase of its industry's development in the sense that few countries have set such ambitious goals for their electronics industries' development and even fewer have tried to compress that development into such a short time span. Indeed, if Korea should succeed, it will no doubt have valuable lessons to offer other countries.

^{19/} Korean electronics firms like to stress the commonality of interest between themselves and US electronics firms in devising methods of successfully competing with the Japanese industry. To this end they suggest that US firms combine their design expertise with the low cost mass production techniques of the Korean industry. While there have been a number of licensing agreements and joint ventures between US and Korean firms in recent years, the fact remains that as a whole US electronics firms are also concerned about the prospect of Korean competition in the long term, especially in such areas as semiconductors.