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EXPLAINING ECONOMIC DEVELOPMENT:
A Case Study of State Policies Towards the Computer
and Electronics Industry in Taiwan (1960-80)

by

Danny Kin-Kong Lam

A thesis submitted to
the Faculty of Graduate Studies and Research
in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy

Department of Political Science
Carleton University
Ottawa, Ontario
February 14th, 1992

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EXPLAINING ECONOMIC DEVELOPMENT: A CASE STUDY OF STATE POLICIES
TOWARDS THE COMPUTER AND ELECTRONICS INDUSTRY
IN TAIWAN (1960-1980)

submitted by

Danny K. Lam, B.A.(Hons), M.B.A.

in partial fulfilment of the requirements
for the degree of Doctor of Philosophy

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TABLE OF CONTENTS

	Page
Abstract	ii
Acknowledgements	iii
Abbreviations	v
List of Tables	vi
 CHAPTER I: Contending Theories of Economic Development....	1
CHAPTER II: Implications of Taiwan's Development for Development Theory.....	55
 CHAPTER III: The Origins of State Promotion of Industry...	139
CHAPTER IV: State Promotion of Industrial Upgrading(1966-80).....	221
 CHAPTER V: Market Driven Sectors of Industry.....	295
 CHAPTER VI: Conclusions.....	357
 APPENDIX I: List of Interviewees.....	378
APPENDIX II: Methodological Note.....	380
References:	382

Abstract

Taiwan's development of competitive electronics and computer industries has been explained from the liberal perspective as being caused by efficient markets. Alternatively, developmental state theories argue that it is the result of successful market conforming policies and actions by government. Both liberal and statist theories have implied assumptions that industries and firms everywhere face similar opportunities and constraints. The author contends Chinese firms are not similar and constraints are often artifacts of theories. Two distinct sectors co-exist in these industries: one explicable as the creation of state policies and action; and a second that originated through market forces. In the former, state planning and regulation was not effective as "long term" measures and sporadically implemented. Where it was implemented, it was often unsuccessful according to its original intentions. Policies that were successful are now cited as evidence of effective planning while failed initiatives have been forgotten. The state, rather than acting coherently, produced policies that were the result of internecine conflict between different parts of the bureaucracy and societal forces. Moreover, policies formulated were based on a flawed vision of high technology and capital intensive industries as the future of Taiwan. At the same time, policy makers failed to understand the growing local electronics industry which was critical to the ultimate success of a portion of the state promoted initiatives. The dynamism of the indigenous electronics industry was the result of several factors: The transfer of know how and technology through learning to local entrepreneurs from more developed economies. This occurred as a result of employment at multinational corporations who opened plants in Taiwan, and also from overseas Chinese who gained their experience with American firms in the U.S. Second, Chinese entrepreneurial culture and family based support systems facilitated the creation of new businesses in the context of a liberal, free market economy in Taiwan. State policies aimed to promote high technology industries had little impact on entrepreneurial firms in this guerilla capitalist sector until after the industries developed. It is the unanticipated interaction between these two sectors that resulted in a successful electronics and computer industries in Taiwan.

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The completion of a doctoral dissertation is always an event to remember in one's career. The author's experience is no exception. This dissertation is the product of some seven years of thinking about the phenomenon of development in East Asia. In this journey, I am privileged to have met many individuals who have contributed to my personal growth and development. Although listing them all would be impossible, I am particularly indebted to my Supervisor, Professor Kenneth D. McRae, who piloted this candidate's dissertation through his meticulous and demanding efforts. His many words of encouragement and prodding, which made this exercise so fruitful is gratefully acknowledged. I am, also, indebted to Professor Teresa Rakowska-Harmstone and Professor Scott E. Bennett, both of whom aided in the refinement of this work.

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I must also extend my gratitude to my family. In particular, my wife Annabelle Cheng-Ping Tsui, who provided a congenial home for me and our daughter while I spent many hours working on the dissertation. She chose this option at the expense of a promising career with the Ministry of Education in the Republic of China on Taiwan. Cheng-Ping's family also provided much support and encouragement in Taiwan. During this process, my daughter, Carol-Anne, arrived to discover that she had to tolerate a very busy father while this project was completed.

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education in the Confucian tradition is a testament to the stability and continuity of Chinese culture even as our family transplanted themselves abroad. I would also like to acknowledge my grandfather, who did his best to perpetuate and promote the success of his clan through three generations. The honors I have, and may in the future receive through this process ought to be, in the best tradition of Chinese custom, be my ancestors and family's as well.

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Abbreviations

ADL	Arthur D. Little
AID	(United States) Agency for International Development
AIT	American Institute in Taiwan
AWSJ	Asian Wall Street Journal, Hong Kong
CEPD	Council for Economic Planning and Development
CIECD	Council for International Economic Cooperation and Development
CUSA	Council on U.S. Aid
DFI	Direct Foreign Investment
EPC	Economic Planning Council
EPZ	Export Processing Zone
ERSO	Electronics Research Service Organization
ESB	Economic Stabilization Board
GATT	General Agreement on Tariffs and Trade
GDCF	Gross Domestic Capital Formation
GDP	Gross Domestic Product
GROC	Government of the Republic of China
IDC	Industrial Development Commission
ITRI	Industrial Technology and Research Institute
JCCR	Joint Commission on Rural Reconstruction
KEPZ	Kaohsiung Export Processing Zone
KMT	Kuomintang (Nationalist Party)
LDC	Less Developed Country
MITI	Ministry of International Trade and Industry (Japan)
MNC	Multinational Corporation
MOEA	Ministry of Economic Affairs
NDP	Net Domestic Product
PRC	People's Republic of China
R&D	Research and Development
ROC	Republic of China
SRI	Stanford Research Institute
TEAMA	Taiwan Electrical Appliance Manufacturer's Association
TCA	Taiwan Computer Association
TNC	Transnational Corporation
TSDB	Taiwan Statistical Data Book, Taipei
VACRS	Vocational Assistance Commission for Retired Servicemen

List of Tables

Table	Description	Page
1.	Foreign Exchange Settlements.....	11-14
2.	Gross Domestic Product.....	58-59
3.	Comparative Statistics.....	60-61
4.	Gross National Product.....	62-63
5.	Per Capita Gross National Product.....	64-65
6.	Foreign Trade (Customs Statistics).....	66-69
7.	Comparison of Taiwan and Other Less Developed Countries.....	70
8.	Gross Domestic Product by Kind of Activity.....	66-72
9.	Agricultural Production.....	73-74
10.	Agricultural Population by Owners and Tenants.....	75-76
11.	Value of Principal Exports.....	77
12.	Output of Principal Electronic Industrial Products.....	78-81
13.	Net Revenues of All Levels of Government By Source.....	82-83
14.	Revenues of All Levels of Government By Source.....	84-85
15.	Price Indices.....	86-87
16.	Typology of State Intervention.....	97
17.	Performance of Taiwan's Electronics Industry.....	114-115
18.	Export Modes for Information Products.....	116-118
19.	Export Markets for Information Products.....	119
20.	Scale of Operation of Information Product Makers.....	120-121
21.	Major Policies to Promote the Electronics Industry.....	131

Table	Description	Page
22.	Distribution of Industrial Production By Ownership.....	167-168
23.	Private and Public Industrial Production.....	169-170
24.	Deposits of Domestic Banks by Depositor.....	171-172
25.	Loans and Discounts of Domestic Banks By Borrower.....	173-174
26.	Summary of U.S. AID (Obligation Amount).....	182-183
27.	Summary of U.S. AID (Arrival Amount).....	184
28.	Arrival Amount of AID by Industry.....	185-189
29.	Statistics on Approved Foreign Investments.....	194-195
30.	Statistics on Approved Asian Foreign Investments..	196-197
31.	Statistics on Approved Foreign Investments by Industry.....	198-199
32.	Planned vs. Actual Output in 1981.....	284-285
33.	Status on Hsinchu Science Based Industrial Park.....	289
34.	Hsinchu Science Based Industrial Park Manpower.....	290
35.	Change in Export Modes for Information Products.....	322
36.	Change in Export Modes from OEM to Proprietary Brands.....	323
37.	Number of Students Receiving Secondary, Academic and Vocational Training.....	327-328
38.	Percentage of Students Enrolled in Next Higher Level of Schools.....	329-330
39.	Number of Students by Level of Education.....	331-332
40.	Number of Students Receiving Higher Education by Discipline.....	333-334
41.	Students Returned from Abroad.....	335-336

Table	Description	Page
42.	Students Studying Abroad.....	337-340
43.	R & D Spending.....	347
44.	R & D Spending.by Source.....	348-349
45.	National R & D Spending by Type and Field of Research.....	350-352
46.	R & D Spending in Select Disciplines.....	353

To the memory of Radoslav Selucky.
He lived to see his dream become reality.

"Industrial Policy in Taiwan has worked like a vitamin pill. It did not do us much harm, but it also did not do much good."

-A Senior Official

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Chapter 1

CONTENDING THEORIES OF ECONOMIC DEVELOPMENT

The Republic of China on Taiwan¹ has successfully achieved industrialization simultaneously with high rates of economic growth, political stability and an equitable income

¹Throughout this essay, The Republic of China on Taiwan will be referred to as Taiwan. While the legitimate government of Taiwan is known as the Republic of China because of its origin as the legitimate government of China that retreated to Taiwan in 1949, at this time, they only control territory in Taiwan and a few small islands in the South China Sea. The other territory is controlled by the People's Republic of China, which also claim to be the legitimate government of Taiwan. Accordingly, in order to avoid confusion with the People's Republic of China, the proper term acceptable to the Republic of China is to refer to the government as the Republic of China on Taiwan. This is shortened to Taiwan in the balance of the thesis. Because of the movement, led primarily, though not necessarily entirely, by the opposition Democratic Progressive Party in Taiwan, to proclaim Taiwan an independent country with no claims as the legitimate government of the chinese mainland, it has been regarded by The Republic of China on Taiwan's officials as being seditious to refer to Taiwan without stating it as a province of the Republic of China. However, while the author makes no judgment on either the legitimacy or illegitimacy of the Taiwan Independence movement, nor of the claim of the Republic of China as the legitimate government of all China, the author feels it necessary to refer to the Republic of China on Taiwan simply as Taiwan for the convenience of a western audience for which this thesis is directed. The author does, however, believe that the People's Republic of China's claim to be the legitimate government of Taiwan to be somewhat doubtful as it does not have effective control over the territory. Accordingly, where the thesis refers to the Government of Taiwan, it is assumed to be a short-form of the Federal Government of the Republic of China on Taiwan and hence, confers no other political statement except to say that it is done for the benefit of a foreign audience.

distribution.² (Chan and Clark, 1989) Apparently negative factors such as a history of colonial rule, and an absence of substantial natural resources have not prevented Taiwan from developing extraordinarily successful export industries. Furthermore, this success was achieved while carrying a heavy defense burden. In other words, the industrialization of Taiwan represents an extraordinary performance to the extent that it occurred in spite of many unfavorable factors that have, rightly or wrongly, been pinpointed as being critical factors in inhibiting or retarding development elsewhere. This places Taiwan's experience at the heart of the debate about the causes of development. One central theme that runs throughout the literature on development is the appropriate role for the state. One group of theorists, known as "bureaucratic regulationists" by David Friedman (Friedman, 1988, 3) argues for the primacy of the state in promoting development. This contrasts with "market regulationists", who contend that the state promotes development by playing a neutral role in policy making.

In Taiwan, the state has clearly intervened extensively in the economy. The range of intervention in economic development

²Income distribution in Taiwan is more egalitarian than the United States and Britain. Only 37.6% of national income goes to the richest 20% of the population in Taiwan vs. 39.9% in the United States and 39.7% in Britain. The poorest 20 percent of the population receives 8.4%, 5.3% and 7% respectively. Figures in (Chan and Clark, 1990, 5).

ranges from outright direct state investment in industry to more mild measures such as industrial targeting, planning and guidance, using "carrots" and "sticks" like taxation and regulatory policy tools. Despite this contrary evidence against the ideal of a "policy neutral state", development theorists from the market regulation school have argued that the Taiwan experience is an example of efficient operation of markets with limited state intervention in the economy. (Balassa, 1981; Little, 1979) On the other hand, citing precisely this evidence of contradictory evidence, the bureaucratic regulation school argues that the operative and critical factors were precisely the extent of, and success of state intervention in this economy. (Amsden, 1985; Haggard and Cheng, 1987; Gold, 1986; Wade, 1990)³

Despite the importance of the East Asian developmental model to policy makers worldwide, sharp disagreements between theorists from these two perspectives make it challenging for policy makers to learn useful lessons from the experience of Taiwan. On a theoretical level, it would be convenient to dismiss the experience of Taiwan as the result of non-replicable circumstances. Thus, Gold argues,

³For a detailed discussion of the distinction between market regulation and bureaucratic regulation theories, see Friedman (1988, 3).

"Too many unique elements shaped Taiwan's experience to make it a viable model, but it offers several lessons worth considering by other LDCs. Taiwan's specific situation of dependency evolved through a series of unique or nonduplicable phenomena: colonization by a developmentalist, racially and culturally a similar neighbor; a postcolonial externally originating state with a developed bureaucracy, elaborated developmentalist ideology, "(Gold, 1986, 132)

but there are lessons that can be learned to enrich and enhance our existing models of economic development. This chapter will begin with a review of some of the analytical problems faced by development theory in explaining economic development in Taiwan, and then proceed to theorize as to how development theories can be adapted and applied to account for the development in Taiwan. It will conclude by suggesting that a plurality of models is necessary to understand the experience of Taiwan, and proceed to demonstrate the limitations of the bureaucratic regulation thesis in explaining the development of even as narrow a sector of the economy as two industries. Of course, culture plays a vital role in development. Taiwan is, and indeed is distinguished by its recognizably Chinese features. While it is a self evident fact that such cultural variables do affect development, western theories of development as elaborated

above have in general downplayed the role of culture in favor of market forces and the role of the state. Later in this thesis, Chapter 5 will proceed to identify some of the distinct Chinese features of industrial organization that are characteristic of the role of Chinese organizations.

Market Regulation Theories of Development

Market Regulation theories⁴ of development originated as an outgrowth of the classical liberal theories of economic development and modernization.⁵ According to Liberal theory, a competitive market economy based on private property and a limited state is the most efficient form of economic organization. Consequently, classical liberal theory argues that economic growth and modernization in the third world can be promoted by removing the economic, social and political barriers to the formation of a free market economy. (Clark, 1987) This theory originated from the liberal economic tradition. In the early 1920s, the debate was between liberal, market oriented economists and radical scholars, who advocated a centrally planned economy based on Marxist-

⁴Market Regulation Theories include: Early modernization theory based on liberal economic theory such as W.W. Rostow; (1960) more recent variants can be found in the World Bank's prescriptions for development, for example, see Little (1982).

⁵For example, see Balassa (1986) and Ho (1986).

Leninist ideas.⁶ During the 1920s and 1930s, radical economists who observed the rapid modernization of the Soviet Union under the centrally planned economy model argued that this form of ex-ante coordination is more efficient than ex-post-facto coordination through the market. While the initial success of socialism would appear to have settled the debate in favor of a planned economy, the failure of the Soviet Union to make rapid progress after a short period of successful primary industrialization, together with the rise of Stalinism and its attendant impact on the Soviet model, made radical economists re-think their belief in the efficacy of central planning. This was discredited during the thirties and forties as the Soviet Union suffered from a series of failures and reverses after an apparently initially, successful attempt at primary development.⁷ Discussing the problems of command planning, Selucky observes,

"The essence of command planning and direct control of a non-market economy from one center consists in a planning board which conveys all necessary information to the

⁶See Ehrlic, The Soviet Industrialization Debate, (1936) for a discussion of the debates between implementing a totally state controlled economy vs. a more "soft" program of socialism in the Soviet Union.

⁷For a more detailed discussion of the problem of Marx's Non-Market Model of Socialism and alternatives, see, Selucky, (1979, 43).

directed units in the form of a mandatory directive whereby it deprives the subordinated units of independent decision-making. If the central decisions are to be correct, and their implementation speedy and purposeful, the directing center must first obtain a considerable amount of information from all prospective consumers (a summary of needs) as well as from all producers (a summary of productive capacities), process it and, having made a specific decision concerning priorities, send a part of the information in the form of binding targets to the subordinated unit which is then expected to implement the decision." (Selucky, 1979, 43)

While it is theoretically possible, in reality, the prospects for this process being anything close to the ideal conditions necessary to function is relatively unlikely. Thus, centrally planned economies are doomed to inefficiency in real life. (Selucky, 1979, 43) The end of World War II brought with it the cold war and the subsequent political, as opposed to the theoretical, discrediting of supporters of Soviet central planning through the cold war. By the time of the post World War II era, the debate over development became colored by the general climate of superpower rivalry between the "capitalist" camp vs. the "socialist" camp. While radical scholars who supported the "socialist", or Soviet model, were discredited

and denounced, radical scholarship on development regrouped around the problems of development in the "third world".

In the post-war era, the debate has become a relatively settled question. Orthodoxy was, and still is, dominated by the answer offered by classical liberal economic thought: that states should play a minimalist role in economic development, because state intervention tends to be harmful to efficient market allocation of goods and services.⁸ This orthodoxy, which we will hence term the "market regulation thesis",⁹ has been fundamentally challenged from several different directions.

Many, though not all, of the states created after World War II were the product of decolonization. Except for a small number of states that established Marxist oriented centrally planned economies, the majority of them followed a "mixed economy" model. In this context of cold war competition, the success of market oriented states became an important claim of victory for the west. In this context, the dominant theory of the time, "Modernization theory", presented two themes to the

⁸The exceptions are in areas of market failure, public goods and other cases where markets fail to deliver an efficient allocation of goods and services.

⁹Friedman (1988, 3-4) outlines the basic distinction between bureaucrat and market regulation theses used through this book.

developing world. On one hand, it was a theme of optimism, promising that developing economies would rapidly progress over time to become developed economies in their own right. On the other hand, it also is realistic about the problems developing economies faced: liberal development economists saw that the price of primary commodities exported by developing economies was going to be facing declining markets and declining relative prices because the developed economies would consume proportionally less of these primary goods as they grew richer. Indeed, as substitutes for primary products develop, this problem will be exacerbated. Thus, this is likely to create a serious foreign exchange shortage during the time when the economy most needs foreign exchange to import machinery and tools to industrialize. Thus, on the external front, economists predicted developing economies were facing serious problems.¹⁰ The Taiwan case was no exception to this case: Maurice Scott, writing about Taiwan's foreign exchange situation during the years 1945-50... noted, See Table 1.

"The large balance-of-payments deficit [in 1950] nearly exhausted the government's gold and foreign exchange reserves" (Scott, 1979, 314)

¹⁰For a brief summary of this "Trade Pessimist" debate, see Todaro (1989, 449-453).

Thus, even orthodox liberal economists were supportive of measures to regulate and control foreign trade and exchange through government licensing of imports, thereby, restricting imports to essentials, and thus, reducing the drain on foreign exchange. On the other hand, development economists were optimistic about the potential for development.

TABLE 1

FOREIGN EXCHANGE SETTLEMENTS

Unit: US\$ 1,000

Period	Imports			
	Total	Import Exchange Settlements	U.S. Aid	Others
1952	206,980	115,228	89,062	2,690
1955	190,065	91,640	89,170	9,255
1956	228,225	114,360	96,486	17,379
1957	252,235	138,797	98,745	14,693
1958	232,785	127,652	82,339	22,794
1959	244,350	150,366	73,424	20,560
1960	252,216	143,233	90,892	18,091
1961	324,050	192,362	108,176	23,512
1962	327,542	224,604	80,110	22,828
1963	336,787	220,469	76,069	34,249
1964	410,401	333,967	39,670	36,764
1965	555,286	453,444	65,908	35,934
1966	601,141	505,581	34,318	61,242
1967	847,497	640,003	30,570	176,924
1968	1,025,862	837,004	19,801	169,057
1969	1,204,804	1,096,448	13,803	94,553
1970	1,527,696	1,411,331	61	116,304
1971	1,990,023	1,854,314	---	135,709
1972	2,843,288	2,617,489	---	225,799
1973	5,492,697	5,085,661	---	407,036
1974	6,171,828	5,458,880	---	712,948
1975	5,562,219	5,050,548	---	511,671
1976	7,108,813	6,650,789	---	458,024
1977	8,071,068	7,402,986	---	668,082
1978	11,323,346	10,439,625	---	883,721
1979	15,659,729	14,187,646	---	1,472,083
1980	20,610,456	18,987,932	---	1,622,524

Period	Imports			
	Total	Import Exchange Settlements	U.S. Aid	Others
1981	20,181,320	18,465,857	---	1,715,463
1982	18,614,123	16,360,579	---	2,253,544
1983	20,481,475	18,823,586	---	1,657,889
1984	22,184,866	21,272,003	---	912,863
1985	20,595,066	19,835,554	---	759,512
1986	25,045,329	24,386,266	---	659,063
1987*	15,117,600	---	---	---
1988	43,785,500	---	---	---
1989	50,579,900	---	---	---
1990	57,254,900	---	---	---

Note: Included in foreign exchange transactions since the lifting of foreign-exchange controls on July 15, 1987.

Source: TSDB (1991, 207)

FOREIGN EXCHANGE SETTLEMENTS

Unit: US\$ 1,000

Period	Exports			
	Total	Export Exchange Settlements	Others	Balance
1952	119,527	119,527	---	- 87,453
1955	133,441	133,441	---	- 56,624
1956	130,060	130,060	---	- 98,165
1957	168,506	168,506	---	- 83,729
1958	165,487	164,433	1,054	- 67,298
1959	163,708	160,540	3,168	- 80,642
1960	174,195	169,866	4,329	- 78,021
1961	218,324	214,041	4,283	- 105,726
1962	244,379	238,609	5,770	- 83,163
1963	363,467	357,524	5,943	+ 26,680
1964	469,468	463,110	6,358	+ 59,067
1965	495,813	487,959	7,854	- 59,473
1966	584,239	569,426	14,813	- 16,902
1967	675,092	649,893	25,199	- 172,405
1968	841,775	776,138	65,637	- 184,087
1969	1,110,623	1,046,591	64,032	- 94,181
1970	1,561,652	1,476,757	84,895	+ 33,956
1971	2,135,546	2,023,734	111,812	+ 145,523
1972	3,114,104	3,001,811	112,293	+ 270,816
1973	4,872,683	4,712,495	160,188	- 620,014
1974	5,697,020	5,501,938	195,082	- 474,808
1975	5,767,316	5,579,202	188,114	+ 205,097
1976	8,206,456	7,944,217	262,239	+ 1,097,643
1977	9,958,455	9,531,873	426,582	+ 1,887,387
1978	13,352,618	12,864,725	487,893	+ 2,029,272
1979	16,786,938	16,281,759	505,179	+ 1,127,209
1980	20,357,258	19,872,216	485,042	- 253,198
1981	23,148,791	22,527,651	621,140	+ 2,967,471

Period	Exports			
	Total	Export Exchange Settlements	Others	Balance
1982	22,483,920	21,827,369	656,551	+ 3,869,797
1983	25,663,784	25,088,901	574,883	+ 5,182,309
1984	30,993,423	30,386,842	606,581	+ 8,808,557
1985	31,371,355	30,858,771	512,584	+ 10,776,289
1986	40,718,363	40,060,205	658,158	+ 15,673,034
1987*	29,554,300	---	---	+ 14,439,700
1988	61,804,700	---	---	+ 18,019,200
1989	67,475,100	---	---	+ 16,895,200
1990	68,443,200	---	---	+ 11,188,300

Note: *Included in foreign exchange transactions since the lifting of foreign-exchange controls on July 15, 1987.

Source: TSDB (1991, 207)

The classic statement of this "Modernization" variant of market regulation theory by W.W. Rostow argues that there are five stages characterizing the process of modernization: traditional society, achieving pre-conditions for takeoff, takeoff, the drive towards maturity, and finally, arrival to a society of high mass consumption. (Rostow, 1965) In the second stage, the state plays a critical role by removing the traditional social and cultural barriers that inhibit capitalism. Once these pre-conditions have been achieved, the economy reaches a "takeoff" stage where self-sustained development finally becomes possible. (Rostow, 1960; Kuznets, 1965) Increased participation in the international economy leads to benefits in two major areas. On one hand, foreign aid and investment supplement the meager capital resources of capital-poor states and provide them with transfers of modern technology. (Galbraith, 1967; Vernon, 1977) Participation in the global economy also allows a developing state to reap the benefits of specialization and the exploitation of comparative advantage in trade. At this stage, import substitution is still the primary form of development. In the next stage, "drive toward maturity", growth is enhanced by transplanting obsolete industries from the developed world according to the product life cycle model. (Vernon, 1977) The further breakdown of barriers to free trade, together with the growth of the domestic market, results in increasing efficiency as import-substitution industries achieve larger scale-economies.

Ultimately, these industries reach a point where they can finally compete on the global market. Accordingly, economic growth becomes driven by Export-Oriented Industrialization (EOI), which ultimately leads the economy into the society of high mass consumption. (Rostow, 1965; Balassa, 1981)

For modernization theory, the state plays a critical role in initially breaking down traditional society. However, as economic development progresses, modernization theory believes in a gradual withdrawal of the state from center stage to the sidelines, where it should only act in a limited, non-interventionist fashion in those spheres concerning the provision of "public goods". (Rostow, 1960) Because this process of development involves substantial changes in the power structure of traditional societies, modernization theorists have also turned to the problem of maintaining political stability during these stages of development. (Huntington, 1968; Gurr, 1970) Modernization brings with it increased demands for popular participation from the population, which then have to be managed by the state in order for political stability to be maintained. Huntington's formula demonstrates a need to balance demands for popular participation with the enhancing of the capacity of institutions to accommodate such demands. (Huntington, 1968) Because such demands may increase faster than the capacity of the state to manage them, Huntington sees military or

authoritarian regimes as a means of maintaining order and stability throughout the developmental process involving the replacement of traditional forms of authority with a single secular order. (Huntington, 1968, 34) Modernization theory believes that the process of modernization can be replicated widely, providing that the "right" policy choices are made by the state. (Rostow, 1960, Balassa, 1981)

This classic model of development, however, was substantially discredited by the failure of many third world states to modernize rapidly. One strand of thought that was reinvigorated by this failure was the idea of cultural barriers.¹¹ On the other hand, the initial failure of liberal theory in Africa and Latin America led to the development of "Dependency" theory primarily based on the Latin American experience.

Dependency Theory

Dependency theory originated as a critique of modernization theory's focus on the internal processes of third world states, and focused instead on the structural characteristics of the global system that constrain and block development in

¹¹A continuation of much of the early work on Confucianism as an anti-market culture. For example, see Max Weber's discussion on how Confucianism is a barrier to modernization in China. (Weber, 1951)

the third world.¹² (Clark, 1987, 330-42) Classic dependency theory argues that the underdevelopment of the periphery is a necessary outcome of development in the center. (Wallerstein, 1978; Frank, 1969) Domination of the periphery by the center results in distorted, uneven development of peripheral economies that are based on the export of primary products and raw materials to the center, and the import of consumer and industrial goods from the center. (Frank, 1969; Wallerstein, 1974) This distortion of peripheral economies is enhanced by increased participation in the global economic system either through expanded trade or foreign investment. (Frank, 1969; Wallerstein, 1974) Classic dependency theory concludes that development in the periphery is not possible unless links with the center are severed. (Frank, 1969; Amin, 1974) Thus, from the dependency point of view, peripheral states like Taiwan are in a "no win" situation where development is simply not supposed to happen while linkages to developed economies persisted. The developments in Taiwan and other newly industrialized countries (NICs), contrary to the assumptions of these theories lead both radical and liberal theorists to rethink this perspective. This was to lead to a group of

¹²There is a clear and under-explored relationship between Latin American literature --- the heroic figure frustrated by outside forces beyond his control --- and dependency theory.

theories collectively known as bureaucratic regulation theories.

Bureaucratic Regulation Theories of Development

The "no-win" perspective of dependency theory later evolved or was modified into a variant of the bureaucratic regulation thesis. This perspective argues that industrialization at the periphery is indeed possible, but that such development will result in high levels of income inequality and increased dependency. (Warren, 1973; Cardoso and Faletto, 1979) More recent neodependency theorists have argued that the state in dependent countries possesses a degree of autonomy from both domestic and international forces. (Evans, 1979; Amsden, 1979) As a result, it has been able to obtain a degree of development through a process of alliance building between multinational, local and state capital. (Evans, 1979) Nevertheless, such development is expected to lead to authoritarianism as a means of controlling the social unrest caused by a highly skewed income distribution. Further developments of this basic theory suggest that state policies and actions can substantially enhance development. (Gold, 1986; Amsden, 1985; Haggard and Cheng, 1987)

Modernization theory, similarly, evolved into a second variant of the bureaucratic regulation thesis. (Johnson,

1978, 1984; Ozaki, 1984) A second source of bureaucratic regulation theories is authors like Chalmers Johnson (Johnson, 1980) who argued that state intervention by MITI was a critical factor in the economic development of Japan.¹³

One primary weakness in market regulation thought is, while it argues for the primacy of the market as a modern, rational and efficient allocator of resources, market regulation theories say little about how the market works and why there are such discrepancies in outcomes between seemingly similar market economies. Bureaucratic regulation theory, on the other hand, argues for the efficacy of state policy and action as the means of achieving modernization with little explication as to the precise modality of transmission of policies into outcomes. Frequently, bureaucratic regulationists will attribute all evidence of positive results in development to effective state intervention in the economy, and seek evidence of state intervention ex post facto to demonstrate the efficacy of state action without exhaustively analyzing the contribution of non-state actors responding to market forces. On the other hand, while market regulation thought tends to pay relatively little attention to the structural constraints and opportunities in the global system, bureaucratic regulation theorists, who are writing from the perspective of

¹³See Chapter 2 below for further discussion of this point.

neodependency theory, tend to emphasize structural limitations in the global system as the major factor affecting development. The problem is, while this attention to global structural forces is welcome, whether such structural factors actually exist or are operative in a particular case is often left unexplored empirically. Therefore, while both perspectives offer interesting macro-level approaches, their ability to explain the success or failure of particular industries, or particular firms, is far from satisfactory. It is not surprising that in the absence of detailed empirical data, the disagreements between these two perspectives revolve around an ideological debate over the correct scope of state action, rather than a debate around the possibilities open to feasible or practical state or market action by any particular country or firm.

There is no reason to believe that either the bureaucratic regulation or market regulation perspective alone is sufficient to explain Taiwan's success. Empirically, there is evidence to support the position of either perspective. The real question is whether the empirical evidence is mutually exclusive, as one would assume from the drastically different theoretical perspectives, resulting in a clear cut case for or against which cannot easily co-exist. The evidence would argue to the contrary. Not even the most radical bureaucratic regulation theorist would argue that macro economic policy

does not affect the decision making of firms. Similarly, only the most dogmatic market regulation theorist would deny that the KMT regime has played a key role in fostering development through direct state intervention in the economy.

Meta Theories

A fundamental problem with both the bureaucratic and market regulation perspective is that they are both meta theories. That is to say, these theories are developed as general theories of development;¹⁴ as such, they are presumed to be applicable to any state. This is only possible by making a series of simplifications theoretically. The first theoretical simplification is to make states, or industries, the appropriate level of analysis. Accordingly, countries are only different in the sense that they are at different stages of development in the case of market regulation theories, or alternatively, for bureaucratic regulation theories, in how they can develop into becoming a mirror image of the ideal "developed" economy: the United States. Thus, while they

¹⁴The definition of what is development in these theories is itself interesting. Whereas both the market and bureaucratic regulation perspectives agree that at the center of development is the idea of sustained growth in national product, they differ in that dependency theory, or its modern version in bureaucratic regulation theory, believes that development has to lead to a balanced, holistic economy that is not "distorted". For a discussion of this point, see Clark (1990, 13-43).

claim radically different lineages ideologically, it is striking how similar both perspectives are in terms of their thinking on their vision of industrial development. Second, both theories believe, implicitly, that a developed economy will have a factory mode of production based on mass production.¹⁵ Such industries are assumed to both look and work like their counterparts in the ideal model. It is this assumption of industrial convergence that makes it possible for the theories to carry out comparative analysis. Convergence is much more than an assumption about similarities. Lane defines convergence as,

"a process by which heterogeneous cultures, characterizing different societies, develop and change in the direction of greater likeness one to another until eventually they adopt similar arrangements for the performance of important social functions." (Lane, 1978, 54)¹⁶

The assumption that all developed societies ought to share similarities in their productive processes and enterprises

¹⁵The implications of this are discussed further below.

¹⁶David Lane, however, cautions about convergence being just a simple phenomenon. He cites seven different conceptual possibilities of convergence just from a two country comparison. (Lane, 1978, 55)

then makes it possible for meaningful cross sectional analysis to be done. In other words, culture is regarded to be an extraneous variable and not thought to influence how different societies may adopt the same technology. This convergence assumption is important to meta theories in that they make macro-level comparative studies not only possible, but relatively simple to carry out by making several simplifying assumptions.

Thematically, convergence can be observed in at least three areas: First industrial convergence, where firms everywhere are presumed to face the same costs, constraints and economies of scale;¹⁷ second societal convergence, where societies and social organizations are presumed to face similar problems, which lead them to make similar rational choices that, in turn, force them to go through similar stages in development in the case of modernization theory, or face similar circumstances of exploitation in the case of peripheral economies for dependency theory; third, both theories also share a view of economic convergence where economies are presumed to respond similarly to incentives, regulations and competition.

¹⁷Friedman, (1988, 3).

The problem of convergence is critical for comparative analysis of economic development for a number of reasons. First, one strand of literature outside these two schools argues that meaningful comparative work between Taiwan and other countries is not possible because Taiwan contains unique factors that are primarily cultural. This line of criticism originated from the area studies perspective, which stressed factors such as Chinese culture, family-based entrepreneurship, overseas education and the uniqueness of the industrial structure of Taiwan as being important in explaining Taiwan's success. (Pye, 1985; Fei, 1986; Greenhalgh, 1988) These factors, are unquestionably operative in Taiwan. Yet alone they do not provide a satisfactory explanation in a number of ways. First, it is difficult to argue that these factors are sufficient. They still have to be made operative across economic institutions. Second, states with relatively similar cultures have had drastically different trajectory and paths of economic development. Perhaps the most striking example is that of Taiwan and the People's Republic of China.¹⁸ Here, two states shared a similar culture initially, yet, over a period of time, it is

¹⁸Or, North and South Korea, East Germany and West Germany, etc. Although in each of these cases, it is possible to discern characteristics that distinguish similarities between Korean "socialism" and "capitalism" from its counterparts, their economic and political organization do fundamentally alter their social structure. For an excellent discussion of how Chinese culture has profoundly affected "socialism", see Pye, 1988.

clear that economic and political institutions were critical in determining the different outcomes between these states. Thus, while cultural explanations offer a useful path of inquiry, it must be used as a part, rather than a sufficient explanation to explain the outcome in any state. One way of looking at this issue is to suggest that cultural issues are operative not only at the state level, but at the level of individuals and sub-state organizations. This leads us to the problem that neither the bureaucratic nor market regulation thesis offers much insight at the sub-state level.

The Problem of Level of Analysis

Bureaucratic regulation and market regulationist theories of development are both primarily concerned with the appropriate role of the state. Market regulation theory argues for a limited role of the state in economic management once a state has accomplished the task of undercutting traditional elites. (Clark, 1986) On the other hand, bureaucratic regulation theory suggests that state intervention can positively affect industrial development. (Johnson, 1978; Amsden, 1985) Both market and bureaucratic regulation theories are abstract, schematic theories that provide analysis and explanations at the state level. Market regulation theorists do so by stressing the importance of the state in opening up markets and "getting the prices right" to permit agents to rationally

respond to prices. One difficulty with market regulation theories is that their focus on economic policy making at the macro level leaves us ill informed as to the precise means through which economic actors are responding to market signals. In addition, many market regulation theories overlook and underestimate the significance of clear cases of state intervention in the economy. (Balassa, 1984) This shortcoming is partially addressed by bureaucratic regulationists.

Bureaucratic regulation theorists concentrate on the importance of state policies and action in playing a leading role in development. By doing so, they make an important contribution to understanding development through the analysis of a key actor: the state. Although the state is a key actor, state interest, autonomy and action being key variables are not in themselves a sufficient explanation for successful development. Many bureaucratic regulationists overlook this and go so far as to attribute, without clear evidence, all developmental outcomes to state interest and action. (Clark and Lemco; 1988) By doing so, they are able to explain development through analyzing the politics behind state action through a backward reconstruction of state interests interacting with domestic and international capital. (Amsden, 1985) This form of backward theorization raises questions of whether "interests" are logical creations -- as opposed to

policy martingales -- which can be reconstructed. (March and Olsen, 1984) Second, the very nature of reconstruction of state interest and action is hazardous from a methodological perspective. In later chapters, I will demonstrate that this is precisely how bureaucrats have written their official "histories" for many investigators.

Even abstracting from the problem of reconstruction of state interests, the difficulties of using state interests in explaining all outcome is evident in Amsden's analysis of Taiwan's development. (Amsden, 1985, 99-101) She was concerned with the puzzle of the turn of the (KMT) regime toward an export-led growth strategy that increased Taiwan's vulnerability to foreign supply and demand when the state policy has historically been guided by autarkic considerations. Amsden tried to explain this discrepancy by suggesting that the change reflected changing perceptions of state interests in relation to international constraints. (Amsden, 1985, 100) This mode of explanation assumes that the state policy making and action is entirely coherent and rational. If we were to break down the state's domain and scope of action into policy areas that are effective vs. other policy areas where state policy is relatively ineffective or even negative, then it is possible to construct many areas where state action is of negligible consequence, simultaneously existing within a state which is heavily

interventionist. This "breaking down" of the state's domain and scope of action then permits the co-existence of alternative explanations that argue the state in Taiwan has played a limited role in the development of export-oriented industrialization by indigenous firms in Taiwan. (Lam, 1988) An explanation that assumes state interest is the primary and only explanation would automatically rule out this line of inquiry.

Bureaucratic regulation explanations are problematical in another way. They presume a priori that the state has the coherence to formulate clear strategic directives that can be implemented through, and translated into action by private firms.¹⁹ This presumption begs the question of the degree of state power over private firms, which can be answered only at a lower level of abstraction than the level of state policies. Yet this issue of how policies are translated into outcomes is often neglected in studies of state policy.²⁰

The need to address questions of whether state policies and action can be translated into outcomes by individuals and

¹⁹Friedman, (1988, 9) makes an effective critique of the statist theory's presumption that state policy is effectively translated into outcomes.

²⁰An example of this assumption is Wade's characterization of state action and outcomes. See Wade, (1990, 95).

firms within the state leads analysts to descend to lower levels of abstraction. The most ready way to do so is to analyze state policies toward specific industries and then assess the effect of the policies at the firm level. As one descends from the state level of analysis, the mirage of consistently effective state strategies and action dissolves. The KMT state's image of a successful developmental state breaks down once the extent of policy failures becomes evident. Thus, writing about the failure of state policies toward Taiwan's automobile industry, Arnold observes:

"The failure of Taiwan's auto industrial policy to attain a comparative advantage in automobiles raises much broader questions still... If Taiwan's economic bureaucracy lacked technical expertise for the automobile industry, then why are the same bureaucrats seemingly doing well in electronics and computers?" (Arnold, 1989, 208)

Accordingly, the translation of state policies and actions into outcomes -- taken for granted by many bureaucratic regulationists -- is not clear cut. Apparent successes in one policy area may be countered by clear failures in others. State policy-making is a process fraught with difficulties of formulation, implementation and compliance by individuals and firms. Posing the question in this manner raises further

issues. Once questions are raised at the sub- state level, it leads rapidly to the analysis of specific firms that are key players in the industry. Where a few large or key players dominate the industry, no explanations of their industry's success or failure can be written without reference to their firm's strategies, capabilities and internal resources in relation to their domestic and international competitors. In other words, an analysis of the success of an industry of a few firms requires an understanding of their business and their business strategy. Factors such as their internal organization and business culture also become important.²¹ (March and Olsen, 1984) Indeed, it is critical to analyze the motivations and goals of individual players where such players are critical to the extent that their actions alter the path and direction of their firms, and by that, the path of industries. This degree of detail is rarely incorporated into most studies of industrial policy. In later chapters, I will demonstrate how there are, indeed, many critical individuals whose individual contributions and motivations are necessary

²¹Given the narrowness of many industries, such explanations rapidly lead to discussions of the contributions and career path of key individuals. For example, a clear exception to the norm of poorly managed state owned industries in Taiwan is China Steel Corporation. This is one of the most successful enterprises in Taiwan, public or private. Its success can largely be attributed to Chao Yao-Tung's expert management during his tenure as managing director between 1971- 78. He also enjoyed the trust and confidence of Premier Sun and many other high ranking officials, who implemented strict protectionist policies to ensure his success.

for a comprehensive explanation of the outcomes in an industry.

Micro level analysis of state policies is interesting for another reason. At the macro level, state policies are implicitly presumed to have a uniform cost / benefit impact on all players in an industry. Discussions of the benefits of state policies on development obscure other equally important distributional questions. If firms within an economy are not equally or proportionally affected by state policies, then the question of which individual or groups of firms benefit disproportionately at the expense of other groups becomes an important issue. Without such analysis, facile belief that state policies are carried out in the general interest of development obscures the fact that there are in fact winners and losers in any state action. Should spoils or costs be disproportionately distributed to one class or group of individuals or firms within a state, apparently altruistic state action could just as easily be viewed as the expression of particular interests. This brings us to a central problem with bureaucratic regulationist theories. The very idea that a bureaucracy, "the economic general staff", in the words of Chalmers Johnson, or "the autonomous state" (Haggard, 1987, 86) that are detached from societal interests, which are presumed to be selfish, profit oriented, and counter to development, are somehow better than market forces at

development, as Professor Pye observes, is a denial of Harold Lasswell's idea that "the motivating forces driving Political Man are private motives that are displaced onto public institutions and rationalized as being in the public interest". (Pye, 1988, 2)²² By doing so, the discussions of state policies,

"give(s) an antiseptic view of the Chinese as mere pursuers of rationalistic policies, devoid of all the human elements of ambition, aggression, jealousy, pride, charity, dedication, pretension, scheming, fantasy, earnestness, frivolity, and general tomfoolery that, together with innumerable other passions and moods, produce the rich mixtures that fuel politics in civilized countries" (Pye, 1988, 2)

Without a detailed analysis of the distribution of cost / benefits for each policy, no state policy can be assumed to benefit all equally. At this level state import substitution policies such as the protectionist referral system -- which requires importers to prove that domestic suppliers cannot meet the demand as a condition for obtaining an import license -- proclaimed as the key to Taiwan's industrial development by

²²Pye (1988, 2) continues this discussion as to how chinese culture is the key to producing a richer, more varied understanding of chinese politics.

Wade (1988, 50), begs the question of who and which firms benefit from protection and whether such protection is not what it appears to be: an expression of particular interests. Bureaucratic regulationists rarely address the question of who pays for the cost of such protectionist measures at the micro level. Indeed, later in the study, I will demonstrate that this micro examination will show that while some individuals did act for "altruistic" reasons, there are also many other players who acted for "self-interest" reasons in formulating policy. Without micro level analysis of these actions, it is impossible to answer the question of whether a "developmental state" as such is the primary causal factor in explaining development.

The broadening of analysis from the level of the state to societal levels permits another line of questioning. Market and bureaucratic regulation theories are grand theories that are presumed to apply to all states across space and time. For this to be valid, it is necessary to make assumptions about the functional similarities of industries in all economies. Entirely apart from the level of analysis problems cited above, there is a question as to whether it is fair or reasonable to assume that industries, even those in similar businesses, can be directly and effectively compared across different countries and over time in gauging their "success" or failure. This critical theoretical problem is glossed over

in the debate between bureaucratic and market regulation theories. In effect, there are many convergence assumptions in development theory. (Friedman, 1988, 9)

The Consequence of Convergence Theses in Comparative Analysis

As we have noted above, bureaucratic and market regulation theories are premised on the assumption that all industries across different states are similar. Thus, industries are believed to face the same opportunities, constraints and costs everywhere. If an industry is successful in one place and not another, it is presumed, a priori, that the successful industry is a more efficient, lower-cost producer. The idea that comparative advantage is a sufficient thesis to explain industrial success is problematic. The factors that add up to the comparative advantage model (labor rates, capital cost, superior techniques, protection or subsidies) are not sufficient, in and of themselves, or taken together, to provide a convincing explanation. In many crude studies, differences in factor costs are presumed to be sufficient to explain the competitiveness of any nation's industries.

Lower costs are most often presumed to be achieved through low labor or capital costs. While wage rates in Taiwan are lower than in comparable developed countries, they are not low compared with those in other developing states. Indeed, if

low wages are the primary explanation for Taiwan's success, then why are not even lower-wage countries such as India, Indonesia, Mainland China, or Thailand more industrialized or faster growing?²³ Two problems exist here: First, it is implicitly assumed in, e.g. Amsden (1985) that wage rates are different for identically productive workers. This is clearly a dangerous assumption to make when comparing across countries. Without a detailed empirical measure to prove this, comparative wage rates used by Amsden say nothing about costs stated in output per man hour, which is a measure of productivity. Second, there is a problem of the fallacy of composition. Looking just at the ostensibly low wage rates paid for unskilled labor in Taiwan leads to neglect of the fact that skilled labor can be more expensive than in developed countries. Such fallacies of composition conceal cases where low wages for unskilled laborers produce savings in labor cost that are entirely wiped out by the high cost of senior management or the cost of operating a firm in a hostile environment. Taking these two caveats, it is fair to say that simple comparisons of wages as a way of determining a country's competitiveness is both theoretically suspect as well as practically meaningless. Similarly, the cost of capital is not obviously less in Taiwan compared to other

²³See comparative data in Chapter 2 for comparisons. Taiwan's growth rate is the fastest of any country in this group.

states. Even if it was, it is subject to the same two problems cited above for comparing labor costs: It requires a capital productivity index and an assumption of homogeneity built into it to make comparisons between other countries meaningful. The consequence of these caveats is that the idea that low labor and capital costs alone sufficient to explain the economic development of these two states is sadly wanting.

Subsidies and protection can be additional explanatory variables. While some industries are subsidized and protected in these two states, the benefits of protection to local industry must be disaggregated. The disaggregation of benefits from protectionism shows a very mixed picture. Although Taiwan heavily protects many industries -- particularly large, state-owned industries -- for small- to medium-scale export-oriented firms that rely on these industries for inputs, such protection represents an added cost and a barrier to achieving a lower cost structure relative to an identical firm in other states such as Hongkong.²⁴ An explanation of industry success from

²⁴There is a duty remission program for goods exported. However, applying for a remission still involves considerable delay, documenting a company's output, etc., all of which costs time while not helping a small business's cash flow. In some of the interviews conducted with small entrepreneurs, they have commented that when they were very small businesses just beginning, for a variety of reasons primarily to do with tax evasion, they often do not have the time to bother to apply for such rebates until they reach a point in their

protectionism and subsidies at the macro level can explain only the success of the particular firm or group of firms being protected. It cannot explain the success of other firms that are forced to rely on higher-cost inputs. Thus, at the micro level, factors that explain success for one group of firms can just as readily be used to explain the inability of another group of firms to be competitive.

Finally, another common mode of explanation is differences in technology. The idea that firms in Taiwan possess superior low-cost technology is questionable. Firms in Taiwan, with rare exceptions, are primarily using either existing or obsolete technology not fundamentally different from what is available to any firm on the international technology market. Friedman, writing about the rise of Japan's machine tool industry, observed that "compelling evidence existed that Japanese successes were based on a refining of techniques common to producers everywhere". (Friedman, 1989, 9-10) There is no evidence that Taiwan has access to superior techniques that can explain the competitiveness of its firms. Indeed, for much of the past thirty years, few of the small-to medium-sized firms that dominate the export industries have

business where they can no longer easily conceal their output from the state's tax collectors. Interview Q.

invested significant sums in research and development.²⁵ Almost all are technologically backward and heavily dependent on imports of technology from Japan and the United States until they "matured" sufficiently to invest in technology on their own.

The implications of disaggregated analysis at the level of individual firms is a clear caution against generalization. Developmental theorists who uncritically compare macro factors across space rely on convergence theses that may not stand up to scrutiny at the micro level. Therefore, suggestions that advantages in macro factors such as low labor costs or low capital costs; or state policies of protectionism, subsidies and the possession of superior technology by firms in Taiwan are responsible for its economic growth, are speculative without a detailed study of how these factors combine together to affect firms behavior at the micro level. In this respect, comparative economic analysis of categories in neoclassical economic theory have failed to provide a sufficient explanation of the development of Taiwan.

²⁵An exception is the new businesses beginning in the government subsidized and sponsored "high tech" development programs in Taiwan. However, this is a relatively recent phenomenon that cannot explain the origins of the industries prior to their arrival.

On the other hand, theories that emphasize meso-societal factors such as education, respect for authority or Confucianism, while providing a welcome relief from the implied convergence theory straitjacket, are incomplete accounts of how these two economies are succeeding. Notwithstanding the comment above with respect to the drastically different outcomes in economies with similar cultures but different economic and political institutions, there is another problem of aggregation even within a economy. If confucianism and education are meso-societal factors that operate broadly across the entire economy, then why are there such discrepancies in the performance of firms within those economies? Taiwan is populated by firms that are chronic under-performers despite heavy protectionism or subsidies. Unless one is to hypothesize that meso-societal factors have an uneven impact on society and also provide a theory of how and why there are uneven distributions of benefits, it would be difficult to use them in and of themselves to explain the economy's success. The critical variable absent is an account of how culture interacts with firm level organization.²⁶ Overall, macro sociological analysis, while theoretically interesting, tells us very little about why particular firms or industries are successful.

²⁶Silin (1978) does this for large scale firms in Taiwan. But such studies of firm level behavior at the micro level are still rare.

The problems of explaining industrial success in Taiwan can largely be attributed to the fact that models of international trade, from which the idea of comparative advantage is derived, are premised on perfect competition in international trade and within states. Where imperfect competition exists, such comparisons are seriously flawed even without the problems noted above. The impact of imperfect competition on firms is, again, a problem that needs to be addressed at the micro level. While it is necessary to descend from macro economic or sociological analysis to micro analysis, the descent is not without convergence problems of its own.

One common technique to descend from high levels of abstraction to more in- depth analysis is through industry-specific studies. Arnold's study of the automobile industry is an excellent example. Other writers have attempted to descend through studies of specific policy initiatives. (Noble, 1987) The difficulty with industry-specific studies derives from the very nature of how industries are defined. Many formal studies of industries in the western world rely on the classification system known as the Standard Industrial Classification (SIC) system, which is itself a product of the need for economic statistics in the 30s and 40s in the United States. At that time the classification system reasonably accurately reflected existing industrial organization in America. In the years since the SIC system became in-

stitutionalized, even industry in the United States has changed. However, the computer industry is still classed under a sub-category of "Electrical Products," while the services sector, despite its growing importance and contribution to the creation of wealth, is regarded as a subsidiary to sectors engaging in commodity production.²⁷ Thus, the SIC classification system, although a powerful institutional force in the western world, does not even accurately reflect industrial organization in the United States today. However, it still is a powerful force for organizing industry. Thus, numerous studies rely on this and blindly use comparative data derived from these classification systems with little thought to the validity of the system. The exception to this is the business literature, which has accepted a widely divergent classification system of industries on the general principle of whatever is "acceptable and convenient" to any group of individuals. The consequence of this is that the numerous studies produced by this effort have incommensurate industry classifications that make cross national, or even cross sectional analysis difficult.²⁸ Inasmuch as this form of industry classification is difficult, the idea of an industry is still a valid and useful category

²⁷The SIC was scheduled to be updated last year, but the item was eliminated from the US budget owing to cutbacks.

²⁸See Porter (1991) as an example of this type of ad hoc classification of industries.

in analyzing industries in the western world because here it is treated as an institution.²⁹ It is such a powerful force that many individuals and firms would define their business and their careers in relation to an industry. This is not to suggest that western firms do not enter each other's industries. It is just that, for example, if a bank entered the aircraft industry, it would be regarded as an inexperienced player in a foreign business. So ingrained is the idea of classification of industries that western analysts of Taiwan almost unconsciously and uncritically apply the concepts of industry to them without ever considering whether there are fundamental problems with the applicability of the system. Later, it will be demonstrated that many so-called industries in Taiwan do not fit this model.

Convergence assumptions about firms also abound from the implied notion that there is one ideal business strategy for all firms. Thus, all firms are presumed to be profit-maximizing, low-cost seekers. Friedman, commenting on the difficulties of comparing Japanese and American firms, argued:

"... even a cursory comparison of Japan with the United States, its principal competitor, indicates basic

²⁹In numerous discussions with Western business leaders, the author was continually struck by how firmly Western executives see themselves as players in a specific industry, though not necessarily an SIC classification industry.

problems with the assumption that all economies are basically the same everywhere.... the structure of its manufacturing industries appears to have broadly diverged from that of the United States. Japanese production increasingly took place in smaller firms ... (while) ... In the United States, by contrast, the number of small firms stabilized as the largest producers employed most of the work force... Such evidence casts doubt on the notion that efficiency gains alone were the key to Japanese development." (Friedman, 1989, 9-10)

Friedman goes on to argue that Japanese firms have pursued a strategy of flexible manufacturing as opposed to cost minimization through achieving maximum economies of scale. Similarly, theorists who attribute the success of Taiwan's export industries to the open market, which exposes these industries to international competition, are confronted by contradictory empirical evidence. Most export industries in Taiwan are small- to medium-sized firms, which are likely to have the least success at achieving large-scale economies. Taiwan's industries have been protected. They are characterized by family-based entrepreneurship, piece-oriented capital ownership, extensive linkages to developed market economies via networks of overseas relatives and unintended transfer of technology from multinational corporations through former employees and former overseas students.

Ultimately, this discussion suggests the phenomenon of successful industrialization in Taiwan is far more complex than conventional development theories can account for. To tackle the problem seriously, a research program must look beyond the traditional, limited focus on economic factors, state action and politics, and go to lower levels of analysis, be it firms, individuals or industries. In order to do so, existing analytical categories and implicit convergence assumptions about firms and industries need to be clearly articulated and tested against the empirical experience of business in Taiwan.

Mixed Evidence

The inability of existing theory to explain Taiwan's development adequately is not cause to reject accumulated theories in order to develop an entirely new "indigenous" explanation. Such a step would have the same flaw of overgeneralization that existing theories of development have been accused of. Taiwan's development experience suggests that bureaucratic and market regulation theories as well as indigenous factor theories can contribute to an explanation. The real problem with these theories is how to reconcile the evidence to support all three vignettes at the same time. In the case of Taiwan, it would be a trying exercise for any theorist to deny that the state has intervened extensively in

the economy. Moreover, no matter how non-interventionist the state has been, it still must be primarily responsible for the relative peace and stability that are essential to any economic system's viability over the long term. At the same time, no bureaucratic regulationists could credibly deny the reality of a system of private property, the primacy of market relations and market forces and the importance of comparatively high levels of economic freedom enjoyed by the citizens of Taiwan. Given this mixed evidence, the suggestion that any single theory can adequately explain the success of Taiwan would be ambitious. The question is how these competing theories -- all of which have some partial empirical support -- can be used to explain economic development.

Toward a Sectorial Approach

The debate over the causes of development in Taiwan has treated states as a logical unit of analysis. Therefore, in comparative studies of industrialization, it is assumed, either implicitly or explicitly, that explanations must be consistently valid within one set of national boundaries. At a minimum, it is presumed that one explanation is the leading explanation while others are subsidiary within one state. Political borders, therefore, serve as an acceptable and convenient means of delimiting cases across time. The method is not entirely without justification. Within a single national boundary, in most states, it is common to find a central authority that exercises a unitary set of domestic and international trade policies.³⁰ At the same time, the application of states as the unit of analysis obscures critical differences within states. In making the descent from the state level of analysis, we are faced with other theoretical problems. On what basis do we descend from the state level? Should it be done on the basis of industries, an approach that is itself laden with convergence assumptions? Or should it be done in some other way? One critical problem with sub-state analysis is the fact that there is reasonable

³⁰In the case of Mainland China, an assumption of unitary domestic and international trade policies would be incorrect because of differences in regional policies.

evidence to support all three perspectives noted above. The interesting theoretical question is whether it is in fact a blending of these perspectives, which brings with it the need to reconcile competing theoretical assumptions, or some other form of integration that can retain the insights of all three without the difficulty of reconciling them.

Conventional developmental theories have treated economies as relatively homogeneous entities within state boundaries. Within a specific national border, a state is presumed to be a heterogeneous unit that can be analyzed as a whole in relation to its relationship with the global economy. Thus, market regulationist economists speak of a state's comparative advantage and the openness of its markets relative to the world economy. International competitiveness is discussed in terms of the relative efficiencies of its firms relative to "world class" industries. (Balassa, 1981) It is presumed that industries that are internationally competitive are so as a result of exposure to the forces of the world market, which, over time, eliminates inefficient industries. In much the same way, bureaucratic regulation theorists assume a priori that efficient industries exist, except that they argue it is the result of state policies and action. The suggestion that one industry or firm in one country is more efficient than a comparable firm or industry in another country is speculative without a detailed analysis of the cost structure of each

firm, taking into account any significant direct or indirect subsidies enjoyed by each firm. Only at the firm level is it meaningful to assess and evaluate the effect of market forces vs. bureaucratic regulation forces. Unfortunately, few developmental economists bother to do such micro comparisons at the firm level. One reason for this negligence is that such comparisons are inherently difficult. To conduct such comparisons, substantial convergence assumptions about the behavior of firms, the skills and techniques available to them, etc., have to be made. A second reason, once comparisons are made at this level, it becomes necessary to consider micro factors such as the business strategy of individual firms or individuals. By confining the analysis to the state or industry level, these problems are assumed away. The implied homogeneity found in theoretical models rapidly falls apart once we start theorizing at the firm level.

The problem with firm-level analysis then becomes one of how we can descend to a lower level of abstraction from the state level and, at the same time, not become completely bogged down in details about numerous firms. To solve this problem, we begin by making an assumption that the economy is not homogeneous. Different sectors of the economy can, at any given moment, face substantially different degrees of exposure to international competition, be exposed to different cost structures within a state, and have different opportunities in

different markets. However, beyond these basic factors, there exist what are best termed discrete islands of economic activity that may have few linkages to the local economy or to other parts of the economy beyond this. The logic behind each grouping of firms may be drastically different, and, furthermore, the rationale behind them may change over time, leading to a continually changing pattern of economic expansion and contraction of these sectors. These economic sectors are largely independent of each other. They may occupy the same space, draw on a common pool of labor and coexist within a single state. But their underlying business rationale, or their networks of production and exchange relationships are not necessarily "tightly coupled" to each other, but potentially only "loosely coupled". Therefore, where necessary, they need to be understood separately as islands of economic activity, each with its own logic or business rationale.

What is proposed here is to take a sample of firms from each economy and attempt to group them in relation to the dominant underlying rationale behind their existence. The rationale may be found in terms of state policies, market forces or other factors. In this way, it is possible to build a more sophisticated model of the economy that avoids the pitfalls of overgeneralization while avoiding the problem of being mired in individual cases. After these sectors are identified, the

basis for a meaningful evaluation of the contributions of state policies, bureaucratic regulation or other forces to each sector can be established. Only then can we begin to pose the question of whether the aggregate effects of state or market forces are legitimate causal factors for the economic success of Taiwan through an assessment of the explanatory power of each theory in aggregate. The approach suggested here is not new. Paradoxically, at the state level of analysis, development theorists have no difficulty accepting the idea that different states can coexist in a single global system while pursuing different economic strategies. This begs the question of why different sectors of the economy within a given state cannot, at a given time, be driven by different rationales.

The recognition that there may be several phenomena at the sub-state level brings with it other problems. First, there is the important question of how to go about developing useful categories. Second, once different sectors of economic activity are identified, an interesting question is how these sectors are related to each other and to what extent they are independent of each other. The interactions between them, intended consequences and unintended outcomes become important issues. In the following chapters, I will outline the range of state policies used by Taiwan's KMT regime in promoting industrialization in the computer and electronics sector.

This will then be followed by an assessment of different islands of economic activity where such policy has had a variety of impacts ranging from negative to positive.

The identification of different sectors permits the next step to be taken, which is to theorize how these sectors' contributions to economic growth changed over time. The next step will be to theorize as to how interactions between these sectors have contributed to or hindered economic development. By recognizing that there are several phenomena operative in the economic development of Taiwan, the debates over the primacy of bureaucratic vs. market regulation can be understood in the overall context.

Summary

The theoretical treatments of development pursued to explain the phenomenon began life as meta-theories. Modernization theory, being the "optimistic" version, has failed to satisfy its critics as being sufficient to explain the inadequacies of development in many states. On the other hand, dependency, both in its classical form and its modern version, has failed to account for the success of a variety of third world states in development. Statist oriented theories that advocate bureaucratic regulation, on the other hand, have failed to make a convincing case for several reasons: First, their

claim that state action leads to development is a meta theory that is carried out at a high level of abstraction. It is, thus, another theory that is limited in its ability to account for the cultural distinctiveness of the Taiwan industrialization experience. In particular, in order to make comparisons useful, they have to resort to many macro analytical categories such as comparative data on wages, productivity and capital costs, which are not useful in explaining how particular firms or groups of firms become competitive in particular industry segments. Furthermore, being conducted at the level of analysis of nations and industries, their basis in empirical evidence is limited. The discussion of particular policy initiatives that led to a certain outcome often fails to consider the role of politics and interests in policy formulation, and more importantly, in many cases, the official record of policies is taken uncritically. Chapter 2 is a particular examination of the case of Taiwan's development experience. Chapter 3 is an examination of the origins of the electronics industry in terms of state policies and how it interacted with firm level actions. Chapter 4 is a look at how the state fostered industries evolved in tandem with state policies. It will demonstrate that the interest of individual players in the policy making arena is critical to understanding how policy is formulated. Chapter 5 makes the case that while state policies do have an impact, often their impact is limited and relegated to an "island" of an outcome

in the industry. It will then look at some of the non-policy oriented forces that shaped the development of industry. Finally, Chapter 6 argues that it is the fusion of developments in the policy driven sector and the market driven sectors that result in the success of Taiwan's computer and electronics industries.

Chapter 2

IMPLICATIONS OF TAIWAN'S DEVELOPMENT FOR DEVELOPMENT THEORY

Introduction

Taiwan occupies a central place in the debate over development. It is important because of its status as one of four East Asian NICs that has maintained a high rate of economic development in the post-war period. See Tables 2, 4. While other nations in Latin America and Africa stagnated, Taiwan has succeeded in maintaining an average rate of economic growth of 8.8% from 1953 to 1990. (TSDB, 1991, 27) See Tables 3, 4. Its official³¹ per capita income of US\$

³¹The official estimate of GNP has been the subject of considerable controversy. The reason is the government's acknowledgement that there are substantial amounts of black market activity that have not been recorded. For example, in an interview with a high ranking official responsible for statistics (Interview F), he stated that his own estimate is that the black market accounts for about 15% more than the official figures. However, discussions with businessmen suggest that this figure can be higher because of widespread under-reporting of income. Government statistics are subjected to manipulation in a number of ways. For example, "transfer pricing" was used by exporters for much of the 1970s and early 1980s to siphon profits from the economy into US dollars. At that time, the supply of dollars was strictly controlled through government banks, which maintained an artificially low exchange rate. Similarly, a large underground economy, including illegal investment houses, etc. exists in Taiwan for which no reliable statistics are available. During the booming years of the mid-1980s, the author received estimates that the actual figure of GDP is considerably higher. See Lam (1989).

7,997 in 1990 (TSDB, 1991, 29) ranks Taiwan among one of the wealthiest of the middle income countries. See Table 4, 5. Moreover, this increase in economic output was not due to exploitation of natural resources.³² It was initially based on agriculture, then gradually shifted to import substitution industries in the 1950s, to export oriented industries in the 1960s and 1970s. See Tables 6, 7, 8, 9. Accordingly, the economy underwent a process of gradual structural change as output from agriculture to manufacturing. See Table 10. By 1960, output of manufacturing equaled agriculture and since then, surpassed it. (TSDB, 1991, 41) This progress was achieved with a trade surplus since 1976 (TSDB, 1991, 208). See Table 6. Government management of the economy was also uniformly healthy. The government ran surpluses for 15 out of 27 years from 1964.³³ See Tables 13, 14. Inflation, the old scourge of the KMT on the mainland, was kept to a rate of 6.4%

³²For example, the oil rich economies were able to increase their country's welfare by purchasing goods and services with their oil revenues. However, except for Mexico, by and large, third world economies that became wealthy primarily as a result of oil wealth have not developed extensive export oriented manufacturing economies.

³³The figure here is for "real" surplus, which excludes revenue contributions from bond sales, borrowings and withdraws from budget surpluses accumulated from previous years. See TSDB, (1991, 167-68) notes for method of calculation.

from 1953 to 1990.³⁴ See Table 15. The economy has also not achieved progress at the expense of social disorder. Taiwan's income distribution, as measured by the GINI coefficient, has improved from 1953's figure of .558 to .303 in 1980.³⁵ Living standards also improved, with an average life expectancy of 73 years in 1986 (Chan and Clark, 1986, 6) See Table 3. In other words, in every way, one can say that life in Taiwan has improved for the better since the defeated Nationalists arrived in 1949. The purpose of this chapter is to first set the record of Taiwan's achievement in the perspective of the performance of other NICs. This will then be followed with a detailed look at how industrialization has transformed Taiwan from a agrarian economy to a manufac'g economy, and in particular, a high-technology manufacturing economy. Finally, the chapter will end with a synopsis of how different perspectives have tried to explain this relative success.

³⁴TSDB (1991, 181). Note their calculation was based on three periods: 1953-70, average consumer price index increase: 6.1%, 1971-80, 10.4%, 1981-90, 3.1%.

³⁵The GINI coefficient is a measure of the amount a economy's income distribution departs from the "ideal" of a perfectly equitable income distribution. The lower the figure, the closer to an equitable income distribution. The above figures are from Kuo (1983, 96-97). A similar measure using income of the top vs. bottom 20 percent of population is available from Chan and Clark (1989, 6).

TABLE 2
GROSS DOMESTIC PRODUCT

Period	At Current Prices
	Amount (NT\$m.)
1952	17,215
1955	29,981
1956	34,410
1957	40,173
1958	44,966
1959	51,833
1960	62,507
1961	70,043
1962	77,159
1963	87,252
1964	101,966
1965	112,627
1966	126,022
1967	145,817
1968	169,904
1969	196,845
1970	226,805
1971	263,676
1972	316,172
1973	410,405
1974	549,577
1975	589,651
1976	707,710
1977	828,995
1978	991,602
1979	1,195,838
1980	1,491,059

Period	At Current Prices
	Amount (NT\$m.)
1981	1,773,931
1982	1,899,971
1983	2,100,005
1984	2,343,078
1985	2,473,786
1986	2,855,180
1987	3,222,993
1988	3,496,951
1989	3,878,547
1990 ¹	4,243,055

Note: ¹ Estimate

Source: TSDB (1991, 23).

TABLE 3
COMPARATIVE STATISTICS

	HK	SP	SK	TW
1986 GNP p.c. in US\$	6910	7410	2370	5246
1965-86 % growth in GNP p.c.	6.2	7.6	6.7	7.0
1985 military expenditure as % GNP	---	6.2	5.5	7.6
income share of top 20%	47.0 1980	NA	45.3 1976	37.6 1985
income share of bottom 20%	5.4 1980	NA	5.7 1976	8.4 1985
1986 life expectancy at birth	76	73 1985	69	73
1986 infant mortality rate	8	9	25	9
1988 % of adult literacy	NA	86	92	92
1985 daily calorie intake	2692	2696	2806	2874
1988 political rights	4	4	2	5
1988 civil liberties	2	5	3	3
1948-77 protest demonstrations	19	20	229	4
1948-77 political strikes	11	50	32	8
1948-77 riots	61	50	203	14
1948-77 deaths from political violence	243	179	2747	5547
1953-80 combat deaths in civil and interstate wars	0	0	5000	0

Key: HK - Hong Kong, SP - Singapore, SK - South Korea, TW - Taiwan

Source: CEPD (1987); Gastil (1989); Small and Singer (1982); Taylor and Jodice (1983); USACDA (1988); World Bank (1988)

COMPARATIVE STATISTICS

	AG	BR	UK	US
1986 GNP p.c. in US\$	2350	1810	8870	17480
1965-86 % growth in GNP p.c.	0.2	4.3	1.7	1.6
1985 military expenditure as % GNP	3.3	1.0	5.3	6.6
income share of top 20%	50.3 1970	66.6 1972	39.7 1979	39.9 1980
income share of bottom 20%	4.4 1970	2.0 1972	7.0 1979	5.3 1980
1986 life expectancy at birth	70	65	75	75
1986 infant mortality rate	33	65	9	10
1988 % of adult literacy	96	78	100	96
1985 daily calorie intake	3216	2657	3148	3682
1988 political rights	2	2	1	1
1988 civil liberties	1	3	1	1
1948-77 protest demonstrations	168	47	691	2184
1948-77 political strikes	119	50	142	154
1948-77 riots	156	109	372	861
1948-77 deaths from political violence	11343	200	1463	434
1953-80 combat deaths in civil and interstate wars	3000	0	10	59026

Key: AG - Argentina, BR - Brazil, UK - United Kingdom, US - United States

Source: CEPD (1987); Gastil (1989); Small and Singer (1982); Taylor and Jodice (1983); USACDA (1988); World Bank (1988)

Source: Cited in Chan and Clark (1989)

TABLE 4
GROSS NATIONAL PRODUCT

Period	At Current Prices	
	Amount (NT\$m.)	Growth Rate (%)
1952	17,247	40.0
1955	29,978	19.0
1956	34,403	14.8
1957	40,118	16.6
1958	44,785	11.6
1959	51,677	15.4
1960	62,480	20.9
1961	69,960	12.0
1962	77,049	0.1
1963	87,139	24.4
1964	101,982	17.0
1965	112,433	10.2
1966	125,925	12.0
1967	145,494	15.5
1968	169,446	16.5
1969	196,598	16.0
1970	226,393	15.2
1971	263,554	16.4
1972	316,240	20.0
1973	410,289	29.7
1974	549,400	33.9
1975	586,307	6.7
1976	702,694	19.9
1977	823,871	17.2
1978	989,271	20.1
1979	1,196,238	20.9
1980	1,488,953	24.5
1981	1,764,278	18.5

Period	At Current Prices	
	Amount (NT\$m.)	Growth Rate (%)
1982	1,899,289	7.7
1983	2,103,261	10.7
1984	2,368,478	12.6
1985	2,515,049	6.2
1986	2,925,772	16.3
1987	3,288,973	12.4
1988	3,585,294	9.0
1989	3,968,975	10.7
1990 ¹	4,349,445	9.6

Note: ¹ Estimate
Source: TSDB (1991, 26).

TABLE 5
PER CAPITA GROSS NATIONAL PRODUCT

Period	At Current Prices			
	Amount (US\$)	Amount (NT\$)	Index 1952 = 100	Growth Rate (%)
1952	196	2,019	100.0	35.2
1955	203	3,162	156.6	14.6
1956	141	3,502	173.5	10.8
1957	160	3,959	196.1	13.0
1958	173	4,282	212.1	8.2
1959	131	4,782	236.8	11.7
1960	154	5,601	277.4	17.1
1961	152	6,078	301.0	8.5
1962	162	6,498	321.8	6.9
1963	178	7,137	353.5	9.8
1964	203	8,113	401.8	13.7
1965	217	8,697	430.8	7.2
1966	237	9,480	469.5	9.0
1967	267	10,685	529.2	12.7
1968	304	12,151	601.8	13.7
1969	345	13,783	682.7	13.4
1970	389	15,544	769.9	12.8
1971	443	17,730	878.2	14.1
1972	522	20,885	1,034.4	17.8
1973	695	26,596	1,317.3	27.3
1974	920	34,974	1,732.2	31.5
1975	964	36,642	1,814.9	4.8
1976	1,132	43,033	2,131.4	17.4
1977	1,301	49,449	2,449.2	14.9
1978	1,577	58,282	2,886.7	17.9
1979	1,920	69,115	3,423.2	18.6
1980	2,344	84,398	4,180.2	22.1

Period	At Current Prices			
	Amount (US\$)	Amount (NT\$)	Index 1952 = 100	Growth Rate (%)
1981	2,669	98,179	4,862.8	16.3
1982	2,653	103,803	5,141.3	5.7
1983	2,823	113,103	5,601.9	9.0
1984	3,167	125,496	6,215.8	11.0
1985	3,297	131,430	6,509.7	4.7
1986	3,993	151,148	7,486.3	15.0
1987	5,275	168,114	8,326.6	11.2
1988	6,333	181,185	8,974.0	7.8
1989	7,512	198,389	9,826.1	9.5
1990 ¹	7,997	215,038	10,650.7	8.4

Note: ¹ Estimate

Source: TSDB (1991, 29).

TABLE 6
FOREIGN TRADE (CUSTOMS STATISTICS)

Period	Total Value (NT\$ million)			
	Total	Exports	Imports	Balance
1952	4,001	1,468	2,533	- 1,065
1955	5,063	1,917	3,146	- 1,229
1956	7,731	2,931	4,800	- 1,869
1957	8,934	3,675	5,259	- 1,584
1958	9,466	3,861	5,605	- 1,744
1959	14,128	5,708	8,420	- 2,712
1960	16,763	5,966	10,797	- 4,831
1961	20,706	7,812	12,894	- 5,082
1962	20,909	8,735	12,174	- 3,439
1963	27,766	13,283	14,483	- 1,200
1964	34,524	17,362	17,162	+ 200
1965	40,283	17,987	22,296	- 4,309
1966	46,408	21,451	24,957	- 3,506
1967	57,943	25,629	32,314	- 6,685
1968	67,790	31,568	36,222	- 4,654
1969	90,604	41,975	48,629	- 6,654
1970	120,367	59,257	61,110	- 1,853
1971	156,358	82,416	73,942	+ 8,474
1972	220,316	119,525	100,791	+ 18,734
1973	315,802	170,723	145,079	+ 25,644
1974	479,113	213,718	265,395	- 51,677
1975	427,928	201,468	226,460	- 24,992
1976	599,052	309,913	289,139	+ 20,774
1977	679,078	355,239	323,839	+ 31,400
1978	876,887	468,509	408,378	+ 60,131
1979	1,112,227	579,299	532,928	+ 46,371
1980	1,423,628	712,195	711,433	+ 762
1981	1,608,389	829,756	778,633	+ 51,123
1982	1,600,332	864,248	736,084	+ 128,164

Period	Total Value (NT\$ million)			
	Total	Exports	Imports	Balance
1983	1,819,326	1,005,422	814,904	+ 191,518
1984	2,075,558	1,204,697	870,861	+ 333,836
1985	2,024,866	1,223,019	801,847	+ 421,172
1986	2,424,077	1,507,044	917,033	+ 590,011
1987	2,821,479	1,707,608	1,113,871	+ 593,737
1988	3,154,905	1,731,804	1,423,101	+ 308,703
1989	3,133,520	1,747,800	1,385,720	+ 362,080
1990	3,274,586	1,802,783	1,471,803	+ 330,980

Source: TSDB (1991, 208)

FOREIGN TRADE (CUSTOMS STATISTICS)

Period	Expressed in US\$ million			
	Total	Exports	Imports	Balance
1952	303	116	187	- 71
1955	324	123	201	- 78
1956	312	118	194	- 76
1957	360	148	212	- 64
1958	382	156	226	- 70
1959	388	157	231	- 74
1960	461	164	297	- 133
1961	517	195	322	- 127
1962	522	218	304	- 86
1963	694	332	362	- 30
1964	861	433	428	+ 5
1965	1,006	450	556	- 106
1966	1,158	536	622	- 86
1967	1,447	641	806	- 165
1968	1,692	789	903	- 114
1969	2,262	1,049	1,213	- 164
1970	3,005	1,481	1,524	- 43
1971	3,904	2,060	1,844	+ 216
1972	5,502	2,988	2,514	+ 474
1973	8,275	4,483	3,792	+ 691
1974	12,605	5,639	6,966	- 1,327
1975	11,261	5,309	5,952	- 643
1976	15,765	8,166	7,599	+ 567
1977	17,872	9,361	8,511	+ 850
1978	23,714	12,687	11,027	+ 1,660
1979	30,877	16,103	14,774	+ 1,329
1980	39,544	19,811	19,733	+ 78
1981	43,811	22,611	21,200	+ 1,411
1982	41,092	22,204	18,888	+ 3,316

Period	Expressed in US\$ million			
	Total	Exports	Imports	Balance
1983	45,410	25,123	20,287	+ 4,836
1984	52,415	30,456	21,959	+ 8,497
1985	50,828	30,726	20,102	+ 10,624
1986	64,043	39,862	24,181	+ 15,681
1987	88,662	53,679	34,983	+ 18,696
1988	110,340	60,667	49,673	+ 10,994
1989	118,569	66,304	52,265	+ 14,039
1990	121,930	67,214	54,716	+ 12,498

Source: TSDB (1991, 208)

TABLE 7

COMPARISON OF TAIWAN AND OTHER LESS DEVELOPED COUNTRIES

Country	GNP/Capita Dollars 1986	GNP/Capita Average 1965-86	Inflation 1965-80	Industry 1965-80	Manuf. 1965-80
Taiwan	3,966 ^a	7.5	8.3	15.6	---
Low-income economies	270	3.1	4.6	7.5	7.6
Middle income- economies	1,270	2.6	21.0	7.0	8.2
Upper middle- income economies	1,890	2.8	20.5	6.5	---
Latin America NICs					
Brazil	1,810	4.3	31.3	9.9	9.6
Mexico	1,860	2.6	13.1	7.6	7.4
OECD Countries					
Spain ^b	4,860	2.9	11.8	5.8	6.7
Greece	3,680			7.1	
Portugal	2,250	3.3	10.5	---	8.4
		3.2	11.5		

Note: ^a This is calculated according to the exchange rate of
US\$1 = NT\$35.45.

^b Taiwan's per capita GNP exceeds Spain's in 1988 when the
Taiwan dollar appreciated to its market value.

Source: (KUO, 1990)

TABLE 8
GROSS DOMESTIC PRODUCT BY KIND OF ACTIVITY

Year	Agriculture	Manufacturing
II. Percentage		
1952	32.2	12.9
1955	29.1	15.6
1956	27.5	16.6
1957	27.3	17.4
1958	26.8	16.8
1959	26.4	19.4
1960	28.5	19.1
1961	27.5	18.9
1962	25.0	20.0
1963	23.3	22.0
1964	24.5	22.9
1965	23.6	22.3
1966	22.5	22.5
1967	20.6	25.0
1968	19.0	26.5
1969	15.9	29.1
1970	15.5	29.2
1971	13.1	31.5
1972	12.2	34.3
1973	12.1	36.8
1974	12.4	32.8
1975	12.7	30.9
1976	11.4	33.8
1977	10.6	34.2
1978	9.4	35.6
1979	8.6	35.9
1980	7.7	36.0
1981	7.3	35.6
1982	7.7	35.2

Year	Agriculture	Manufacturing
II. Percentage		
1983	7.3	36.0
1984	6.3	37.6
1985	5.8	37.6
1986	5.5	39.7
1987	5.3	39.5
1988	5.0	37.8
1989	4.9	35.6
1990 ¹	4.2	34.1

Note: ¹ Estimate

Source: TSDB (1991, 41)

TABLE 9
AGRICULTURAL PRODUCTION - INDICES

Period	Index (Base: 1952 = 100)	
	General Index	Agriculture
1952	100.0	100.0
1955	118.7	110.2
1956	124.9	116.9
1957	134.9	124.0
1958	144.7	131.2
1959	147.1	131.1
1960	148.0	133.0
1961	158.8	141.5
1962	163.7	144.2
1963	166.6	143.1
1964	182.4	160.1
1965	194.5	170.7
1966	201.6	174.8
1967	215.8	183.2
1968	232.4	190.6
1969	229.7	182.4
1970	245.5	190.5
1971	252.3	191.4
1972	263.9	192.7
1973	282.4	195.2
1974	281.4	206.2
1975	277.5	200.1
1976	312.7	212.8
1977	329.9	217.1
1978	330.9	207.0
1979	357.0	214.7
1980	360.8	210.1
1981	356.0	205.0
1982	362.3	206.8

Period	Index (Base: 1952 = 100)	
	General Index	Agriculture
1983	376.9	200.6
1984	388.7	201.9
1985	400.5	203.5
1986	399.2	192.9
1987	430.3	200.9
1988	437.7	203.7
1989	435.9	202.9
1990	445.4	193.4

Source: TSDB (1991, 67).

TABLE 10

AGRICULTURAL POPULATION BY OWNERS AND TENANTS

Unit: 1,000 persons

End of Year	Percentage		
	Full Owner	Part Owner	Tenant
1952	38	26	36
1955	59	23	18
1956	60	23	17
1957	60	23	17
1958	61	23	16
1959	62	23	15
1960	64	22	14
1961	65	21	14
1962	65	21	14
1963	66	21	13
1964	67	20	13
1965	67	20	13
1966	67	20	13
1967	67	21	12
1968	68	20	12
1969	80	11	9
1970	77	13	10
1971	78	12	10
1972	78	12	10
1973	79	12	9
1974	80	11	9
1975	82	9	9
1976	82	9	9
1977	82	9	9
1978	83	9	8
1979	85	7	8
1980	82	11	7
1981	84	9	7
1982	87	7	6

End of Year	Percentage		
	Full Owner	Part Owner	Tenant
1983	83	11	6
1984	82	12	6
1985	82	12	6
1986	83	12	5
1987	83	12	5
1988	85	11	4
1989	86	10	4
1990	85	9	6

Source: TSDB (1991, 65).

TABLE 11
VALUE OF PRINCIPAL EXPORTS
(BY CCC)

Unit: US\$ Million

Period	Electronic Products	Information & Communication Products	Precision Instruments
1981	2,940.3	159.8	531.6
1982	2,529.6	232.5	531.1
1983	2,828.0	616.0	561.1
1984	3,473.6	1,067.6	641.5
1985	3,038.3	1,317.6	614.5
1986	3,907.3	2,398.8	830.1
1987	5,738.5	3,786.2	1,187.8
1988	6,689.2	5,017.1	1,455.0
1989	8,138.2	4,423.9	1,681.2
1990	7,725.3	5,023.6	1,720.6

Source: TSDB (1991, 228).

TABLE 12
OUTPUT OF PRINCIPAL INDUSTRIAL PRODUCTS

Period	Television Sets	Telephone Sets	Radio
	1,000 sets	set	set
1952	---	---	---
1955	---	---	---
1956	---	---	---
1957	---	---	---
1958	---	---	---
1959	---	---	---
1960	---	---	---
1961	---	16,676	1,251
1962	---	13,002	10,560
1963	---	10,746	24,984
1964	31	19,296	487,023
1965	50	30,404	1,244,785
1966	66	36,730	1,718,643
1967	112	41,811	3,184,033
1968	650	52,873	4,013,494
1969	948	70,099	3,923,490
1970	1,254	82,125	6,247,610
1971	1,892	88,189	7,237,610
1972	3,591	148,850	9,262,465
1973	4,542	181,564	14,530,163
1974	4,036	332,231	12,945,725
1975	2,999	229,610	6,654,624
1976	3,847	431,353	6,848,583
1977	4,926	455,800	7,426,891
1978	7,095	500,388	9,648,950
1979	6,699	939,054	8,720,455
1980	7,041	1,758,129	9,489,938

Period	Television Sets	Telephone Sets	Radio
	1,000 sets	set	set
1981	6,924	2,004,746	8,754,058
1982	4,752	3,448,802	6,061,128
1983	5,177	25,989,423	7,667,148
1984	5,576	11,783,470	8,220,744
1985	4,250	11,502,836	7,960,176
1986	6,216	22,288,340	10,139,053
1987	6,442	21,417,113	11,599,651
1988	5,031	18,324,239	11,143,860
1989	5,172	16,522,409	7,902,111
1990	3,398	13,992,431	5,892,881
Average Annual Increase (%)			
1981-1990	- 7.0	23.1	- 4.7
1990/1989	- 34.3	- 15.3	- 25.4

Source: TSDB (1991, 94).

OUTPUT OF PRINCIPAL INDUSTRIAL PRODUCTS

Period	Sound Recorder	Electronic Calculator	Integrated Circuits	Electronic Watches
	set	set	1,000 pcs.	pcs.
1952	---	---	---	---
1955	---	---	---	---
1956	---	---	---	---
1957	---	---	---	---
1958	---	---	---	---
1959	---	---	---	---
1960	---	---	---	---
1961	---	---	---	---
1962	---	---	---	---
1963	---	---	---	---
1964	---	---	---	---
1965	---	---	---	---
1966	589	---	---	---
1967	845	---	375	---
1968	237,680	---	5,175	---
1969	320,868	---	19,975	---
1970	515,255	---	30,248	---
1971	687,568	---	34,198	---
1972	1,053,077	35,600	160,597	---
1973	2,668,113	120,512	342,021	---
1974	2,204,371	508,562	655,512	---
1975	2,475,066	2,760,553	373,565	284,600
1976	3,040,196	4,361,063	308,500	1,889,431
1977	4,598,931	4,445,396	314,990	6,283,180
1978	7,826,949	6,058,946	442,400	8,108,590
1979	9,289,032	8,752,091	531,000	6,132,078
1980	9,821,408	10,972,381	622,100	6,589,839
1981	10,362,897	22,163,910	755,005	5,800,075

Period	Sound Recorder	Electronic Calculator	Integrated Circuits	Electronic Watches
	set	set	1,000 pcs.	pcs.
1982	11,377,742	24,696,427	788,222	13,105,681
1983	13,237,078	35,758,306	995,946	14,038,207
1984	18,768,418	53,914,689	1,429,163	11,764,254
1985	15,418,038	46,261,017	1,152,121	5,324,386
1986	15,504,087	44,924,503	1,650,506	4,319,998
1987	17,003,784	60,123,072	1,910,495	5,250,023
1988	11,859,719	68,263,519	2,072,973	4,484,012
1989	10,484,257	68,669,197	2,288,709	5,013,625
1990	8,124,253	44,843,192	2,488,127	5,115,695
Average Annual Increase (%)				
1981-1990	- 1.9	15.1	14.9	- 2.5
1990/1989	- 22.5	- 34.7	8.7	2.0

Source: TSDB (1991, 94).

TABLE 13

NET REVENUES OF ALL LEVELS OF GOVERNMENT - BY SOURCE

Period	Total	Total (%)	Tax Revenue	Monopoly Revenue	Monopoly Revenue (%)
1955	6,689	100.0	4,174	921	13.8
1956	7,368	100.0	4,549	1,330	18.1
1957	9,096	100.0	5,541	1,442	15.9
1958	10,833	100.0	5,875	1,663	15.4
1960	12,111	100.0	6,915	1,886	15.6
1961	14,026	100.0	7,268	2,286	16.3
1962	15,040	100.0	7,402	2,740	18.2
1963	15,841	100.0	8,368	2,886	18.2
1964	19,054	100.0	9,957	2,883	15.1
1965	23,384	100.0	11,974	3,273	14.0
1966	25,192	100.0	13,600	3,697	14.7
1967	31,639	100.0	15,288	4,244	13.4
1968	35,235	100.0	19,567	4,779	13.6
1969	45,046	100.0	27,327	5,433	12.1
1970	51,215	100.0	30,657	6,007	11.7
1971	57,345	100.0	34,248	6,438	11.2
1972	66,368	100.0	41,034	6,942	10.5
1973	89,637	100.0	53,093	7,634	8.5
1974	115,832	100.0	80,915	7,939	6.9
1975	134,034	100.0	84,389	13,115	9.8
1976	166,103	100.0	106,983	14,784	8.9
1977	193,828	100.0	122,697	16,608	8.6
1978	233,644	100.0	149,048	19,145	8.2
1979	287,420	100.0	199,345	21,176	7.4
1980	368,922	100.0	237,187	24,162	6.5
1981	437,707	100.0	281,087	33,962	7.8
1982	490,767	100.0	300,496	37,594	7.7
1983	501,155	100.0	302,478	39,901	8.0
1984	534,154	100.0	343,312	40,152	7.5

Period	Total	Total (%)	Tax Revenue	Monopoly Revenue	Monopoly Revenue (%)
1985	576,039	100.0	353,109	41,738	7.2
1986	636,204	100.0	356,975	44,824	7.0
1987	707,843	100.0	415,318	46,137	6.5
1988	852,630	100.0	511,637	45,273	5.3
1989*	1,072,683	100.0	629,749	47,538	4.4
1990	1,198,602	100.0	794,812	52,921	4.4

Note: Excluding the special budget for land reserve for public facilities.

Source: TSDB (1991, 169-170)

TABLE 14

NET REVENUES OF ALL LEVELS OF GOVERNMENT - BY SOURCE

Period	Surplus of Public Enterprises & Public Utilities	Surplus of Public Enterprises & Public Utilities (%)	Proceeds from Issues of Public Bonds	Receipts from Loans for Economic Construction	Others
1955	250	3.8	2	---	1,342
1956	524	7.1	0	---	965
1957	739	8.1	---	---	1,374
1958	717	6.6	400	---	2,178
1960	1,144	9.4	---	---	2,166
1961	1,035	7.4	400	---	3,037
1962	1,457	9.7	500	---	2,941
1963	1,090	6.9	600	159	2,738
1964	2,182	11.5	800	48	3,184
1965	3,109	13.3	1,200	17	3,811
1966	2,371	9.4	2,100	215	3,209
1967	3,946	12.5	2,800	336	5,025
1968	3,071	8.7	3,000	455	4,363
1969	4,829	10.7	2,100	135	5,222
1970	4,938	9.6	2,500	428	6,685
1971	6,034	10.5	2,800	466	7,359
1972	7,686	11.6	1,900	701	8,105
1973	12,662	14.1	2,901	1,225	12,122
1974	9,906	8.6	900	744	15,428
1975	14,227	10.6	400	1,009	20,894
1976	16,570	10.0	4,600	1,913	21,253
1977	18,536	9.5	3,106	1,524	31,357
1978	21,732	9.3	6,510	5,862	31,347
1979	22,764	7.9	5,600	2,894	35,641
1980	33,106	9.0	---	4,612	69,855
1981	41,107	9.4	4,000	3,717	73,834
1982	55,628	11.3	13,382	6,806	76,861

Period	Surplus of Public Enterprises & Public Utilities	Surplus of Public Enterprises & Public Utilities (%)	Proceeds from Issues of Public Bonds	Receipts from Loans for Economic Construction	Others
1983	60,486	12.1	22,300	7,778	68,212
1984	63,022	11.8	9,779	5,982	72,007
1985	76,779	13.3	24,088	7,102	73,223
1986	99,646	15.7	28,800	7,441	98,518
1987	102,626	14.5	48,339	8,457	86,966
1988	111,727	13.1	76,540	9,504	97,950
1989*	128,211	12.0	117,397	7,836	141,952
1990	121,418	10.1	15,831	73,368	140,252

Note: *Excluding the special budget for land reserve for public facilities.

Source: TSDB (1991, 169-170)

TABLE 15
PRICE INDICES

Period	Wholesale Prices		Consumer Prices
	1952 = 100	Last Year = 100	1952 = 100
1953	108.79	108.79	118.79
1954	111.33	102.33	120.77
1955	127.00	114.08	132.74
1956	143.16	112.72	146.69
1957	153.50	107.22	157.73
1958	155.67	101.41	159.74
1959	171.64	110.26	176.62
1960	195.91	114.14	209.19
1961	202.23	103.23	225.57
1962	208.36	103.03	230.85
1963	221.86	106.48	236.02
1964	227.37	102.48	235.55
1965	216.78	95.34	235.36
1966	220.00	101.49	240.04
1967	225.57	102.53	248.08
1968	232.26	102.97	267.73
1969	231.64	99.73	281.22
1970	237.96	102.73	291.29
1971	238.02	100.03	299.53
1972	248.61	104.45	308.55
1973	305.45	122.86	333.76
1974	429.41	140.58	492.20
1975	407.62	94.93	517.99
1976	418.89	102.76	530.94
1977	430.46	102.76	568.32
1978	445.70	103.54	601.11
1979	507.31	113.82	659.72
1980	616.59	121.54	785.13

Period	Wholesale Prices		Consumer Prices
	1952 = 100	Last Year = 100	1952 = 100
1981	663.59	107.62	913.42
1982	662.41	99.82	940.46
1983	654.55	98.81	953.16
1984	657.71	100.48	952.97
1985	640.62	97.40	951.35
1986	619.20	96.66	958.01
1987	599.07	96.75	962.99
1988	589.72	98.44	975.32
1989	587.49	99.62	1,018.33
1990	583.90	99.39	1,060.39
1953-70 Average	4.9		6.1
1971-80 Average	10.0		10.4
1981-90 Average	-0.5		3.1

Source: TSDB (1991, 181).

The Context of Taiwan's Performance

The economic performance of Taiwan is especially outstanding compared to other countries. The economic performance of Taiwan is one of the best in the post war era. (See Table 3) While other countries have managed to obtain high rates of economic growth, it has resulted in repression and political strife (e.g. PRC, South Korea, Iran), or promoted excessive income inequities. (e.g. Argentina) This contradicts much of the current literature, which argues that while high levels of economic development facilitates the development of democracy, equality and stability, high rates of development work against the same factors. (Chan and Clark, 1989, 5) In Taiwan, there has been a relative smooth path of development, which went hand in hand with a gradual, though not smooth, pattern of democratization. At the same time, the standard of living for the population of Taiwan has increased noticeably. Measured on standard indicators such as life expectancy, infant mortality, adult literacy and daily caloric intake, Taiwan's standards compare favorably with, and sometimes better than, many developed countries. (See Table 3) The development of Taiwan is all the more remarkable because it managed a smooth transition from primarily an agricultural based economy to manufacturing. Table 8 shows the rapid decline of agriculture output as a percentage of total output as Taiwan developed. Moreover, the development of manufacturing industries also

went through a similar transition from simple products to heavy industry, and most recently manufacturing of high technology items. See Table 11, 12.

Taiwan's Implications for Development Theory

There is no question that Taiwan is an important case for development theory. Alone of many countries, Taiwan has successfully developed with comparative ease. Moreover, its development has also been accompanied with a gradual process of increased sophistication in industry. If it can be demonstrated that Taiwan's success is primarily derived from state policies aimed at industry promotion, it is an important conclusion not only for Taiwan, but also for other industrializing nations. Indeed, since Taiwan succeeded in developing industries that many industrialized nations have failed to develop, the Taiwan case will be important also for developed nations that are concerned with the competitiveness of their industries.

The idea that there exists a relationship between political institutions and economic development is an enduring topic of interest in the field of political economy. Central to this debate is the appropriate role of the state in fostering economic development. Beginning with Alexander Gerschenkron's theory of late development (Gerschenkron, 1962) many theorists

have argued that the state needs to play more than a "hands off" role played by the classic liberal state epitomized by Adam Smith's Wealth of Nations. In the case of Gerschenkron, he argued that modern industry is capital intensive and requires large scale investments in production facilities. Countries that developed industry first benefit by being early entrants that can enter an industry when capital requirements are still small. However, for any "late entrants", the sheer scale of investment requires that the state act in support - either through subsidies, loans or protection to overcome the hurdles created by the "early entrants". In the modernized version, Gerschenkron's argument is made for "high technology" or "knowledge intensive"³⁶ industries that are inherently risky and require large scale investments in capital. The purpose of this thesis is to examine critically and evaluate in detail the argument put forward by modern day followers of Gerschenkron, which we termed "bureaucratic regulationists",

³⁶The definition of what is "high technology" or "knowledge intensive" is itself a valuable question for further research. If the definition of "high technology" is defined in terms of the degree of skill and knowhow required to design, build and produce at a profit goods and services, then the level of skill required in different segments is more than likely to be different. Therefore, if we speak of a particular industry, goods or service as "high technology", we are more often than not speaking of portions of it as being "high technology" rather than the whole thing. The implications of this are that most products and industries are aggregates of "high" and "low" technology inputs. Furthermore, "high technology" or "knowledge intensive" do not assure one that the industry or goods referred to need to be necessarily "high profit". Many goods that are reckoned to be "high tech" are in fact low profit items while the reverse is often true.

who believe that state leadership was critical and necessary to the development of Taiwan's "high technology" electronics and computer industry.

The thesis will demonstrate that state action and regulation, rather than affecting these industries broadly, created "islands" of economic activity. Moreover, more often than not, the policies that created these islands were ad hoc measures rather than the product of a coherent, well thought out strategic plan implemented over the long term.³⁷ While these "islands" are by no means insignificant, their actions alone are insufficient to explain why Taiwan's computer and electronics industries succeeded. In order to explain this, the thesis concludes by looking at how another segment of the electronics industry originated relatively independently of the sectors most affected by the state-policy driven sector. These non-state policy segments of the industries grew up side by side with the state policy driven sectors. Because they were considered to be "low tech" and failed to meet with the aspirations and vision of what is deemed "high technology" sectors by the bureaucrats, they were more or less left alone. The segments of the state policy driven sector, however, failed to become a success on their own. They had to be linked and fused with the market driven "low tech" sector in

³⁷The definition of "long-term" for the purpose of this thesis is 10 years or more.

the seventies in order to create a highly successful grouping of competitive industries. However, this linkage with the "low tech" sector was created not as an intended outcome of state policy, but due to a whole series of fortuitous events that were beyond the control of the state. Accordingly, the thesis argues that state policies are a limited explanation for the outcome of competitive electronics and computer industries in Taiwan. A more complete account will have to take into account the dynamic pattern of entrepreneurial small to medium scale Taiwan firms, which were a product of Chinese culture in a market economy, as it interacted with the creations of state action.

The Role of the State in Development

The revival of the debate between "bureaucratic regulationists" and "market regulationists" in the 80s was caused by the spectacular rise of Japan and the East Asian Newly Industrialized Countries (NICs) in the seventies and eighties. In the post-war era, Japan - as with Germany - has risen from ruinous defeat to become one of the world's largest economic powerhouses. Moreover, it has not only become a powerhouse in obscure industries, but in many highly visible consumer goods industries traditionally dominated by the United States and western Europe. Electronics, automobiles, steel, and computer peripherals were but a few of the

industries where the prowess of Japanese industry resulted in a reduction in the dominance of the market by established American firms. The United States, being the leader and chief proponent of liberal market policies both domestically and internationally, has been regarded in the post war era as the de facto expert on efficient market economy. When industries in the leading market economy began to be threatened by competition from Japan, it is not surprising that alarms began to be raised. When Japan began to establish a position in "high technology" electronics and semiconductor manufacturing, many established believers in the free market began to call for state intervention to support their industries. In this context, the East Asian NICs were seen as Japan in miniature, each poised to become a powerhouse that would eventually challenge US domination across many industries.

Chalmers Johnson's analysis of Japan's rise from defeat in World War II to the status of an economic superpower pointed to the key role played by the state in economic development. On the surface, Taiwan appears to have much the same institutions and program of state actions in strategic industries, therefore, Johnson's model would seem to be a convincing model to explain economic development in Taiwan. From this perspective, Chalmers Johnson's study of how Japan succeeded is important because it influenced a series of studies done on the East Asian NICs.

The Developmental State Thesis

The classic "bureaucratic regulationists" study of Japan's rise to dominance in industry is Chalmers Johnson's book MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925-1975. In this book, he argued that Japan's spectacular rise to success from defeat is caused by the central role played by the government in economic development. The institutions of Japan's bureaucracy played a key role in fostering economic growth through effective state action. First, Johnson argued that the economic bureaucracy is an autonomous institution that is not explicitly linked and thereby, forced to respond to societal forces. Therefore, bureaucrats can rule without responding to political forces to which reigning politicians are subject. The state thereby has independence from public pressures and interest groups, giving it a free hand in planning and organizing long term economic development through an elite agency - the Ministry of International Trade and Industry (MITI).

MITI, being an elite agency, is able to exercise a large degree of control over the economy through seven major means: monetary and fiscal measures including subsidized loans to favored industries; taxation measures that promote exports, industrial rationalization, technological development and other areas of public interest through tax relief; direct

subsidies to certain industries; direct allocation and rationing systems that regulate production of goods; extensive licensing and approval powers that control industries; direct investment in key industries; administrative guidance to coordinate public and private enterprises. (Johnson, 1982, 318) While the state has extensive regulatory powers, it remains committed to regulating within a market economy. See Table 16. This results in a hybrid whereby the economy remains predominantly private, yet the market is informally guided and directed by a policy elite that promotes public goal setting and private execution. (Johnson, 1984) The purpose of MITI's guidance of Japan's economy is to direct the economy towards appropriate long term goals as defined by the state. MITI functions as an "Economic General Staff" whose purpose is to coordinate, direct and promote long-term economic development. The industrial policies formulated by the elite agency MITI are in turn transmitted to the private sector through numerous channels of consultation, which results in effective implementation of policy.³⁸ The developmental state that emerges from Johnson's account is able to achieve economic growth with a high degree of social equity and political stability. In Johnson's model, state intervention becomes the

³⁸The problem of whether these linkages represent channels of transmission of MITI's will or a two way channel is something which Johnson never tackled. His assumption is that it is a one way channel from government to the private sector.

critical factor that is necessary and sufficient to explain the cause of Japan's economic success.

TABLE 16
 TYPOLOGY OF STATE INTERVENTION

Degree of State Control	
Centrally Planned	All production, distribution, exchange, pricing decisions made by central authority under aegis of central plan which has force of law.
Indicative Planned	Many production, distribution and pricing decisions made by private firms but with many public firms participating in economy. Coordination through "indicative" plan that does not have force of law.
Mixed Economy	few state firms, but all production, distribution, exchange and pricing decisions made by private firms, no "target" by central government except for its control over macro-economic levers as credit, money supply and regulation.
Complete Free Market	Almost no state firm except in strategic/defense related sectors, all pricing and output decision made by individual firms.

Source: D. Lam

The specter of Japan's apparently successful application of what is known in economic theory as "indicative planning" then raises questions as to whether "market regulation" is sufficient to promote development. The evidence from the East Asian NICs does seem to support the idea that state intervention played a key role in market relations. Except for Hongkong, Taiwan, South Korea and Singapore, all have regimes that intervened extensively in the economy. Moreover, Taiwan has many agencies that appear, *prima facie*, to serve the same functions as MITI in Japan. This apparent similarity in institutional arrangements, together with the evidence that they have all experienced spectacular rates of economic growth in the post-war period, makes them interesting case studies for the applicability of Johnson's thesis to the East Asian NICs. Later in Chapter 3 and 4, I will look at how successful the MITI "work-alike" agencies in Taiwan did their job.

The Developmental State Thesis In Practice

Bureaucratic regulation theories argue that Taiwan is governed by a "Strong Developmentalist State". The notion that Taiwan is a "strong state" in the political sphere is important to bureaucratic regulation theories because state autonomy from societal forces is a necessary condition for state intervention in the economy. Bureaucratic regulationists believe market forces are either inefficient or incorrect in

signaling to the private sector the appropriate course of action to take in economic development. Therefore, a state that is able to either "lead" or work against market forces is better able to promote development. Since market signals or societal forces are "incorrect", it follows that the state necessarily requires a degree of "autonomy" or insulation from these forces.³⁹

The "autonomous" state is found in a stable corps of bureaucrats in many state organizations. Implicit in these theories is the notion that state bureaucrats, being salaried employees who are given long tenures at their posts, need not fully take into account market signals or political forces. Therefore, they are able to plan and execute "long term" strategies. In contrast, the private sector is implicitly seen as "short-term", profit oriented, and unwilling to invest in risky, long-term investments necessary for sustained economic development. Consequently, bureaucrats, insulated from societal demands that are detrimental to the goal of economic development, are able to formulate and implement "market conforming" intervention to promote economic development. (Johnson, 1982, 317; Wade, 1990, 27-28)

³⁹For a discussion of the idea of the autonomous state, see Evans, Rueschemeyer, Skocpol, (1985, 347-361).

The ideal world where state autonomy exists to the extent that rational developmental strategies can be formulated is problematic. First, there is no question that states, as with any large organization or even individuals, can be said to be relatively autonomous in different degrees from market or societal forces. However, that begs the question of how and when such a state is not autonomous, while obscuring the fact that politics takes place in any organization. The consequence of political infighting between different factions of the state, and competing societal demands that can reduce state autonomy in certain issues and at certain times but not others, is that the assumed degree of coherence and competence of state action is often overestimated. Writing about Taiwan's economic bureaucracy, Arnold notes:

"turf fights, inter-bureaucratic rivalry, and clashes of opinion between the heads of the CEPD and MOEA, [dominate] Taiwan's foremost industrial policy making institutions... these two organizations often advocate contradictory policies and frequently clashed over policy issues to the detriment of policy outcomes." (Arnold, 1989, 182)

The assumption that the state bureaucracy is stable is problematic. Although many bureaucrats have, in general, life tenures in the bureaucracy per se, many senior bureaucrats

are routinely shuffled between different bureaucracies. A look at the vitae of many senior bureaucrats shows that on average, they are shuffled every four years.⁴⁰ Thus, while there may be continuity of personnel at lower levels, at higher levels there is in fact extensive rotation of bureaucrats, leading to a high degree of discontinuity at the top level of policy making. As we will see later, changes in personnel leads to considerable discontinuity in the execution of policies that requires "champions" within the bureaucracy.⁴¹ Second, while there is generally a low level of turnover in Taiwan's bureaucracy, (as with any government bureaucracy, it is almost impossible to be fired for anything short of gross misconduct) in the key organizations responsible for state intervention in the "high technology" industries in the 80s - ERSO and ITRI - there has been an unusually high level of turnover relative to other ministries or departments. Many highly skilled technicians and researchers, naturally, have sought and found lucrative positions in the private sector as Taiwan's economy developed. While this turnover may be healthy from a macro-economic point

⁴⁰A convenient source for this is the "Who's Who?" section of the Republic of China Yearbook. (Chang, 1991, 585-686)

⁴¹See description of Premier Sun's involvement in promoting state intervention in the IC industry below. While he was Minister of Economic Affairs, he was able to push the project. After he became Prime Minister, support waned until his retirement left the project without a strong champion.

of view, it has certainly led to a relative reduction in the state's technical and scientific capabilities and a certain lack of continuity in policy formulation and execution. Thus, the assumption that the state policy and execution mechanism has been stable is not without qualifications.⁴²

As we have seen in the above discussion, the developmental state - although not as "insular" and "stable" as first thought - is argued to have an exceptional capacity to act in the economy to carry out policies promoting development. This capacity for intervention is based on the notion that the state bureaucracy has access to resources not ordinarily available to the private sector. Specifically, the state has the ability to fund expensive and risky undertakings that would be unlikely to attract private capital. Secondly, the state is argued to be able to visualize and plan "long term" goals. Therefore the state can both identify opportunities that are not apparent to the private sector, and then bring to bear financial resources not normally available to all but the largest private firms. While both of these exceptional

⁴²There is relative stability in the Planning Agency staff, but not in the applied industrial research labs, which has private sector potential. As would be expected, there are more opportunities in industry for bureaucrats who have marketable skills derived from their experience in the state research laboratories. On the other hand, few private firms would find the skills of economic planners useful.

attributes can be true in theory, in practice, the problem is not so simple.

The notion that a state has "long term" perception compared to the private sector begs a number of further questions. First, it suggests that it has access to information and resources not available to the private sector. This is partly true. Any sufficiently large organization can readily tap into information and technical resources that are difficult for any similarly sized group of small organizations working independently. While it is theoretically possible that a state can have accurate perceptions beyond any private individuals or firms, in reality, when a state attempts to gather such information, it is frustrated by many practical difficulties.

When the state tries to gather information on an industry that it does not have a presence in directly, the state often finds itself as an outsider to industries under private control. Private industries competing in the same market have no reason to trust the state with sensitive competitive information. Thus, more often than not, the state has to rely on sources of information that are outdated, partial or given under duress.⁴³ Where such information is given, frequently it is

⁴³On a theoretical level, suppose there are two industries in a segment of the economy. If one firm is so foolish as to give the state planners accurate information, the other firm

used as a tool to encourage the state to act in favor of one firm at the expense of others, or to deliberately mislead the state, which may be passing on this information to other competitors. The notion of professionalism in general, and especially of confidentiality and fairness in using information supplied to legitimate state agencies, is a very western concept that cannot be readily assumed to exist in other countries. Therefore, the very basis of state indicative planning that relies on the private sector to supply information to state planners willingly is fundamentally flawed.⁴⁴

The problems of gathering accurate information are exacerbated where the state has a history of arbitrarily intervening in the economy in new businesses or already has state enterprises in the same business. Why should a private firm invite the state to intervene in its industry by providing the state with information unless the firm somehow benefits or at least, does not lose from such intervention? In fact, rational behavior would have private enterprises deliberately concealing or misleading the state from the best opportunities, while

would be able to deduce their actual details from the published plan numbers.

⁴⁴This same problem with indicative plans was also recognized in Britain and France, both of which have tried indicative planning briefly. See Stephen Cohen, on the French indicative planning model. (Cohen, 1977)

encouraging the state to go into ones that are high risk or where private firms can benefit from the state trying to enter the business regardless of the outcome of the venture.⁴⁵ This is especially a problem in Taiwan, where the state has traditionally been dominated by ethnic mainlanders who arrived on the island after their defeat on the mainland, and the native Taiwanese, who regard the mainlanders as yet another army of occupation. The animosity between them is legendary,

"Local private capital (mostly Taiwanese) was hampered by government action or inaction (whether deliberate or not) of the Nationalist government... [based on surveys of businessmen in 1952] ... a consultant ... reported that "they stated emphatically that they employed no mainlanders in their plants and had no intention of doing so, and added that no Taiwanese hold responsible positions in government factories". (Simon, 1990, 147)

Accordingly, innumerable practical problems of gathering information for long-term planning are practically ignored in the developmental state thesis. These problems are compounded by the inherent problems in producing an accurate forecast of

⁴⁵Infrastructural megaprojects are typical of these. All contractors want the state to spend large sums on capital intensive, infrastructural megaprojects. Whether or not it is needed is not a concern for the contractors.

the future. Notwithstanding these problems of state planning, there are also practical problems of executing state action.

The state, while powerful and large as an organization, rarely acts as a coherent whole. Providing that the state can be coordinated to act as a whole - a dubious proposition except in "crisis" scenarios like an all out war - the state rarely acts as one organization towards one or any number of goals. In real life, state organizations are broken up into smaller units with distinct missions and capabilities that inevitably overlap or duplicate each other. While these sub-units may have capabilities beyond any one or a group of private firms, it is important to qualify that their ability to intervene in the economy is, in many instances, more limited than statist theorists claim. The crux of this matter is that whereas in theory, it is possible for "a stable corps of bureaucrats" in the state to carry out extensive intervention in the economy, in reality, the prospects for intervention are actually much more circumscribed.

Conceptually, there is no reason why the state cannot carry out a "full scale" intervention in the economy. By full scale, we mean the state would not only act to initiate production of the needed goods and services directly, but also directly purchase and consume its output. This, however, does not necessarily imply the state can achieve autarky at the

national level. Raw materials, production machinery, technology and other essential components may have to be imported rather than purchased. Technology can be developed, but often at an unacceptably high price. There are, indeed, industries that fit this model of "full scale" state intervention. The military industry in Britain, which utilizes a system of state owned arsenals, is an example of such model. However, even this "strategic" industry is not fully autarkic. It also engages in extensive sourcing of components, technology and other inputs to produce its products. Likewise, other state directed efforts like the American space program are examples of full scale state intervention to achieve a particular goal or set of goals. Thus, while there is no question that a sufficiently well funded effort aimed at a narrow, well defined and achievable set of goals, properly executed, can deliver results, the question is whether such efforts can also simultaneously achieve the goal of economic efficiency and commercial success at the same time over anything more than a narrow segment of an economy. Market regulation theories would suggest otherwise. (Friedman, 1988, 5)

The difficulties with "full scale" intervention limit these activities to areas with non- or extra-economic goals that are difficult for the private sector to achieve. Thus, state funding of autarkic military industries is not driven by

profit seeking by the state, but by the pursuit of national security, for which autarky may be an important element. The U.S. space program to send a man to the moon was driven by a desire for national prestige to, "catch up" against what appeared to be a Soviet advance in launching Sputnik first, and to promote advanced science and high technology. Indeed, it can be argued that the spin-offs that occurred as a result of the U.S. goal to send a man to the moon were in many instances, incidental: Space travel and high technology became "trendy" in the United States, and U.S. international prestige was enhanced while the Soviet competitors for world technological leadership lagged. These efforts demonstrate the ability of state policies and actions to achieve a specific goal. However, these goals were achieved at a price. First, the very scale of these efforts precludes it from being universally applicable. No economy can afford to undertake such herculean efforts on anything except a small segment of the economy. To do otherwise is to threaten the entire national economy by over extracting from other sectors. Thus, although the theoretical ability of states to intervene in the economy to achieve goals is extensive, it is impractical for all but a segment of the economy to be subject to this type of "state intervention" at any given time. The Soviet economy's experience is indicative of the pitfalls of total state intervention. It was able to achieve near military parity with the United States, an economy twice its size, by 1980.

However, despite the totally statist controls on the economy, the regime was not able to deliver an acceptably high standard of living to its citizens at the same time.⁴⁶

A parallel problem with extensive state intervention is that excessive state intervention would crowd out the private sector over time. This occurs for a number of reasons. First, diversion of resources into state intervention is not free. Revenues must be raised from taxes or other indirect levies such as protectionism. This burden must be paid by citizens within a state either directly or indirectly. While some authors have argued that such state investments have produced higher rates of return than comparable private investments, and therefore have justified state intervention, that is an argument that begs the question of precisely whom such higher rates of return benefit: employees of state enterprises or citizens of a state who pay taxes or indirect subsidies to support such activities.⁴⁷ The "full scale"

⁴⁶The problem with the Soviet economy is not so much with static efficiency. It is difficulties in dealing with evolution and change. For an interesting discussion of this point, see Selucky (1979, 43).

⁴⁷South Korea used precisely such a system of extensive subsidies for state and chaebol enterprises through a program of "carrot" and "sticks" to promote industry. While it is true that these firms have been leaders in industrializing South Korea, it is also true that such incentives have made entrepreneurship in South Korea for the average citizen much more difficult. As democratization reached South Korea, this resulted in widespread protests against those firms' low wages, resulting in rapid wage increases from 1988 to 89,

promotion of activities that are relatively unambiguously non-economic and necessary or public goods is relatively non-controversial. Therefore, all nations and governments provide some degree of "full scale" market intervention to provide goods and services for activities such as national defense, infrastructural projects like roads, sewage systems and airports and other public goods like education and scientific research. The promotion of industry is not so unproblematic.

There are many problems with "full scale" state intervention in industry. The first problem is ideological: Liberal market theory demonstrates that prices ought to be the signal for economic activity. Therefore, most governments in liberal, market oriented economies are predisposed to favor non-interventionism. Intervention carries with it risks of failure and creates other practical problems with how to intervene successfully.⁴⁸ Furthermore, there is major problem is knowing exactly how to pick a "winner". Given the risks of picking a "loser", it is rarely done in developed economies.

which raised their wage level to Taiwan levels. Second, as those discriminatory incentives are lifted due to popular demand by South Koreans, the chaekos have all experienced significant problems.

⁴⁸Bureaucrats everywhere fear failure more than inaction. See Pye, (1984, 22) for his description of how Asian leaders believe that not having to make decisions is the hallmark of "power" in Asian societies.

Few OECD countries resort to "full scale" intervention in all but a few sectors of the economy. At the same time, almost all of them use some form of partial intervention across all segments of the economy. By partial intervention, we mean that the state undertakes administrative measures, ranging from administrative guidance, regulation, subsidies or protection, tax incentives, cash operating or capital grants, etc. that are aimed to promote certain kinds of preferred industrial or economic activity, while other industrial or economic activities are not so favored. According to this definition, all of Taiwan's industrial promotion efforts aimed at the electronics and computer industry except for the military electronics sector can be said to be "partial" rather than "full scale" efforts at intervention. Being "partial" intervention, such measures necessarily require the availability of opportunities and resources in the private sector and the acceptance of the state's efforts by private organizations and individuals in order to succeed. In the following pages, I will outline first, the attempts at planning and the measures at industry promotion that arose from the planners' vision of the future.

Electronics Manufacturing in Taiwan

The success of East Asian NICs in economic development is an extraordinary achievement from the point of view of development. It is also an extraordinary achievement in the sense that all four East Asian NICs developed a vibrant electronics and computer industry. In the case of Taiwan, the success of these two industries has reached spectacular proportions. These two industries have developed rapidly from essentially a base of zero in 1960 to its current status as the nation's leading exporting industries. If we were to estimate the prospects of Taiwan for developing such "high technology" industries in 1960, we would certainly give Taiwan little prospects for success. It did not possess a comparative advantage in the manufacture of electronics or computer equipment, nor did it possess the fundamental building blocks - highly skilled electrical and electronics engineering and technical manpower, electronics manufacturing infrastructure, institutional market linkages, etc. - necessary to create one. Thus, the success of these industries is a direct challenge to "market regulation" theories of development. If Taiwan's indigenous resources and comparative advantage were considered as determining factors in isolation, there was little reason to believe that an electronics or computer industry could take shape in 1960. Thus, these two industries form an ideal case study for the

efficacy of industrial policy making and implementation in Taiwan. See Tables 17, 18, 19, 20.

TABLE 17

PERFORMANCE OF TAIWAN'S ELECTRONICS INDUSTRY

Year	Export Value in US\$ million	TEAMA Members	Export Value/Total Export	
1957	0.05	---	0.0	---
1958	0.1(100)	---	0.0	---
1959	0.7(600)	---	0.0	---
1960	1.0(43)	---	0.0	---
1961	1.6(60)	---	0.0	---
1962	2.2(38)	---	0.1	---
1963	2.6(18)	---	0.1	---
1964	4.8(85)	---	0.1	---
1965	7.0(46)	---	0.2	---
1968	---	---	---	---
1969	---	310	---	---
1970	185	417(35)	12.5	---
1971	276(49)	442(6)	13.4	---
1972	500(81)	539(22)	16.7	---
1973	773(55)	772(43)	17.2	---
1974	991(28)	862(12)	17.6	---
1975	741(-2)	853(-1)	14.0	---
1976	1,285(73)	880(3)	15.7	---
1977	1,487(16)	1,069(21)	---	15.9
1978	2,017(36)	1,202(12)	---	15.9
1979	2,823(40)	1,505(25)	---	17.5
1980	3,626(29)	1,722(14)	---	18.3
1981	---	1,978(15)	---	---
1982	3,911	2,084(5)	---	17.6
1983	4,851(24)	2,321(11)	---	19.3
1984	6,578(36)	2,471(6)	---	21.6
1985	6,448(-2)	2,632(7)	---	21.0
1986	8,908(38)	3,067(17)	---	22.4
1987	13,479(51)	3,622(18)	---	---

Cited in (KUO, 1990)

PERFORMANCE OF TAIWAN'S ELECTRONICS INDUSTRIES
MEASURED BY REVENUES OF TEAMA AND TCA

Year	TEAMA	TCA
1966	---	1,112,782
1968	812,501	---
1969	997,100	---
1970	1,707,655	---
1971	1,560,828	---
1972	1,500,017	---
1973	2,170,063	4,791,646
1974	2,572,952	4,890,045
1975	3,776,671	6,833,593
1976	4,523,952	7,581,465
1977	5,929,676	8,189,382
1978	6,874,514	---
1979	8,585,777	9,137,725
1980	13,848,134	17,045,276
1981	19,159,998	16,984,475
1982	18,928,906	18,112,215
1983	23,522,857	17,062,986
1984	37,944,175	17,749,496
1985	39,089,174	19,283,736
1986	48,678,863	16,859,553
1987	55,826,255	---

Note: Numbers are in NT\$.

TEAMA is Taiwan Electrical Appliances Manufacturers Association
TCA is Taiwan Computer Association
Their revenue figures is a good indication of the revenue of the whole industry but tends to undercount the smaller players.

Source: (KUO, 1990)

TABLE 18

Export Modes for Information Products

Mode of Exports	1985		
	Exports from Foreign Invested Companies	Exports from Chinese-Owned Companies	
		(Self-Owned) Proprietary Brands	OEM ⁴⁹
Microcomputers	64	9	27
Disk Drives	65	6	29
Printers	91	0	9
Terminals	63	2	35
Monitors	40	4	56
Other Peripherals	62	6	32
Computer Components	-	-	-
Total	58	5	37

Source: Institute for Information Industry Handbook. (III, 89, 41)

⁴⁹OEM is an abbreviation for Original Equipment Manufacturer or Original Engineering Materials. It refers to products that are manufactured by one firm and then sold to another firm, but not sold under the brand name of the original manufacturer. In other words, an OEM manufacturer is a sub-contractor to a distributor or another manufacturer who incorporates the components into another product.

Mode of Exports	1986			
	Exports from Foreign-Invested Companies		Exports from Chinese-Owned Companies	
	(Self-Owned) Proprietary Brands	OEM	(Self-Owned) Proprietary Brands	OEM
Microcomputers	40	10	28	22
Disk Drives	62	30	0	8
Printers	98	0	0	2
Terminals	69	0	7	24
Monitors	27	15	17	41
Other Peripherals	66	4	5	25
Computer Components	18	2	20	60
Total	36	8	17	39

Source: Institute for Information Industry Handbook. (III, 89, 41)

	1987			
	Exports from Foreign-Invested Companies		Exports from Chinese-Owned Companies	
	(Self-Owned) Proprietary Brands	OEM	(Self-Owned) Proprietary Brands	OEM
Microcomputers	32	9	36	23
Disk Drives	56	16	5	23
Printers	76	0	3	21
Terminals	65	6	7	22
Monitors	18	22	23	37
Other Peripherals	67	4	10	19
Computer Components	21	2	16	61
Total	30	9	20	41

Source: Information Industry Yearbook (III, 1989, 40).

TABLE 19

Export Markets for Information Products

Unit %

Product Area	Information Products (Including Computer Components)	Micro- computer	Disk Drive	Printer	Ter- minal	Moni- tor
N.America	53.44	35.56	54.08	57.8	70.17	58.55
U.S.	51.62	33.94	52.92	57.77	70.04	56.70
Canada	1.82	1.62	1.16	.03	.13	1.85
Europe	32.02	50.14	35.34	32.71	24.18	30.55
Holland	7.44	9.44	10.87	21.01	12.29	8.86
W. Germany	5.78	6.62	6.67	2.85	1.59	4.91
U.K.	5.25	7.74	7.07	3.62	4.40	6.20
France	2.93	5.51	2.56	.24	.99	2.94
Italy	1.90	3.18	1.15	.44	1.24	1.71
Switzerland	1.52	3.40	1.05	.81	.06	.64
Belgium	1.04	1.39	4.73	.14	.24	1.27
Other Areas	6.16	12.86	1.24	4.60	3.37	4.02
Asia & Pacific	9.91	6.33	8.49	6.72	5.04	8.01
Hongkong	2.39	0.36	2.34	1.05	.73	1.85
Singapore	1.88	1.04	2.66	.56	1.69	1.41
S. Korea	0.51	0.16	.73	.07	.01	.38
Japan	1.47	0.38	.80	.27	.34	.69
Australia	2.61	3.32	1.52	3.53	2.08	2.18
Other Areas	1.05	1.07	.44	1.24	.19	1.50
Other Areas	4.63	7.97	2.09	2.77	0.61	2.89
S. Africa	1.47	1.78	.64	2.21	.25	.91
Total	100	100	100	100	100	100

Source: Information Industry Yearbook, 1989. (III, 1989, 42)

TABLE 20

Scale of Operation of Information Product Makers

Product	All Information Products		Micro-computers		Monitors	
Above NT\$5 Billion	4	4	0	0	1	1
NT\$1 Billion to NT\$5 Billion	17	21	5	5	5	6
NT\$500 Million to NT\$1 Billion	18	39	5	10	7	13
NT\$100 Million to NT\$500 Million	90	129	13	23	16	29
NT\$50 Million NT\$100 Million	190	319	22	45	8	37
NT\$10 Million to NT\$50 Million	401	702	62	107	39	76
Below NT\$10 Million	3000	3720	813	920	768	844
Total		3720		920		844

Note: The figure on the upper part of a box is the number of companies in that particular segment, while that on the lower part of the box is the accumulated total.

Source: Information Industry Yearbook, 1989. (III, 1989, 43)

Product	Terminals		Disk Drives		Printers		Components	
Above NT\$5 Billion	0	0	0	0	0	0	0	0
NT\$1 Billion to NT\$5 Billion	3	3	1	1	0	0	6	6
NT\$500 Million to NT\$1 Billion	4	7	0	1	1	1	10	16
NT\$100 Million to NT\$500 Million	7	14	6	7	2	3	70	86
NT\$50 Million to NT\$100 Million	5	19	3	10	1	4	156	242
NT\$10 Million to NT\$50 Million	4	23	13	23	4	8	345	587
Below NT\$10 Million	126	149	219	242	140	148	2866	3453
Total	149		242		148		3453	

Note: The figure on the upper part of a box is the number of companies in that particular segment, while that on the lower part of the box is the accumulated total.

Source: Information Industry Yearbook. (III, 1989, 43).

Analytical Issues

The difficulty of settling the debate between market and bureaucratic regulationists is exacerbated by the limitations of the existing literature. Market regulationists, for the most part, do not conduct exhaustive field work on the relative contribution or lack of contribution of the state to economic development. Frequently, their research work will cite extensive aggregate statistical data, and then stop at that. The actions of critical government agencies are often ignored or downplayed.⁵⁰ Market regulationists do little or no practical theorizing on who are the agents of economic action and on how these agents carry out the process of adjustment in response to prices. This, of course, is the logical consequence of a state conceived to be theoretically restricted to promoting efficient markets with a minimum of intervention in the economy in favor of "private" agents. It is therefore not surprising that bureaucratic regulationists, many of whom have had extensive opportunities to conduct field work, have had a very productive time turning out evidence that the state was indeed a key actor in the process of development. Present research by bureaucratic regulationists

⁵⁰A bureaucratic regulationist writer is perhaps the best critic here. Wade bluntly comments, "Ian Little and Gustav Ranis wrote twenty-thousand-word essays on Taiwan's development, which both make only casual reference to the government's industrial promotion policies." (Wade, 1990, 232)

demonstrates clearly that the state has, indeed, conducted industrial planning, executed an industrial policy to promote certain industries, and finally, where necessary, has used the full panoply of state powers to achieve its goals in all of the East Asian NICs and Japan. (Wade, 1990, 231-266).

The problem with bureaucratic regulationists is not that there is no evidence to support their case. The problem is what to do with this evidence. While market regulationists will stop their analysis at the level of collecting and interpreting economic data, bureaucratic regulationists primarily focus their attention at the level of the state and state institutions. Thus, while state action is extensively documented, the actions of nonstate actors are not well documented. Thus, studies of state industrial policies have been conducted often with no more than a cursory documentation of key facts about the industry in which they are making policy. The majority of these studies have not even begun to understand the industry dynamics that are necessary to interpret why and how firms behave in a certain industry. It goes without saying that these studies, by and large, do not regard the role of competition and firm behavior in these industries as being critical to how and why they behave.

Bureaucratic regulationists are often extreme institutionalists in the sense that they will downplay the influence of

particular individuals - either as bureaucrats or non-state actors - in the process of policy making. While this form of abstraction is useful and necessary for analytical purposes, the reality is that this is often not possible. As one descends the levels of policy making to more and more micro levels, one finds that individuals, whether bureaucrats or non-state actors, play an important role. The reality is that individuals do play key roles in policy making. Key persons make, or fail to make contributions, which in turn influence policies affecting the fate of entire industries or firms. Without an exhaustive study that evaluates motives and consider constraints and resources of key individuals, it is not possible to suggest that there is a faceless bureaucracy acting in the general interest of "development". Despite this need to conduct detailed empirical investigations at the level of individual actors, few studies written from either the bureaucratic or market regulation perspective have tackled this problem.

The role of bureaucratic politics is something to which bureaucratic regulationists have traditionally paid little attention. The reason is twofold. First, should there be extensive bureaucratic infighting, then the argument that such conflicts result in optimal decision making is undermined. Second, bureaucratic infighting tends to tarnish the image of a united state driving society marching to one tune towards

the goal of industrialization. The reality is that bureaucratic politics plays a critical role in policy formulation. In chapter 3, I will demonstrate how bureaucracies - at the micro level - will find their ability to understand a particular industry enhanced or reduced as critical individuals came and left the ministry. Policy formulation is sensitive to the extent that critical individuals will often be the sole source of information and contacts within an entire bureau. Moreover, the motivations and capabilities of these key individuals are vital in understanding why they chose particular courses of action as they did at a certain time. Therefore, their careers, as they rose and fell, became a necessary variable to understand how and why policy shifts. The problem of formulating state interest as a coherent whole is eclipsed by the problem of defining bureaucratic and individual interests.

Analyzing bureaucratic politics is tied up with another difficulty. Chinese institutions have traditionally been relatively weak institutions in the sense that rule by law have always been subservient to rule by man. Therefore, even though extensive policies may become institutionalized, they are not institutionalized to the extent that they cannot be bypassed by key actors with personal power. Thus, once again, what appears to be well thought out and well implemented plans

often go astray. Finally, the weakness in institutions is tied up in the issue of how we deal with interests.

Another critical problem for comparativists who are studying development is the problem of convergence. Even if we were to ignore the above problems for a moment, there is still the problem of how we analyze industries. Industries, according to both the market and bureaucratic regulation traditions, are assumed to be the same everywhere. Therefore, industrial activity is presumed to be similar and data for industries can be readily compared across different countries. The implications of this are critical for comparative studies. If industries are in fact dissimilar in their behavior and organization, then direct comparisons of industries between different countries are a fundamentally flawed exercise. While segments of industries may have a great deal in common across different nations, aggregates that consist of an industry are often greatly at variance with respect to their make-up of products and activities.

The organization of many small- to medium-scale indigenous industries in Taiwan does not fit the pre-conceived classification systems developed in the western world.⁵¹ While the petrochemical and steel industries are excellent examples

⁵¹There are industries that fit the classification system well. For example, the electric power generation industry is the same everywhere.

of industries that are relatively well understood with an assumption that they are like their western counterparts, the reason is because these industries consist of a relatively stable configuration of capital goods, technology, marketing and distribution networks that cannot be "moved" into another "industry" without costs. Thus, their ability to diversify into different businesses without large frictional costs is limited. In contrast, most small- to medium-sized industries, which account for a large percentage of the manufacturing output in Taiwan, are not organized in the same way. They are specialized only to a limited degree. They do not see themselves as "industries" but, rather, as general-purpose businessmen. Should they own specialized capital equipment for an industry, they are likely to see it as a tool that has a set of capabilities that are not specific to an "industry". (Myers, 1984) Thus, the owner of a metal-stamping press would see himself as being in the business of stamping metal. He is indifferent as to whether the stampings are used in the automobile or consumer products industry. The implications of this absence of self-defined institutional boundaries for industries are significant for several reasons. First, businessmen in Taiwan are prone to -- from the western point of view -- move around to different "industries". To them, they are doing the same thing: making money. Secondly, firms can and do exercise considerable freedom of entry and exit into different "industries". Yet it would be anathema for

most of them to consider laboriously acquiring specialized manufacturing technology or skills that would permit them to be the "low-cost" producer. Thus, small- and medium-scale firms in Taiwan are engaged in a form of flexible manufacturing (Piore and Sable, 1984) without the high technology visualized by Piore and Sable. They are playing industrial arbitrage with low technology inputs. The implications of this pattern for analysis are clear. A mechanical application of the western notion of industries to an analysis of the success of Taiwan is fraught with perils. This is especially true when SIC codes are arbitrarily compared without considering their relevance. It is liable to miss the entrepreneurial nature of many firms, particularly in, but not limited to, the small- to medium-scale sector. Later, we will demonstrate how this form of "switching" is in fact a primary factor in explaining the rapid spread of technology and skills in Taiwan's economy. State policies were in fact helpless in regulating or controlling this phenomenon.

Finally, there are the common analytical problems dealing with any study of industrial policy. As with any bureaucratic process, government officials are driven by a fundamental need to look good. State bureaucrats - who are, after all, human - are notorious for selective memory when it comes to policy successes and failures. Thus, any history of their action,

unless written by someone who is an insider with an overarching view, is likely to contain nothing more than self rationalizations of past policies and actions that very selectively "remembers" what worked and "forgets" what did not. Therefore, while information of what they did "right" is relatively easy to obtain, information on policy failures or other less than successful areas of policy formulation is hard to obtain. Bureaucrats, as from ancient times, have been skilled at court politics. It is only human nature that they will try to conceal data and evidence that is contrary to their "official version" Thus, it is often difficult to separate policy pronouncements from implementation and similarly, piece together a comprehensive account of the political maneuvers and politics that lead to a particular policy. This study has attempted, as much as possible, to reconstruct the events as they occurred rather than as policy makers like to remember them.

The difficulties of formulating industrial policies notwithstanding, the government of Taiwan did carry out an impressive list of actions to promote industry. Please see Table 21 for a major list of policy initiatives that were specifically aimed at the electronics industry. In addition to these specific sectorial policies, the whole range of state regulations and incentives that were used in Taiwan in general was applied to the electronics industry:

1. Indirect Incentives
2. Tax holidays for "foreign investment"
3. Subsidies for research
4. Funding for Research and Development
5. Support for education and overseas scholarships
6. Trade promotion support

While these measures are by no means unimportant as industrial policy instruments, this thesis will limit itself to dealing with major initiatives that were thought to be targeted specifically to the electronics and computer industry. The reason for this focus is because these other policies, while important variables in the whole of Taiwan's developmental history, would have been relatively "policy neutral" with respect to any industry. Therefore, that in itself did not assure that Taiwan would develop competitive electronics and computer industries. The major policies that this thesis will focus on are all measures specifically aimed at, or thought to be targeted at, the electronics industry. These policy initiatives are outlined in Table 21.

Table 21

Major Policies to Promote the Electronics Industry (1960-80)

1961	Stanford Research Institute, a consulting firm commissioned to study industrial policy, identified Radios as item of potential interest to foreign investors
1962	Local Content Requirements set up for Televisions
1965	First Export Processing Zone Opened
1966	Plan published to promote "electronics industry center
1967	Joint Working Group formed to Promote and Coordinate Electronics Assembly Industry
1967-68	Exhibitions to promote Local Manufacturers
1969	Proposal made to set up Science Based Industrial Park
1973	Arthur D. Little Consultants Studies state of electronics industry
1973	Arthur D. Little Consultants drafted Plan to Promote Computer Peripherals, Minicomputers and other items
1973	Establishment of Industrial Technology Research Institute (ITRI)
1973	Plan made for Hsinchu Science Based Industrial Park
1974	Formation of Electronics Research and Service Organization (ERSO) under ITRI to promote IC manufacturing
1976	State Opened IC Fabrication Facility
1979	Establishment of United Microelectronics Corp. (UMC) as state-private industry joint venture

Source: D. Lam

This study will demonstrate that on a policy making level, the overall contribution of the state is certainly not zero. It did make a positive contribution. However, the study will demonstrate that this series of actions, rather than being a well planned out and executed program, was in fact a series of ad hoc measures that were cobbled together by the players at the time. There was no long term plan in the sense that these actions - even in the broad sense - were not anticipated in advance. They were not necessarily coherent as a package and in many cases, the results of policy actions were not the intended outcome of any player or group of players or institutions. While it is beyond the scope of this thesis, the issue of assessing these measures can only be done by quantifying the extent of these contributions and evaluating them against the cost of the failures.⁵²

The real problem is that even if state policies are taken fully into account, they primarily affected only a segment of the economy. Large segments of the same industry can, at the same time, be left relatively untouched by the impact of these state actions. Consequently, detailed studies of industrial policies that do little more than list actions taken by the

⁵²A detailed cost-benefit analysis might involve assessing the cost/benefit ratio by taking discounted cash flows of the amount of additional profit/loss generated by each measure. Such a study would involve a large amount of speculation as to the "might have been" picture.

state, without detailed study of how this is mediated through the industries and firms involved, are fundamentally flawed. A case in point is Wade's study of industrial policy making in Taiwan,

"In 1965 the first export-processing zone opened, where foreign and domestic firms could enjoy unusually unfettered conditions in return for exporting all of their production. In 1966 the government published a plan to turn Taiwan into an "electronics industry center." Electrical and electronics exports grew at 58 percent a year between 1966 and 1971."⁵³

While it may be true that exports grew, it does not follow that state action was either necessary or sufficient to be a cause of that outcome. There is no discussion of the consideration of firms that either chose, or chose not to participate in the state initiative. There is no evidence of state plans being implemented into specific policy actions, and assessing the impact of these initiatives in retrospect on firms. Suppose a few private firms independently set up an operation to export electrical and electronics goods entirely

⁵³Wade (1991, 94-95). In reality, it was not so much a plan as a vague document that was more an aspiration than reality. It certainly did not contain elements of a plan that includes details for implementation and an institution to carry out the task. See Chapter 3 below.

in ignorance of the state initiatives, the evidence presented above would have made it look as if the state was the critical factor. Without detailed interviews of the firm's perspective and its reasons for its action, this conclusion is unfounded. Consequently, such studies of industrial policy that claim effective outcomes are at best, unproven speculation.

This brings us to the crux of the problem in industrial policy making. Because industrial policy is by definition a means to which some groupings of activities are favored over others within a polity, it begs the question of the process of politics involved in distributing cost and benefits. Chalmers Johnson's vision of the benign state bureaucracy that takes the long range view to guide development for the good of the whole is fraught with difficulties. This view does not take account of the political nature of economic planning and policy making. Friedman comments,

"[In Johnson's view], MITI's policies have no background; they spring fully formed from the desks of the relevant industrial bureau. ... Yet Johnson's research is filled with instances where political opposition led to the transformation of MITI's plans or their wholesale rejection. ... Carefully examined, the record Johnson himself provides gives little support for the idea that MITI and its predecessors guided development. Indeed, it

seems more likely than at best, policies resulted from a compromise forced on the bureaucracy, or even business constrained the state. Johnson's research design, a historical account of MITI's internal politics, cannot falsify any of these propositions."⁵⁴

Furthermore, industrial planners are far removed from the day to day grind of making a profit that drives business. Therefore, their very distance and loose coupling with market forces makes them more prone to read market signals incorrectly or to misinterpret trends. Later I will demonstrate how policy makers translated their misguided visions and aspirations into policy with disastrous results.

The differential impact of policy on different sectors is further exacerbated by the nature of policy making in Taiwan. High technology policy, by its nature, created a large discrepancy between the existing industrial structure and the new islands of activity. Consequently, the high tech sectors created had an inherent tendency to become islands of activity. While policy makers were relatively successful in creating islands of such activity at the expense of vast state subsidies, the impact of their existence on the industries as

⁵⁴Friedman (1988, 30) expands on this line of critique.

a whole has been relatively limited. Indeed, the thesis will show that they were almost two discrete sectors of the economy. The sector that in fact, made it possible for the high tech sector to thrive was the "guerrilla capitalist" sector, which the policy makers always despised as "low tech" and treated with disdain. It was only because of a number of fortuitous events that the economy was able to achieve a dynamic fusion of these two sectors. These events, while unique, were not understood either by the planners or policy makers until they stumbled upon them. A case in point is the impact that the breaking up of Bell in the U.S. had on Taiwan. The Bell break-up created a vast new market in "add on" telephones that could be made relatively cheaply by the island's "low tech" assemblers of radios and electronics goods. However, it also created a demand for a custom IC chip which was the electronic brain of the telephone. Because this chip was available only from a few relatively high priced suppliers in the U.S. and Japan, it created an opening for Taiwan's fledgling IC makers toward the end of the 80s. However, this event could not have been foreseen by any of the players before hand. Had this unforeseen event not occurred, the evolution of the industry would not have run in its present course. Furthermore, had the state eliminated the "low tech" sector, even if the IC had been developed in Taiwan, the firm would have to compete for business in other countries and lose the advantage of having a large base of

local customers to help them develop and test products. The history of the electronics and computer industry's development is impossible to complete without referring to the impact of these events on the industry. Similarly, who could have predicted the impact of the personal computer in the computer industry ahead of time? Yet, these events are often left out of the conventional "bureaucratic regulation" accounts of development on Taiwan.

Summary

The idea that Taiwan's development is primarily caused by the state is a problematic one. The state, like any large organization, has great difficulties bringing its theoretical power and resources to bear on micro-level problems such as development of particular segments or sectors of industry. There are great problems of a state "knowing" any better than any other similarly equipped group of individuals. When a state does act, it is more likely than not going to produce a joint output that is the result of many political compromises and other deals. This makes the likelihood of rational choice in state action a relatively difficult goal to achieve. Even when it does act to directly intervene in the economy, the state is not likely to have broad outcomes achieved except in areas where the state has a distinct competence in such as macro-economic policies. It is likely to create an "island"

of outcomes. At the same time, there can coexist even in the same industry other segments that may or may not be touched by state policy. In order to understand the development of an entire industry, it is necessary to carefully demarcate and outline the areas where the state did make a contribution, and then also, at the same time, seek out other segments where the state may not have made a contribution. It is only in this holistic context that the real contribution of the state can be assessed. In the next chapter, I will demonstrate how much difficulty the state has in gathering information and long range planning. It will show that the economic plans that were produced were not necessarily a sound reflection of the intent of the state as a whole per se, but particular interests that may be completely unrelated to the state as a whole.

Chapter 3

THE ORIGINS OF STATE PROMOTION OF INDUSTRY

State intervention to promote "high technology" industries is not new or unique to Taiwan. Almost all OECD and many Newly Industrializing Countries have either overt or disguised programs to promote "high technology" industries. Taiwan is, however, unique in that it is one of few developing countries that has succeeded in developing a flourishing electronics and computer manufacturing industry in the span of less than thirty years.⁵⁵ Moreover, the electronics and computer industry appeared to have at least partially achieved the elusive goals of reducing foreign dependence, introducing higher value added products over time, and induced a diffusion of high technology into the economy in general by 1990. Thus, these two industries appear to be prime examples of successfully executed state policies that have achieved many goals set out by the state in the 70s and 80s.

A prior assessment of Taiwan's prospects in developing such "high technology" industries in 1960 would certainly have given Taiwan little prospect for success. According to

⁵⁵The others are Hongkong, Singapore and South Korea. The concentration of these industries in the NICs is no accident. All of them were initially electronics assemblers and their local industry developed along much the same path.

liberal economic theories of comparative advantage, Taiwan did not possess a comparative advantage in the manufacture of electronics or computer equipment, nor did it possess the fundamental building blocks - highly skilled electrical and electronics engineering and technical manpower, electronics manufacturing infrastructure, institutional market linkages, etc. - necessary to readily create one. See Table 40 for the number of engineers trained in Taiwan. Thus, the success of these industries is a direct challenge to market regulation theories of development. If Taiwan's indigenous resources and comparative advantage were considered as determining factors in isolation, there was little reason to believe that a electronics or computer industry could take shape here in 1960. Yet this did not deter the state from taking action to create one in the early sixties.

Because state intervention and guidance has proven to be extensive in the development of Taiwan's computer and electronics industry, the evidence to support the notion of a "Strong Developmentalist State" in guiding development of these two industries is, a priori, attractive. In this chapter, I will begin by sketching out the early efforts at promotion of these two industries in the 60s to establish the context of policy making in the period prior to the late 60s. By then, the industry had developed into a major employer and player in the economy. Specifically, I will argue that what

appeared to be consistent long term state planning to develop these two strategic industries from the 60s in fact is no more than a series of ad hoc measures. Efforts to "upgrade" industry came to naught in the seventies. Major projects were launched not on the basis of long term plans, but on little more than the personal aspirations of key officials who had no notion of long term planning beyond completion of their projects. This pattern also did not improve over time. Even in the early 80s, with growing bureaucratization and support, there was a large discrepancy between the planner's vision of high technology and what transpired.

The Origins of Indicative Planning

The limitations of indicative state planning had been well known for many years by the 1950s. Despite the inability of indicative planning to gain acceptance in any developed western industrial country outside of France, it has been used in Taiwan through the Council for Economic Planning and Development and its precursors since the early 50s. The reasons why this planning technique was adopted in the 50s has been a subject of some debate. Several senior officials offered an intriguing explanation: They both pointed to the 50s as a time of grave crisis and danger in Taiwan. It was a time when the regime was under great stress both from preparations for an attack by Communist China as well as

practically living from hand to mouth. US military and economic assistance and the presence of the 7th fleet was all that kept the regime from being overrun by Communist forces. In this context, US economic and military advisors achieved a greater than life status whereby their orders were, in effect, the law. The regime in those early years could not afford to offend their American friends. In view of the negative view of the regime as being corrupt and responsible for "losing" the mainland, they were all the more eager to please their American advisors. Indeed, their most immediate and largest source of foreign exchange in the early 1950s was American foreign aid. It was in this context that the first plan was formulated.

The first "economic plan" formulated was in fact, not an economic plan. The task of drafting this document fell to the Economic Stabilization Board (ESB) which was established in 1951 with a primary mission to:

"Review and coordinate trade, payments, and monetary and fiscal policies, in the interests of stabilizing the price level." (Jacoby, 1966, 58)

The ESB board was comprised of senior officials from the Ministry of Finance and the provincial governor of Taiwan. Although there were no Americans represented, members of the

USAID mission were present at their meetings and advised them. (Jacoby, 1966, 59) In 1953, this agency was given broader powers and reorganized into five committees in 1953 which oversaw the development of the economic plans, and, furthermore, an Industrial Development Commission was established to implement the plans. The first plan developed by this organization was in no way a comprehensive development plan. It was a document titled "Plan for the Application of U.S. Aid".⁵⁶ (Kuo, 1990, 67) It was a document that was required of countries applying for foreign assistance under U.S. law. (Kuo, 1990, 68) Because the government lacked the capability to make any document that met the requirements of USAID, American consultants, the White Company, was brought in to make a plan. In effect, the government of Taiwan found it convenient to hire consultants who knew how to "fill out the forms" to the specifications needed to obtain foreign aid. Based on hasty reports from different ministries, a plan was created. This document was manufactured with no input from business and only limited input from different sectors of the

⁵⁶This document was mis-cited by Wade (1990, 81) as the "Plan for Economic Rehabilitation". Furthermore, he mistakenly believed it was a crude economic plan "a little more than a collection of projects already underway or partially prepared for implementation.... The main thrust was to encourage government agencies through a three-prong effort (import substitution, increasing traditional and new exports, and encouraging foreign capital from Overseas Chinese" (Wade, 1990, 81) In fact, the "Plan" was a collection of justifications for foreign aid projects requests before US AID.

government. (Kuo, 1990, 68) Once the first "economic plan" was manufactured, the government set about to make a better plan. After the second plan for the years 1957-60 was drafted, the Economic Stabilization Board was disbanded because its functions overlapped the turf of three ministries. Consequently, the functions of the board were divided and restored to the Ministry of Economic Affairs (MOEA), the Ministry of Communications (MOC), and the Council for U.S. Aid (CUSA). The problem was that the ministries proved incapable of completing the plan. Consequently, the bureaucracy had to hurriedly back track and reactivated central control over planning under the aegis of the Industrial Coordinating and Planning Group and the Agricultural Planning and Coordinating Group together with the help of former staff from the Industrial Development Commission of the Economic Stabilization Board and the Joint Commission on Rural Reconstruction (JCRR), an organization formed in 1950 between the Americans and the Chinese government to oversee the land reform program. (Li, 1976, 91) Thus, the third plan was produced in some disarray by this hastily formed group under the Ministry of Economic Affairs, to become the Plan for 1961-64. It was a document crafted for the purpose of obtaining foreign aid. The plans were a means to an end, but not a guiding document in any sense. Once the funds for projects were dispensed by USAID, the spending of it was quite up to the government. It is not surprising that,

"Neither the state nor the business sector took seriously the first three Four Year Plans which were merely required documents for aid applications." (Kuo, 1990, 68)

However, this document was to take on a life of its own for several reasons. First, the amount of funds tapped by USAID was small to begin with, many projects that were grandiose were either dissuaded by USAID mission advisors or rejected. Furthermore, as the economy recovered, the percentage contribution of foreign aid declined in relative terms even before it declined in absolute terms. Project assistance by USAID, measured according to the amount approved that would have required an application like the "economic plans", peaked in 1959 at \$55 million dollars and declined thereafter. (TSDB, 1991, 247) However, the government of Taiwan had another source of foreign exchange in the form of loans.

In those early years, Taiwan was also heavily dependent on foreign loans from the International Bank for Reconstruction and Development (IBRD) and other commercial lenders. Foreign loans were critical to the regime because it supplemented the meager foreign exchange earnings from exports, and it was a main source of foreign exchange together with US military and economic assistance. Whereas AID monies (United States Agency for International Development) had many strings attached

including stipulating that the majority of aid be used in the USA, IBRD loans were comparatively less stringent. Moreover, even with the strings attached, they did free up resources for other purposes. A crucial factor was the willingness of IBRD to lend, which legitimized the regime, and made it possible to obtain commercial loans to allow the regime to purchase what it wanted from around the world.⁵⁷ Being an embattled regime that had little political security save for the presence of American troops, foreign commercial loans were all but impossible to obtain in the early 50s without these measures. Thus, until the regime was able to effect a primary recovery of exports from Taiwan's domestic industries and demonstrate to the international banking community that they were not in immediate danger of invasion, IBRD loans were a critical source of foreign exchange.

American influence in securing IBRD loans is crucial in several respects: first, the United States controlled the largest single vote at the IBRD. Second, American influence was vital in maintaining continual diplomatic recognition of this embattled regime. Without diplomatic recognition at the UN and by major powers, the regime could not seek loans from this institution. Finally, American advisors, more than

⁵⁷There was also a certain amount of diversion of World Bank loans for other projects. This was hinted at by officials familiar with the loans. Interview O.

anyone else, were very familiar with what the IBRD bureaucracy wanted to see as the condition for granting a loan. Like the applications for USAID, nothing is more important than having a "plan" for economic growth that shows an IBRD loan will be profitably put to use. Naturally, Taiwan was able to continue this art of "making up" a plan learned from its experience from applying for USAID. Plans were written up even though they were relatively meaningless in the overall context of both the political and economic uncertainty the island faced. Chinese officials, indeed, commented that they "prefer 'loose' planning". (Jacoby, 1966, 143) Given how readily the economy can be buffeted by events beyond its control, the plan was, for all practical purposes, nothing but a document prepared to satisfy the IBRD. The plan was not backed up by what was needed to make it a real program: it had no teeth that enforced compliance with the plan. Therefore, it was, in kind words, window dressing. While these short-term plans were useful in securing project financing, this did not explain the origins of long-range planning.

Inasmuch as indicative planning began so inauspiciously, like most bureaucratic documents, this one sprang a life of its own rapidly. The Council for International Economic Cooperation and Development (CIECD), became home to a planning agency in 1963. CIECD was originally established in 1948 as the Council for U.S. Aid (CUSA) as a unit charged with coordinating the

disbursement of foreign aid, selecting projects, and offering a direct channel to monitor and control the disbursement of government assistance. It was not an agency of the Chinese government, which would have diminished the efficacy of foreign aid. (Jacoby, 1966, 61) CUSA evolved into CIECD in 1963 by the government amalgamating CUSA's staff, now obsolete with the ending of US foreign aid, with the three planning groups from the MOEA, MOC and the JCRR. This new agency was charged with the mission to gradually wind down aid projects and, at the instigation of American advisors, also to energize the private sector. This is taken by the Chinese to mean securing foreign loans and investments in lieu of the former source of foreign aid. Accordingly, it was charged with the broad mandate of carrying out, "technical studies, commodity import programs, long range economic planning, investment operations, technical cooperation, and manpower development". (Jacoby, 1966, 66)

CIECD's long range planning agency was originally established as a planning group within CIECD. The move for establishing this long range group did not come from the American advisors, who were, as expected, liberals who felt ambivalent toward economic planning. The initiative came from the Chinese government, which wanted the group to demonstrate that Taiwan can ultimately be viable without foreign aid. (Jacoby, 1966, 142) Accordingly, the first ten-year plan for the years 1965-

74 was produced. Because this plan was internally consistent with the four year 1965-68 plan, the credibility of the Government was enhanced. This was in response to widespread criticism of US foreign policy in the earlier years which gave away much funds to the Chinese government only to have the aid wasted on corruption, and charges that the embattled Republic of China would remain a permanent basket case for US aid. These charges, and other criticisms of the Nationalists, were making it difficult for Taiwan to secure loans beside foreign aid even as that was declining. Partly as a result of this positive publicity and the "documentation" of Taiwan's viability, it resulted in one of the break-throughs of this trying period: the successful securing of a package of \$180 million in low interest foreign loans from the United States and Japan by the then junior Vice-Chairman of CIECD, Mr. K. T. Li, (Gold, 1986, 78) who was eventually to become a minister of economics. In other words, the impetus for long-range planning, rather than short term planning that was needed for loans, came about for a reason entirely different than ideas of promoting and guiding economic development.

Therefore, the institutionalization of economic planning succeeded by 1965 at the CIECD, which was later to become the Economic Planning Council (EPC), the forerunner of the Council for Economic Planning and Development (CEPD), after the termination of US aid, which made the institutional mission of

coordinating aid obsolete. This organization was to continue its task of writing and publishing economic plans. The four-year plans remained useful documents for the purpose of obtaining loans for much longer afterwards. The long-range plans were continued for no other reason than because of bureaucratic inertia once Taiwan's long term economic viability was no longer in doubt. Much later, these plans were regarded by bureaucratic regulationists as evidence of long-range state planning and guidance of the economy.

Attempts at State Intervention

As we can see above, whereas Japan's Ministry of International Trade and Industry (MITI) had descended from a Ministry of munitions during the war with real teeth (Johnson, 1982, 157-197), CIECD, the equivalent organization in Taiwan did not. It had different origins initially and thus, its initial institutional arrangements were different. Whereas MITI reached the height of its power after the post-war period during reconstruction, followed by a gradual decline in its role through-out the sixties and seventies as Japan's economy grew, CIECD was never at any time even an agency with comparable powers. However, in the post-war period, its public role gradually expanded from being an agency created to please a few actors such as the IBRD and US advisors to take on a bigger role. The expansion of its role was not, however,

in the direction of exercising more direct control over the economy. Indeed, as aid wound down in 1963, CIECD became an orphan bureau in the government. It was kept alive because it still served the purposes of making up planning documents to get foreign loans, which were aimed at securing foreign financial and technical assistance. (Li, 1976, 92) Its reason for existence diminished with the ending of foreign aid and easier access to commercial loans by the late 60s. The extent to which the plans were of limited utility was demonstrated by:

"[CIECD]... did not devote much energy to the plans because [its writers] was composed of department heads occupied with other chores... The result was the plan's underestimation, sometimes by as much as 70%, of Taiwan's economic potential during the most critical years of its development. The planning authority did not even bother to revise its plans after real growth records surpassed the expected goals. Hence, basic infrastructural construction lagged far behind industrial needs.... Commenting on the loose connection between development plans and their execution, one economist and high-ranking official in the late 1960s concluded that Taiwan's development never had a long-term plan." (Kuo, 1990, 68)

The rise of CIECD in 1963 was caused by an accident of bureaucratic politics. When the US Aid Mission, (CUSA) began to wind down, there was a question as to what to do with the staff of the mission as well as who would take over the residual tasks of administering the U.S. Aid programs. CUSA staff was merged with its Chinese counterparts in the MOEA, MOC and the JCRR. At that time, Li Kuo-Ting, who was the Secretary General of the Council on U.S. Aid (58-63)⁵⁸, was able to secure a comparably high position at the new CIECD. He became CIECD's Vice Chairman in 1963. In turn, Li was able to use this position to move himself into the post of Minister of Economic Affairs in 1965 even though he held onto his post as Vice Chairman of CIECD until 1973. While CIECD was still useful in helping to secure foreign loans in the years immediately afterwards, the real cause of its survival and rebirth in the late sixties was its strategic locale and the co-incidental rise of Chiang Ching Kuo.

⁵⁸This agency was not a part of the regular government. It was an agency that was quasi-governmental, with representatives from both the U.S. Aid mission and a locally hired staff. The primary benefit of working for it was the fact that it paid considerably better salaries than an equivalent position in the Taiwan government. It gave someone like Li Kuo Ting, who was a Cambridge University graduate with excellent English, a great career opportunity. He was able to distinguish himself from many chinese officials by his facility with English. By securing a job at CUSA, he provided himself a career path traditionally known in chinese society as a "barbarian handler". Using his power and influence with the Americans he built up here, he was able to advance his career rapidly without using the traditional paths in the bureaucracy.

President Chiang Kai Shek's son, Chiang Ching Kuo, was a rapidly rising star in the government after the death of his rival, Chen Cheng, in 1965. By deftly building a power base in the military and national security agencies, he became Minister of National Defense in 1965. From this position, he became vice premier in 1969 as President Chiang Kai Sek became less and less able to manage the day-to-day affairs of government with advanced age. Chiang Ching Kuo took over the chairmanship of CIECD and a related agency, the Financial, Economic and Monetary Conference, in 1969. From this position, Chiang Ching Kuo sought to gain control of the critical Ministries that controlled economic policy. This was particularly a problem for Chiang Ching Kuo because he did not have a base of power in economic affairs. This was traditionally an area dominated by Chiang Kai Sek's wife's relative, T.V. Soong. First, Chiang engineered the fall of Hsu Po-yuan, Madam Chiang's financial expert, through a scandal. (Winkler, 1990, 160) Next, Chiang Ching Kuo forced Li Kuo Ting to accept a Chiang Ching Kuo protege, Fei Hua, to become chairman of the CIECD. Chiang Ching Kuo then utilized CIECD as a power base, which he reinforced with many young technocrats to strengthen his sources of information into the other ministries, using the information gathering role of CIECD as his justification for information on the goings on of the ministries responsible for economic management, which was not his power base. (Gold, 1986, 92)

When Chiang Ching Kuo was made premier in 1973, he was able to use this information effectively to remove many senior officials under the rubric of a crackdown on corruption and replace them with officials loyal to him from the CIECD. The crackdown on corruption demonstrated his power amply by,

"jailing of a former personal secretary to Chiang Kai Shek, members of the feared Taiwan Garrison Command (i.e. the security forces), and wealthy businessmen". (Clark, 1989, 131)

As the usefulness of CIECD to him was coming to an end, Chiang Ching Kuo replaced it with the Economic Planning Council (EPC) to prevent someone else from using it as a power base to spy on him or to undermine his power. The functions of the CIECD that were of substance were transferred back to the ministries. (Winckler, 1988, 160) Much of the staff was dispersed and transferred to other ministries while the EPC was staffed by a weak chairman. (Gold, 1986, 92) The new EPC's "responsibilities included only economic planning and research. It had no funds to implement plans nor power to evaluate them." (Gold, 1986, 92)

Direct economic policymaking control under Premier Chiang Ching Kuo rested in the ministers who actually had clout at the Ministry of Economic Affairs, the Ministry of Finance, and

other senior officials. This group of five economic and financial policymakers was headed by Central Bank Governor Yu Kuo-hwa, who was also a loyal Chiang family insider who reported directly to Chiang Ching Kuo. (Gold, 1986, 92) While technically, Chiang Ching Kuo was not the head of government, which was the President, the position was filled by a weak official, Yen Chia-Kan, who officially succeeded Chiang Kai Sek as president in 1975. Even though technically, Chiang Ching Kuo was only the premier, in fact, after his father's death, he ran the country from the premier's office. (Winckler, 1988, 160)

With a powerful "inner cabinet", Chiang Ching Kuo launched major initiatives to shore up the then faltering economy in 1974, which was severely affected by the oil shock. This event was never anticipated by the planners at the EPB and they were further discredited by their inability to adjust to it. The sixth four-year plan for 1973-76 was scrapped by these unforeseen events. It was not until 1978 that Chiang Ching Kuo finally secured the post of president officially. At that point, he appointed a weak technocrat as premier and moved much of policymaking power with himself to the president's office. (Liu, 1984, 318-59) The so-called Economics Planning Board is no longer a powerful organization, if it ever was.

Under such unfavorable circumstances, more often than not, EPB was to become no more than just the sounding board for policies made elsewhere. As we have demonstrated above, it was a power to the extent that the individuals who happen to occupy its place had a power base on their own. It had only a very limited basis of power as an institution. The key players, as they wished, expanded or contracted its powers and budgets at will. In this respect, there was a uniquely Chinese character to their treatment of institutions. As Pye observes,

"Chinese leaders can make institutional changes almost by whim ... ministries are added and subtracted as though built of cards..." (Pye, 1984, 291)

To the extent that the Economics Planning Board planned, it was only by way of going through the motions. Indeed, EPB was, as with many other quasi-state institutions, becoming a "refrigerator" in the government: A place where senior politicians and bureaucrats could be temporarily parked until they could be assigned responsible line positions.

The toothless Economic Planning Board was to be partially revived in 1977 when the trusted Yu Kuo-hwa was installed as its head. However, at the same time, the five-man economic policy committee headed by Yu was also terminated. While Yu

Kuo-hwa remained the governor of the Bank of China and Minister of State, he was simultaneously asked to become the chairman of the successor to the Economic Planning Board. The EPC was then renamed the Council for Economic Planning and Development (CEPD), its current name, and given broad powers to do macroeconomic planning, set priorities, coordinate and evaluate. Although the CEPD gained influence and power under Yu, even with his diminished role in government, it was still not a line agency that had the power to make substantive decisions. Later, I will demonstrate how the agency was in fact not a major player in policy making. The advocacy of high technology manufacturing from the CEPD under Yu was in fact originated from the Minister of Economics Affairs, Sun Yun-suan. Consequently, despite the reinvigorated CEPD, it being the source of numerous publications about the future direction of the computer and electronics industries, it is not necessarily an indication of the power of the agency with respect to industrial policy.

The history of ad hoc planning and the toothless nature of the planning agencies, coupled with the institutional weaknesses of the planning agency, does not, however, suggest that Taiwan's government does not have an industrial policy. The government did have vague notions of what it wanted to do and did carry out a set of actions which, in retrospect, can be seen as an emergent strategy. (Mintzberg, 1990, 25) While

the idea that this represented a planned move, a priori, may be doubtful, the state did, on occasion, act with a strategic vision to move industry towards certain goals. In this context, although industrial policy is not new to Taiwan, comprehensive industrial policy geared to specifically support the electronics and computer sectors is relatively new.

The first sectorial specific plans for the electronics and computer industries were not created until 1980. Prior to 1980, planning and policy for these two industries consisted of a series of relatively limited, ad hoc measures that were not necessarily, and often not, launched by the planning agencies. Therefore, the following discussion will only be concerned with the electronics industry beginning with the pre-1980 policy environment. The 1976-81 plan was particularly critical because it was at that time that the electronics and computer industry could be clearly seen as future "sunrise industries". Whether state planners foresaw this development is a critical test of the bureaucratic regulation theory's claim of a successful planned state intervention. The following chapters will tackle the policies and actions taken by the state to promote the industry in the early 1960s to the mid 80s. In addition to creating two detailed sectorial specific plans, the state initiated a series of policy measures in both industries including financial and tax incentives to develop specific products;

purchase, develop and transfer technology to the private sector; improve the supply of qualified manpower; establish a strong marketing capability in the private sector; and also to produce specific infrastructure for "high technology" companies. While these measures were certainly important, it did not represent foresight as by that time, it was self evident that these industries were already "sunrise" industries.

State Planning and Regulation 1960-65

Extensive industrial planning in Taiwan to support the electronics and computer industry is a relative newcomer to policy making. Up to 1963, the local industry was only capable of assembling radios from imported components that were sold on the local market.⁵⁹ The reason for this assembly operation was that imports of radios were restricted in 1950 after the arrival of the defeated Nationalists from the

⁵⁹At that time, transistor radios were still a relatively novel item. The radios assembled here were Vacuum tube based models that consisted of a series of relatively "low technology" components like the wooden cabinet, a tuning capacitor and a number of tubes. The tubes were the "high technology" component, which had to be imported. Little knowledge of technology was involved in manufacturing a radio except for designing the basic circuit and manufacturing the tubes.

mainland.⁶⁰ This was reflected in the 1953-56 Economic Plan which listed radio manufacturing as an item to be protected.⁶¹ Because Taiwan did not, at that time, manufacture the critical "high technology" component in radios --- vacuum tubes --- naturally, such components had to be imported from Japan, the United States or Europe. Protectionism for the electronics industry in this period failed to achieve anything more than to create local assemblers of radios from imported parts. Rather than being successful in promoting industrialization, all it did was to create an inefficient assembly industry. Between the late 50s and early 60s, a number of Japanese firms set up electronics and other assembly operations that consisted of nothing more than importing circuit boards and components that were inserted manually into the boards by low cost local labor. This type of activity, while including electronics, was certainly not just limited to electronics. It was described by an observer as follows:

"Many former landlords who received money from the land reform program in 1953 went ahead and used the funds to build a "factory". They then went to Sungshan Airport

⁶⁰Similar regulations were promulgated to restrict the entry of televisions in 1961. This will be discussed in the next chapter.

⁶¹Other items on the protected list were electrical items. See note below.

[in Taipei] and held up a sign to arriving Japanese businessman saying "Factory for Rent" in Japanese. Japanese businessmen would rent the factory, engage the former landlord to hire labor, import the parts to be assembled and a few machines, and presto, create an instant "industry".⁶²

Therefore, it is fair to say that no indigenous electronics industrial base existed before the early 60s beyond assembly of imported components⁶³. It was in this inauspicious context that the electronics industry began in Taiwan.

Electronics Industry Promotion ?

The electronics industry did not initially develop directly as a result of state planning. The story was in fact more complex. After the recovery of the economy from the dislocations caused by war, retrocession and the arrival of the mainlanders in the mid- 50s, US advisors to Taiwan turned toward the problem of creating the conditions for sustained

⁶²Interview Q.

⁶³There was a small but growing electrical goods industry. It made goods such as fans, electrical meters, fluorescent lights, cable, etc. For purposes of analysis, the electrical industry is excluded from this discussion.

economic growth. While military aid declined between 1955-60, it was only minimally made up by increased developmental and commodity shipments. The primary instrument used by the U. S. Agency for International Development (USAID) to promote development was through advice, guidance and threats to further reduce aid. As was to be expected, there were deep divergences in opinions between US advisors and the KMT regime as to what were the proper policy choices.⁶⁴

Orthodox developmental economics, which informed both US advisors and Taiwan's economic planners, suggested that their present pattern of commodity exports of primary products will face a declining market over the long term as rich countries spend less on them or develop substitutes. Therefore, export earnings will likely decline over time while the imports of

⁶⁴In many ways, there was a striking parallel in the conflicts between Chiang Kai Shek and General Joe Stilwell, the American General sent to command and remake the Chinese army in WW II. Stilwell repeatedly tried to create a professional, well trained Chinese army with lavish American supplies and use it to engage the Japanese, only to discover that Chiang did not want such an army that would threaten his power. The outcome was Chiang did everything to frustrate Stilwell and eventually got him recalled to the U.S. Likewise, U.S. advisors' attempts to create in the late 50s the foundations of a liberal market economy based on the private sector were frustrated by the KMT. Such a move would have enhanced the power of the rebellious native Taiwanese population and threatened KMT control of the island. As with the Stilwell-Chiang conflict, neither side was able to win outright but both compromised. See John King Fairbank's description of General Stilwell's conflict with Chiang Kai Shek. "Joe Stilwell, All-American, and His Mission to China" in Fairbank, (1987, 53-54).

machinery and equipment needed to modernize the economy must increase. Foreign exchange will be scarce and must be restricted to being spent on essential imports. This called for import tariffs and licensing controls on imports to promote import substitution industrialization. Local content of domestically produced goods needed to be increased over time to reduce imports that required scarce foreign currency. This early "second stage" vision of developmental economics was shared by both US advisors and statist KMT bureaucrats for different reasons. US advisors saw this as being consistent with developmental theory, while KMT bureaucrats used it to justify extensive control of the economy to extract a maximum of resources for military and defense needs. As the economy developed in the 50s, US advisors naturally moved to the "second stage" of economic development theory, which called for a relaxation of controls to promote self-sustained economic growth. American advisors naturally saw the private sector at the leading edge of future development and non-capital intensive industries as most suitable given Taiwan's comparative advantage. KMT bureaucrats rejected this vision and this led to much acrimonious disagreement between the advisors and the KMT bureaucrats. Jacoby comments,

"AID influence was limited in the field of fiscal and monetary policy. Persistent efforts were made to induce the Chinese government to reduce military expenditures,

to raise revenue levels, to curtail the government deficit, to limit increases in money supply, and to inaugurate effective controls of credit by the central bank. ...

Another field of economic policy in which AID's influence was limited was that of transferring public enterprises to private ownership and competitive markets." (Jacoby, 1966, 144-148)

Insofar as the present claims by Taiwan officials that they supported private enterprise in those critical years, Kuo notes,

"Empirical data, however, points to the opposite. Most private entrepreneurs did not benefit from these assistance programs. In the 1950s and 1960s, most industrial assistance programs were designed to regulate industries by restricting both entry and expansion.... The economic boom of the 1960s and 1970s was partially the result of rescinding these regulations.

The state offered various industrial loans to private enterprises... According to several surveys and my interviews, nevertheless, few producers knew about these loans, let alone benefitted from them. Most production

capital came from their relatives, friends, or company profits... One embarrassment of the Taiwanese government in 1961 was that few entrepreneurs at that time applied for Small Industry Loans and China Development Corporation Loans funded by U.S. aid. The Taiwanese government therefore could not send new applications to the U.S., even though the money was there." (Kuo, 1990, 70)

Thus, the idea that the state supported private enterprise is unproven in those early years. The advice of American advisors to support private enterprise was only heeded to the extent it was necessary to please them.

During the late 50s, the relationship between USAID and the KMT regime was cordial but intensely conflictual. This relationship is described as,

"The relationship between the government of the U.S. and that of ... [Taiwan] ... is analogous in its essentials to the time-honored relationship between the banker and his business client who receives long-term financial assistance to expand his operations. The banker advances funds on specified conditions governing the client's use of bank funds and of his own resources as well. The banker provides advice on the execution of the expansion

program, and expects that at least some of it will be heeded. He requires periodic reports of progress. He intervenes more actively when affairs do not go well." (Jacoby, 1966, 131)

US advisors sought not only to prop up the KMT regime, but also to curb their statist tendencies. Jacoby describes Chinese officials as,

"public administrators by training and experience, and had strong predilections towards taking over and operating as public enterprises the former Japanese private enterprises. Nothing in their situation---nor in their economic philosophy---motivated Chinese officials to foster the growth of a strong private sector." (Jacoby, 1966, 137)

The extent to which the government is highly statist is demonstrated by the distribution of public and private investments in manufacturing, which accounted for over 28 percent of the manufacturing value added until 1967. See Tables 22, 23. Moreover, the state also injected substantial sums into the public sector over the years. See Tables 24, 25.

TABLE 22

DISTRIBUTION OF INDUSTRIAL PRODUCTION BY OWNERSHIP
(Based on Value Added at 1981 Prices)

Period	Manufacturing	
	Private	Public
1952	43.8	56.2
1955	51.3	48.7
1956	51.7	48.3
1957	51.3	48.7
1958	52.8	47.2
1959	54.8	45.2
1960	56.2	43.8
1961	54.7	45.3
1962	57.7	42.3
1963	59.4	40.6
1964	61.1	38.9
1965	63.2	36.8
1966	66.7	33.3
1967	71.2	28.8
1968	75.3	24.7
1969	77.3	22.7
1970	79.4	20.6
1971	84.7	15.3
1972	86.0	14.0
1973	86.2	13.8
1974	85.9	14.1
1975	85.8	14.2
1976	84.8	15.2
1977	84.2	15.8
1978	85.1	14.9
1979	85.3	14.7
1980	85.5	14.5
1981	86.5	13.5

Period	Manufacturing	
	Private	Public
1982	86.7	13.3
1983	87.0	13.0
1984	87.8	12.2
1985	88.0	12.0
1986	89.3	10.7
1987	89.5	10.5
1988	88.9	11.1
1989	88.6	11.4
1990	88.9	11.1

Source: TSDB (1991, 89).

TABLE 23

PRIVATE AND PUBLIC INDUSTRIAL PRODUCTION - INDICES

Period	General Index		Manufacturing	
	Private	Public	Private	Public
I. Index (Based: 1952 = 100)				
1953	137.50	125.58	142.31	132.26
1955	186.11	139.92	207.69	140.47
1956	195.83	147.67	215.38	146.48
1957	222.22	165.70	236.54	164.37
1958	237.50	172.29	257.69	168.18
1959	276.39	186.63	300.00	182.40
1960	306.94	203.88	344.23	194.28
1961	402.78	225.58	465.38	214.37
1962	450.00	234.30	523.08	214.37
1963	502.78	247.48	596.15	226.39
1964	625.00	292.44	761.54	268.18
1965	758.33	321.90	911.54	295.89
1966	922.22	343.80	1,121.15	310.12
1967	1,138.89	364.73	1,400.00	315.25
1968	1,468.06	399.81	1,851.92	337.68
1969	1,801.39	452.33	2,326.92	379.47
1970	2,219.44	514.15	2,923.08	421.41
1971	2,855.56	575.19	3,811.54	462.46
1972	3,523.61	646.51	4,751.92	516.28
1973	4,106.94	713.80	5,600.00	602.93
1974	3,890.28	737.02	5,255.77	577.57
1975	4,255.56	769.57	5,728.85	586.51
1976	5,488.89	1,047.87	7,369.23	806.60
1977	6,200.00	1,203.68	8,290.38	950.59
1978	7,712.50	1,387.02	10,403.85	1,109.09
1979	8,233.33	1,451.55	11,021.15	1,155.13
1980	8,825.00	1,530.23	11,728.85	1,212.46
1981	9,230.56	1,514.15	12,232.69	1,214.08

Period	General Index		Manufacturing	
	Private	Public	Private	Public
I. Index (Based: 1952 = 100)				
1982	9,131.94	1,511.82	12,359.62	1,207.62
1983	10,330.56	1,676.94	14,111.54	1,345.89
1984	11,694.44	1,781.59	16,011.54	1,420.09
1985	12,008.33	1,826.55	16,467.31	1,425.37
1986	13,888.89	1,937.98	19,230.77	1,466.28
1987	15,408.33	2,123.06	21,438.46	1,594.87
1988	15,936.11	2,317.05	22,103.85	1,746.63
1989	16,411.11	2,472.29	22,765.38	1,859.24
1990	16,187.50	2,488.57	22,457.69	1,781.53

Source: TSDB (1991, 86).

TABLE 24

DEPOSITS OF DOMESTIC BANKS - BY DEPOSITOR

End of Year	Total	Government	Public Enter-prises	Private Enter-prises	Individuals and All Others
II. Percentage					
1961	100.0	30.3	7.7	16.3	45.7
1962	100.0	29.6	5.2	17.2	48.0
1963	100.0	24.2	7.4	16.9	51.5
1964	100.0	19.9	9.5	19.1	51.5
1965	100.0	17.8	6.6	20.6	55.0
1966	100.0	16.4	6.1	20.8	56.7
1967	100.0	14.0	5.1	23.2	57.7
1968	100.0	17.2	3.8	22.8	56.2
1969	100.0	16.9	4.3	20.2	58.6
1970	100.0	16.2	3.9	19.3	60.6
1971	100.0	11.9	3.9	20.6	63.6
1972	100.0	11.1	5.7	22.9	60.3
1973	100.0	15.4	5.2	23.6	55.8
1974	100.0	12.8	7.1	22.5	57.6
1975	100.0	13.4	8.6	21.2	56.8
1976	100.0	13.4	9.4	18.8	58.4
1977	100.0	10.9	8.9	21.4	58.8
1978	100.0	11.9	12.2	20.9	55.0
1979	100.0	13.8	10.1	19.9	56.2
1980	100.0	13.3	9.8	19.7	57.2
1981	100.0	12.3	10.4	19.5	57.8
1982	100.0	10.8	9.8	17.8	61.6
1983	100.0	10.8	8.5	17.3	63.4
1984	100.0	11.3	8.2	15.6	64.9
1985	100.0	9.9	7.7	13.9	68.5
1986	100.0	8.9	6.6	16.9	67.6
1987	100.0	10.2	4.2	16.7	68.9
1988	100.0	9.6	3.8	16.8	69.8

1989	100.0	10.5	5.3	17.7	66.5
1990	100.0	10.3	4.7	17.8	67,2

Source: TSDB (1991, 158).

TABLE 25

LOANS AND DISCOUNTS OF DOMESTIC BANKS - BY BORROWER

End of Year	Total	Government	Public Enter-prises	Private Enter-prises	Individuals and All Others
I. Amount (NT\$ million)					
1961	12,992	814	4,846	5,809	1,523
1962	16,419	785	6,405	7,023	2,206
1963	17,848	1,084	5,298	8,184	3,282
1964	21,140	1,321	5,592	10,794	3,433
1965	25,506	1,764	5,708	14,973	3,061
1966	28,849	1,505	6,194	17,392	3,758
1967	35,962	2,048	7,265	21,933	4,716
1968	45,153	2,374	7,843	29,516	5,420
1969	56,881	2,963	9,739	37,683	6,496
1970	68,840	3,306	12,148	45,401	7,985
1971	86,135	3,671	16,086	55,239	11,139
1972	104,599	3,914	18,093	69,967	12,625
1973	151,514	3,573	22,244	104,709	20,988
1974	214,759	3,871	39,497	152,154	19,237
1975	284,507	5,094	57,568	193,339	28,506
1976	317,704	6,647	66,130	208,476	36,451
1977	375,892	8,398	79,226	231,274	56,994
1978	470,186	12,590	86,440	284,211	86,945
1979	544,650	13,088	112,119	304,285	115,158
1980	693,599	14,480	169,069	352,948	157,102
1981	760,369	19,466	191,844	382,087	166,972
1982	903,567	35,996	229,982	419,462	218,127
1983	1,033,218	41,058	241,213	477,126	273,821
1984	1,146,106	36,623	233,901	540,381	335,201
1985	1,221,410	38,650	228,588	533,619	420,553
1986	1,354,803	42,371	224,580	550,371	537,481
1987	1,592,959	28,596	189,072	673,590	701,701
1988	2,215,397	48,543	192,194	963,059	1,011,601

1989	2,857,725	282,537	221,629	1,156,069	1,197,490
1990	3,141,678	289,060	260,912	1,276,858	1,314,848

Source: TSDB (1991, 159).

Efforts to curb such statist tendencies only met with limited success. Nevertheless, with the lever of military and economic aid, USAID was able to undermine the regime's plans to develop many large scale, capital intensive state owned enterprises such as steel mills, nuclear power plants, and plastics plants.⁶⁵ This is a continuation of a pattern whereby the KMT regime was dependent on continued US military and political support, but at the same time, chafed at American attempts to export their culture and economic concepts to China without understanding the political and economic implications of these exports on the regime. The conclusion of the Mutual Defense Treaty in 1954 produced two developments. First, the treaty provided a legal guarantee of security to the KMT regime and lessened the threat of a military invasion. However, it also forced the KMT to quietly subdue its claim to return to the mainland. The treaty stipulated that should the ROC invade the mainland, America would not be obligated toward helping Taiwan. From the KMT's point of view, the treaty had the unintended and desirable consequence of reducing the influence of American economic advisors to intervene in policy making. At the same time, the treaty also contributed to a diversion of attention by the

⁶⁵Every one of these projects was later launched by the state after the American advisors began to lose their influence in the early 60s. The nuclear plant was built in 1961, and the others later.

regime and US advisors from preparations for a military offensive towards economic development.

The new focus on economic development by both the KMT regime and American advisors placed economic policy as the top issue for debate. In 1958, USAID institutionalized its economic development policy of promoting the private sector by formally establishing a Developmental Loan Fund and an Office of Private Development.⁶⁶ KMT economic policy makers - already used to being browbeaten by U.S. advisors in promoting private investment - were browbeaten into accepting a package of liberal, market oriented reforms. While USAID wanted to keep the KMT government off the backs of the people, the KMT wanted to get USAID off its back. The law promulgating the reforms was passed with the blessing of Chiang Kai Shek because he saw its passage as a way to get USAID off the KMT's back and allow the regime to manage affairs for itself.⁶⁷ The reforms were

⁶⁶The impact of USAID is easy to exaggerate. Total aid received between 1954-68 amounted to roughly US \$1.5 billion. This, however, does not include non-aid purchases by U.S. military and civilian organizations. Unfortunately, there is little hard data on these figures even though they were substantial. Of the total of US \$1.5 billion in direct assistance given to Taiwan, a paltry US \$67 million were allocated to the Developmental Loan Fund. Compared to U.S. military and civilian procurement from Taiwan, which rose sharply during the Korean and Vietnam war, this is almost negligible.

⁶⁷Gold translated Chiang Kai Shek's reason for supporting the reforms under the phrase tzu-li keng-sheng as self-reliant. It should be more accurately translated as self-control of work, which does not have any economic self

strictly orthodox "take off stage" Rostowian developmental economics of liberal, market oriented policies. Originally the "Eight Point Program", it became the "Nineteen-Point Program of Economic and Financial Reforms" that was intended to accelerate development by liberalizing the economy was passed in 1960. (Gold, 1986, 77) This package contained classic orthodox measures, which reduced import duties, provided duty remission if products were exported, set a single exchange rate, liberalized exchange and trade controls, encouraged investment, reduced military expenditures, and increased utility rates to more realistic market levels. It is interesting to note that this 19 point program law crossed over the jurisdictions of numerous ministries. One of the key reason why an omnibus law was passed in lieu of individual laws dealing with areas of jurisdiction of each individual ministry was to minimize the inevitable feet-dragging and delays the ministries that opposed the law were expected to do.⁶⁸ As we will see later, the passing of a law is not any assurance of a law's systematic implementation.

The goal of USAID in pushing the 19-point reform package was to raise export earnings through rationalizing the price

reliance connotations, just a demand for self control of resources.

⁶⁸Interview N.

structure's bias against manufactured exports, attract foreign investments in order to replace declining foreign military and economic aid, increase domestic private investments while reducing the size of the public sector through rational pricing policies for public utilities and curb spending. (Jacoby, 1966, 134-35) Rather than being welcomed by the KMT, these reforms were resented because they threatened bureaucratic fiefdoms, and price stability and reduced scarce foreign exchange. (Gold, 1986, 77) Furthermore, they threatened the statist orientation of the KMT regime, whose primary purpose at that time was to mobilize national resources against the communist threat. Nor was it in the regime's interest to see a private sector strengthened that they did not trust or directly control. They knew full well that the native Taiwanese population dominated the private sector and would benefit from such reforms most. Also, the Taiwanese still had fresh memories of their brutal oppression by the mainlanders. Abandoning the policy of supporting state owned enterprises was also unthinkable, as they provided not only jobs for mainlanders, but also represented a segment of the economy that generated resources, particularly foreign exchange, which they directly controlled.⁶⁹

⁶⁹The state enterprises were initially not even separate entities from the state. They were branches of government until they were converted into public corporations under pressure from Japanese and American banks, which wanted assurance their investments would actually be used for the projects intended. In 1968, these enterprises generated US\$ 90 million of foreign exchange, which represented about one-tenth of

While USAID used the classic method of offering a US \$20 - 30 million carrot and a stick of threatening to reduce aid, the KMT responded in a classic Chinese fashion. See Tables 26, 27, 28 for US Aid's contribution to Taiwan. They agreed to the reforms, promulgated the laws, and continued investing resources into the state sector while bending the rules. This was reflected in the actions of the state, which incorporated the new liberal approach in the Third Four-Year Economic Plan (1961-64) in a contradictory fashion. The 1960 Statute for Encouragement of Investment was included in the plan while at the same time it established and funded the China Development Corporation (CDC), with part of its capital from quasi-public sources like the KMT party coffers. Thus, rather than seeking overt domination of the economy through state enterprises, the KMT resorted to using indirect instruments like KMT party funds to invest in "private" enterprises.⁷⁰ These indirect instruments of state investments were later to include the armed forces pension funds, (Vocational Assistance Committee

imports in 1968. (Silin, 1976, 188)

⁷⁰Public enterprises in Taiwan are defined as 51% state owned enterprises. However, quasi-state organizations like the ruling KMT Party, the Armed Forces Pension Fund, etc., are regarded as private organizations. However, they own substantial share holdings of companies in Taiwan. Should such organizations be regarded as public, many "private" firms would become public, state owned firms with a majority of shares controlled by public interests.

for Retired Soldiers)⁷¹ and other investment vehicles such as state owned banks and insurance funds. Therefore, the percentage share of industrial output by public enterprises apparently went down from 47.9% 1960 to 41.3% in 1965. (TSDB, 1989, 89) However, should output of enterprises that are in part or indirectly controlled by the state be proportionally counted, it is unlikely to have changed much during these years.⁷² Similarly, while formally the rules for foreign

⁷¹This organization owned a complex of about 40 firms and was reputed to be the largest single private enterprise in Taiwan in 1968. (Silin, 1976, 21)

⁷²Evidence of a suspicious change in numbers that may be caused by a shuffling of categories can be seen in the annual growth rate of private vs. public industrial production. 1961, the year after the passing of the Nineteen Point plan, saw the private share of industrial production grow by 31.2 percent while the year before and three years afterwards it grew by roughly 11-12% a year. The uncharacteristic private sector growth was also concentrated exclusively in the manufacturing sector, which recorded a 35.2% increase while the public sector grew at 10.3%. (TSDB, 1989, 88) In 1960, the year prior to this, manufacturing output was overwhelmingly state dominated, with 88% of the output in state hands. A similar awkward pattern is seen in statistics on Gross Capital Formation. From 1954 to 1960, public sector capital formation grew steadily annually. In 1961, it declined for the first time since 1953. At the same time, the private sector showed an irregular pattern of growth NT\$ 2,000 to NT\$ 3,000 per year and then jumped to NT\$ 4,569 in 1959 and \$6,908 the year afterwards. A check of major private sector projects in manufacturing started in 1961 failed to find any record of any one or a few individual projects, which might skew the numbers. The coincidence of this spurt of investment in what was formally a public sector dominated segment into the private sector - which was not repeated again for three years afterwards - would strongly suggest that in fact, the state did not comply with the spirit of liberalization suggested by USAID. In fact, the reduction of state enterprise involvement was not to happen until 1966, when public enterprise's share of industrial output fell to 38.2% and declined to 22.9% by 1971.

trade and exchange rates were liberalized, the administration of rules was done in such a way as to favor the state sector or those who have friends in the government. Thus, for non-state or state related enterprises, import licenses, foreign exchange, special favors and incentives, etc. were still difficult to obtain even as late as 1968. (Silin, 1976, 21)

TABLE 26

SUMMARY OF U.S. AID
As of December 31, 1970

Unit: US\$ million

Period	Program Amount			
	Regular Program	Prior Year's Obligation Fund	Nonproject Assistance	Project Assistance
FY 1951-54	375.2	---	300.4	74.8
1955	140.6	7.8	105.9	42.5
1956	92.8	15.6	73.3	35.1
1957	112.3	6.3	67.2	51.4
1958	78.8	8.8	53.2	34.5
1959	130.9	8.2	75.0	64.1
1960	99.2	6.9	71.8	34.2
1961	98.0	---	73.0	25.0
1962	70.3	---	63.2	7.1
1963	119.6	---	117.5	2.1
1964	101.7	0.3	43.4	58.6
1965	77.4	---	76.8	0.6
1966	4.2	---	4.2	---
1967	4.5	---	4.5	---
1968	41.3	---	41.3	---
Total	1,546.8	53.9	1,170.7	430.0

Note: Some of the figures cannot be added up because of rounding.

Source: TSDB, 1991, 247.

SUMMARY OF U.S. AID

As of December 31, 1970

Unit: US\$ million

Period	Obligation Amount		
	Total	Nonproject Assistance	Project Assistance
FY 1951-54	375.2	300.4	74.8
1955	132.0	96.4	35.6
1956	101.6	69.5	32.1
1957	108.1	65.2	42.9
1958	81.6	51.9	29.7
1959	128.9	73.7	55.2
1960	101.1	68.7	32.4
1961	94.2	70.4	23.8
1962	65.9	59.3	6.6
1963	115.3	113.5	1.8
1964	83.9	37.3	46.6
1965	56.5	56.1	0.4
1966	4.2	4.2	---
1967	4.4	4.4	---
1968	29.3	29.3	---
Total	1,482.2	1,100.3	381.9

Note: Some of the figures cannot be added up because of rounding.

Source: TSDB, 1990, 248.

TABLE 27

SUMMARY OF U.S. AID
As of December 31, 1970

Unit: US\$ million

Period	Arrival Amount		
	Total	Nonproject Assistance	Project Assistance
FY 1951-54	375.2	300.4	74.8
1955	132.0	96.4	35.6
1956	101.6	69.5	32.1
1957	108.1	65.2	42.9
1958	81.6	51.9	29.7
1959	128.9	73.7	55.2
1960	101.1	68.7	32.4
1961	94.2	70.4	23.8
1962	65.9	59.3	6.6
1963	115.3	113.5	1.8
1964	83.9	37.3	46.6
1965	56.5	56.1	0.4
1966	4.2	4.2	---
1967	4.4	4.4	---
1968	29.3	29.3	---
Total	1,482.2	1,100.3	381.9

Note: Some of the figures cannot be added up because of rounding.

Source: TSDB (1991, 247).

TABLE 28

ARRIVAL AMOUNT OF PROJECT-TYPE U.S. AID - BY INDUSTRY

Period	Total	Agriculture	Mining and Manufacturing	Electric Power	Trans- portation
I. Amount (US\$1,000)					
FY 1951	12,938	98	677	5,966	4,958
1952	12,313	252	3,772	5,879	141
1953	20,728	1,885	5,615	6,778	1,796
1954	28,803	1,077	14,839	5,167	1,592
1955	35,646	1,925	10,760	11,174	1,368
1956	32,102	941	8,443	7,139	5,285
1957	42,890	1,345	11,538	14,244	6,632
1958	29,726	1,070	3,636	13,648	5,925
1959	55,176	123,069	9,771	7,211	11,221
1960	32,412	1,081	15,336	207	10,978
1961	23,805	767	3,286	16,813	412
1962	6,629	327	4,313	---	74
1963	1,825	163	370	---	95
1964	46,589	256	217	45,053	73
1965	371	59	72	---	---
Total	381,953	34,315	92,645	139,279	50,550

Note:¹ Including Loan for Shihmen Development Program

TABLE 28 (Continued)
ARRIVAL AMOUNT OF U.S. AID

Unit: US\$ million

Period	Grand Total	General Economic Aid				Develop- ment Loan Fund
		Total	Defense Support of Development Loan			
			Subtotal	Non- project Assist- ance or Program Loan	Project Assist- ance or Project Loan	
FY 1951- 54	375.2	374.3	289.1	230.3	58.8	---
1955	132.0	129.4	97.5	68.9	28.6	---
1956	101.6	92.0	78.7	49.9	28.8	---
1957	108.1	87.1	77.0	37.7	39.3	---
1958	81.6	64.6	53.3	27.1	26.2	---
1959	128.9	71.2	62.2	40.1	22.1	30.6
1960	101.1	74.4	68.2	57.4	10.8	19.1
1961	94.2	50.1	45.7	40.0	5.7	16.1
1962	65.9	6.6	3.9	---	3.9	---
1963	115.3	21.6	19.8	19.8	---	---
1964	83.9	57.7	56.2	12.1	44.1	---
1965	56.5	0.4	---	---	---	---
1966	4.2	---	---	---	---	---
1967	4.4	---	---	---	---	---
1968	29.3	---	---	---	---	---
Total	1,482.2	1,029.4	851.6	583.3	268.3	65.8

Source: TSDB (1991, 249).

TABLE 28 (Continued)

ARRIVAL AMOUNT OF PROJECT-TYPE U.S. AID - BY INDUSTRY

Period	Health & Sanitation	Education	Public Administration	Direct Force Support	General and Misc.
I. Amount (US\$1,000)					
FY 1951	---	141	---	1,098	---
1952	4	---	---	2,070	195
1953	156	531	8	3,615	344
1954	151	179	23	5,046	729
1955	941	842	774	4,612	3,250
1956	1,672	1,129	248	55	7,190
1957	1,338	976	103	210	6,504
1958	739	1,109	---	---	3,599
1959	347	1,231	---	---	2,326
1960	595	1,081	150	---	2,984
1961	448	932	192	---	955
1962	462	668	---	---	785
1963	6	279	271	---	641
1964	---	66	235	---	689
1965	---	---	---	---	240
Total	6,859	9,164	2,004	16,706	30,431

Source: TSDB (1991, 252).

TABLE 28 (Continued)

ARRIVAL AMOUNT OF PROJECT-TYPE U.S. AID - BY INDUSTRY

Period	Total	Agriculture	Mining and Manufacturing	Electric Power	Trans- portation
II. Percentage					
FY 1951	100.0	0.8	5.2	46.1	38.3
1952	100.0	2.1	30.6	47.7	1.2
1953	100.0	9.1	27.1	32.7	8.7
1954	100.0	3.7	51.5	18.0	5.5
1955	100.0	5.4	30.2	31.4	3.8
1956	100.0	2.9	26.3	22.2	16.5
1957	100.0	3.1	26.9	33.2	15.5
1958	100.0	3.6	12.3	45.9	19.9
1959	100.0	41.8	17.7	13.1	20.3
1960	100.0	3.3	47.3	0.6	34.0
1961	100.0	3.2	13.8	70.6	1.7
1962	100.0	4.9	65.1	---	1.1
1963	100.0	8.9	20.1	---	5.8
1964	100.0	0.6	0.5	96.7	0.1
1965	100.0	15.9	19.4	---	---
Total	100.0	9.0	24.2	36.5	13.2

ARRIVAL AMOUNT OF PROJECT-TYPE U.S. AID - BY INDUSTRY

Period	Health & Sanitation	Education	Public Administration	Direct Force Support	General and Misc.
II. Percentage					
FY 1951	---	1.1	---	8.5	---
1952	---	---	---	16.8	1.6
1953	0.7	2.6	---	17.4	1.7
1954	0.5	0.6	0.1	17.5	2.6
1955	2.6	2.4	2.2	12.9	9.1
1956	5.2	3.5	0.8	0.2	22.4
1957	3.1	2.3	0.2	0.5	15.2
1958	2.5	3.7	---	---	12.1
1959	0.6	2.3	---	---	4.2
1960	1.8	3.3	0.5	---	9.2
1961	1.9	3.9	0.8	---	4.1
1962	7.0	10.1	---	---	11.8
1963	0.3	15.2	14.8	---	34.9
1964	---	0.1	0.5	---	1.5
1965	---	---	---	---	64.7
Total	1.8	2.4	0.5	4.4	8.0

Source: TSDB (1991, 252).

That is not to say that the liberalizing reforms had no impact. From then on, the KMT had to resort to more clandestine ways to obscure the extent of its involvement in the economy. Aside from using indirect instruments, it did begin to attract private investments as partners. Despite this heavy statist orientation by the KMT regime, non-KMT enterprises were given a breathing space because of the KMT's need to demonstrate to USAID that its efforts to liberalize the economy had worked. Therefore, overt attempts to maximize revenues from the private sector were reduced. Once the overt attempts to squeeze the private sector were limited, the private sector was given a degree of freedom to save and invest comparatively free of an explicit threat of confiscation from the state. As with Chinese peasants since the dawn of history, the private sector resorted to the oldest means of dealing with arbitrary and rude Chinese revenue collectors: they concealed income, evaded taxes and pretended poverty while doing as many of their transactions through the back door as possible. The strict measures designed to favor the state were in turn frustrated by black marketers. Scarce foreign exchange, which was difficult to obtain, was secured through illegal smuggling of gold and valuables out of the country. Ingenious means were devised to undervalue exports while over pricing imports to create foreign exchange outside of state control. Strict controls on imports were frustrated

by cleverly disguising restricted goods as permissible vital imports. State attempts to divert business to state owned import substitution industries were frustrated by businessmen who assiduously devised specifications that could not be met by the mainlander firms. Strict rationing of credit by state owned banks was frustrated by the development of an illegal, unlicensed banking industry. Ultimately, the long-term price of maintaining strict controls was to further undermine the legitimacy of the control system.⁷³ In turn, this increased the distrust of the private sector by officials.

In the early 60s, these flaws created by conflicts between USAID and KMT interests were not apparent. All parties concerned with "liberalization" were satisfied. USAID got the liberalization it asked for, the KMT was able to more or less maintain its grip on the economy, and USAID felt it was possible for it to plan its withdrawal from Taiwan in the expectation that foreign investments and exports would take off. Given how shallow and symbolic the reforms in fact were, their results are mixed. Export growth, although healthy, was

⁷³The extent to which the cumbersome and discriminatory legal system had been undermined in Taiwan by the mid-70s is to a large extent, responsible for creating the innumerable problems of illegal underground investment houses, smuggling and widespread cheating on export and import licenses that made a mockery of the system of state control on trade and commerce.

erratic. It grew strongly at 30.9% per annum in 1961, 11.8% in 1962 and 52.1% in 63. At the same time, imports grew steadily. (See Table 6) Thus, it failed to correct the chronic trade deficit at that time. Consequently, there was a pressing need to attract foreign investments if the regime were not to increase its indebtedness or fall into the poverty trap.

USAID's response to the disappointing impact of the reforms on the private sector was to increase efforts to promote foreign investments. After a brief surge in 1960, total foreign investment approvals from all sources never exceeded US \$20 million per year between 1960 to 1964. Indeed, in the years immediately after the reforms in 1961 and 1962, they declined drastically. See Tables 29, 30, 31. Despite USAID's close relationship with American industry, it was not especially successful in attracting U.S. investment either. After an initial spurt of US\$ 14 million in approved foreign investments from the U.S. in 1960, the following year it declined to US \$4.3 million. It was in this context of disappointing responses to the investment liberalization measures and declining foreign investments that USAID commissioned the Stanford Research Institute (SRI) to prepare a series of reports in 1961 to pinpoint the most promising

industries to attracting foreign investors and increase foreign investment.

TABLE 29
STATISTICS ON APPROVED FOREIGN INVESTMENT
BY YEAR & BY AREA

(unit): (US\$ 1,000)

Year	U.S.A		Japan		Hong Kong	
	Case	Amount	Case	Amount	Case	Amount
1952	---	---	---	---	---	---
1953	1	1,881	1	160	---	---
1954	3	2,028	1	14	---	---
1955	2	4,423	---	---	---	---
1956	2	1,009	---	---	---	---
1957	1	11	3	37	---	---
1958	---	---	3	1,116	---	---
1959	1	100	1	45	---	---
1960	5	14,029	3	309	---	---
1961	1	4,288	3	1,301	---	---
1962	8	738	16	2,664	---	---
1963	9	8,734	6	1,397	1	216
1964	7	10,196	2	728	---	---
1965	17	31,104	14	2,081	---	---
1966	15	17,711	35	2,447	---	---
1967	18	15,714	76	15,947	---	---
1968	20	34,555	96	14,855	1	297
1969	30	27,862	75	17,379	---	---
1970	16	67,816	51	28,530	---	---
1971	17	43,736	17	12,400	2	150
1972	17	37,307	26	7,728	4	3,479
1973	29	66,876	92	44,599	8	1,907
1974	21	38,760	50	38,901	8	7,555
1975	12	41,165	22	23,234	5	4,868
1976	8	21,767	26	30,760	5	3,818
1977	17	24,242	20	24,145	11	16,186
1978	18	69,765	43	50,336	2	6,468

Year	U.S.A		Japan		Hong Kong	
	Case	Amount	Case	Amount	Case	Amount
1979	19	80,375	39	50,462	9	16,580
1980	15	110,093	35	86,081	7	21,518
1981	25	203,213	27	64,623	3	12,691
1982	33	79,606	24	152,164	8	26,688
1983	35	93,294	33	196,770	15	13,980
1984	41	231,175	28	113,978	13	48,151
1985	42	332,760	32	145,236	12	17,944
1986	56	138,428	88	253,596	24	64,283
1987	74	414,061	207	399,240	23	80,321
1988	60	134,726	212	431,867	45	114,922
Total	695	2,403,548	1,407	2,215,130	206	462,021

Source: Statistics on Overseas Chinese & Foreign Investment
Investment Commission, Ministry of Economic Affairs (1988)

TABLE 30
STATISTICS ON APPROVED FOREIGN INVESTMENT
BY YEAR & BY AREA

(unit): US\$ 1,000)

Year	Asian Countries	
	Sub-total	
	Case	Amount
1952	---	---
1953	1	160
1954	1	14
1955	---	---
1956	---	---
1957	3	37
1958	3	1,116
1959	1	45
1960	3	309
1961	3	1,301
1962	16	2,714
1963	7	1,613
1964	2	728
1965	17	3,886
1966	35	2,447
1967	76	15,947
1968	97	15,152
1969	76	17,417
1970	51	28,530
1971	19	12,550
1972	30	11,207
1973	102	48,978
1974	58	46,470
1975	27	28,268
1976	33	34,908
1977	31	40,331

Year	Asian Countries	
	Sub-total	
	Case	Amount
1978	45	56,804
1979	50	71,705
1980	44	108,173
1981	31	78,766
1982	33	179,648
1983	52	248,345
1984	41	162,691
1985	48	164,011
1986	116	321,557
1987	241	493,398
1988	284	564,118
Total	1,677	2,763,344

Source: Statistics on Overseas Chinese &
Foreign Investment
Investment Commission,
Ministry of Economic Affairs (1988)

TABLE 31

STATISTICS ON APPROVED OVERSEAS CHINESE
AND FOREIGN INVESTMENT
BY YEAR & BY INDUSTRY

(unit): US\$ 1,000)

Year	Electronic & Electric Appliances	
	Case	Amount
1952	---	---
1953	---	---
1954	---	---
1955	---	---
1956	---	---
1957	---	---
1958	2	1,043
1959	---	---
1960	---	---
1961	2	1,156
1962	4	851
1963	1	626
1964	2	771
1965	6	21,377
1966	23	15,382
1967	30	14,557
1968	25	26,993
1969	34	64,765
1970	33	73,831
1971	15	32,971
1972	26	19,720
1973	59	75,748
1974	37	69,652
1975	9	24,701
1976	20	72,395
1977	15	52,801
1978	25	63,495

Year	Electronic & Electric Appliances	
	Case	Amount
1952	---	---
1979	24	110,408
1980	23	108,602
1981	21	83,948
1982	18	70,797
1983	29	107,265
1984	42	267,652
1985	19	139,304
1986	68	231,744
1987	86	377,376
1988	37	237,331
Total	735	2,367,262

Source: Statistics on Overseas Chinese &
Foreign Investment
Investment Commission
Ministry of Economic Affairs (1988)

The reality was that Taiwan was not an attractive place for foreign investment. As Gold succinctly put it: "Why would a [Multinational Corporation] consider investing in an overcrowded island with a small domestic market, limited industry, no resources and a precarious political future?" (Gold, 1986, 78) He might have added: limited infrastructure, frequent power shortages, bureaucratic redtape and hostile attitudes towards private enterprise. Commenting on the attitude of officials in the late sixties, China News noted,

"Our whole bureaucratic system is based on mistrust and unwillingness to accept responsibility... investors, workers, and their families are to be mistrusted... as sharpers and cheats awaiting the smallest opportunity to defraud the government." (China News, July 19, 1968)⁷⁴

Notwithstanding these difficulties, the SRI report published in 1961 identified the following industries as potentially interesting to foreign investors: petrochemical intermediates, plastic resins, synthetic fibers, transistor radios, electronic components, watches and clocks, all of which were potentially viable industrial products for foreign investment.

⁷⁴Cited in Silin, (1976, 18).

One interesting feature of these reports was that they were not really industry feasibility reports per se. They were not broad "industry wide" feasibility studies that applied to groups of firms or sectors of the economy. They were actual micro level feasibility studies of individual business opportunities that go into tremendous detail as to whether or not a particular enterprise is feasible. It is, in effect, a report that an investor who wishes to finance a venture might commission. In the case of the electronics industry report, the report did not study the feasibility of an industry. It was a specific study of whether a radio assembly plant was feasible. It went into such details as estimating both domestic and nearby export market (i.e. Hongkong, Philippines, etc.) size, calculating break-evens, and even establishing the size of the actual investment needed. (SRI, 64) While the report did not specifically state that its intended audience was foreign investors from the United States, that was certainly implied as it was written in English with all figures given in US dollars. The report states:

"[This] Contract ... provided for a program of research on investment opportunities in Taiwan. This report is one of four feasibility studies prepared under that program. Each study presents an analysis of the financial feasibility of producing selected products in Taiwan. The four industrial product groups are:

- I Petrochemical intermediates
- II Plastics, resins and synthetic fibers
- III Radios and electronic components
- IV Watches and Clocks

A separate report has been prepared for each product group. In these reports, the analysis of markets, facilities, and costs, while not comprehensive, is in sufficient detail to permit an interested investor to assess the attractiveness of the opportunity. ... This report is concerned with an investment opportunity in the production of transistor radios and radio components in Taiwan." (SRI, 1962, 1)

While the report may prove useful for attracting American electronics industry businessmen in that it did a lot of their "homework" for them, it still required that potential investors have the skills needed to set up a facility and run it. In fact, that was precisely the intention of this report. Copies of this report were sent to many major American manufacturers of radios soliciting their investment in setting up a radio manufacturing facility in Taiwan. In that sense, it was not a master plan to set up an industry,⁷⁵ but to

⁷⁵The report, did, however, anticipate that such a plant would lead to other spin-offs, like manufacturing of more complex components. See SRI (1962, 2).

achieve a very specific goal of getting an investor to invest in a specific facility. Significantly, all these industries studied by SRI were aimed primarily at producing finished products or raw materials for the domestic market in Taiwan. The domestic market was relatively small, but it was thought the listed import substitution industries could potentially survive given adequate protection from trade barriers. There was no thought at all that these investments were to be set up as Export Processing Zones (EPZ) to serve primarily foreign markets. However, when the first electronics assembler was set up, it was in essence, an export processing zone operation.

Nearly three years after the publication of the SRI report, there was little response to the identified opportunities for foreign investment. Despite extensive efforts to promote foreign investments in these seven industries by USAID, no major US firm took the bait. USAID saw the problem as one of "fear" by foreign investors about investing in Taiwan's murky legal environment. There was little institutional protection for foreign investments in Taiwan. This resulted in measures taken by USAID to correct these unforeseen problems. From 1961, USAID worked hard at building these institutional measures to facilitate foreign investment. They formulated and implemented the AID Investment Guarantee Program, Cooley Fund, China Trade Act, and the passing of the Sino-American

Industrial Guarantee Agreement. All of these measures were aimed to give American based foreign investors the same protection they come to expect in making a foreign investment in a country such as Canada. To some extent, USAID's problems were partially relieved by the revival of foreign investment from the disastrous low levels of 1962. (See Table 29.) This, however, did not solve the basic problem of Taiwan's poor investment climate. Even after the flurry of legislative and institutional measures to improve Taiwan's investment prospects was passed, Taiwan still remained a relatively unattractive market for foreign investment.⁷⁶ This created an environment where USAID would be embarrassed by failure in a key plank of the AID program to Taiwan. With USAID scheduled to end early in 1965, USAID officials were pressed to have a "success".

The Arrival of General Instruments

In 1964, when efforts to attract major investments in the targeted investments appeared to have nearly failed after two fruitless years, General Instruments (GI), an American based electronics company, agreed to invest in a manufacturing facility in Taiwan. This was regarded as a breakthrough for the government's industry promotion program. (Wade, 1990, 94)

⁷⁶See Schreiber, (1970) and Gold (1986, 79).

The investment proposal was approved in the "record" time of six months from when General Instruments decided to invest. While this may be seen as a breakthrough both for attracting foreign investment from a major firm and in promotion of an indigenous electronics industry, in fact, it was certainly not a breakthrough for state policy to promote the electronics industry. First, the operation was not the kind of "industry" the state had wanted. The investment was only tangentially related to the industries identified by SRI. Rather than investing in a radio factory identified as a potential industry in the SRI report, GI set up a crude electronics assembly operation. The operation initially consisted of little more than a facility of work benches and solder irons. It imported all of its components and relied on inexpensive local labor to assemble three particular components that were highly labor intensive. Only later did it branch into more "sophisticated" work such as placing the components onto the circuit boards and soldering them. Specifically, the components assembled were the VHF/UHF tuners, deflector yolks and the IFT transformers. Each of these parts are "low tech" in the sense that the general principles of making one are rudimentary. However, their assembly is very time consuming. For example, the VHF/UHF tuner was an air gap capacitor made out of a set of aluminum fins spaced a fixed distance apart from each other. While the capacitor is primitive, it required very detailed and time consuming adjustment of the

fins to achieve the exact amount of capacitance so as to ensure that channels are switched correctly. This operation was done after assembling the capacitor from fins and then using a tool to gently bend the fins until the right tolerance is reached. Similarly, the work to assemble the deflector yolk is highly labor intensive in that it requires carefully winding fine wires around a frame numerous times.⁷⁷ The yolk was used in television tubes to create a magnetic field to steer the electron gun to "paint" a picture on the screen. The capacitor was used in televisions and radios to "tune" the receivers to particular frequencies. While they were parts of televisions, they were only a few of the most labor intensive parts of the television to build. However, the GIT facility did not manufacture complete television sets. It was, in fact, a labor intensive, Export Processing Zone (EPZ) manufacturer that was in Taiwan only because it offered a low cost supply of skilled labor, and permitted the firm to import and export goods with a relatively limited amount of bureaucratic interference. Insofar as the risky nature of Taiwan's political environment was concerned, General Instruments could hardly be worried as a facility to assemble these primitive components required only a minimal investment

⁷⁷This information was obtained from a former senior manager who was in charge of the television manufacturing facility for General Instruments in Taiwan. Interview B.

that amounted to less than \$500,000. That is hardly a signal of a strong commitment to Taiwan.

The extent to which this facility set up by General Instruments was an unintended outcome of foreign investment promotion was demonstrated by Taiwan not even having an EPZ facility at that time. Thus, there was in fact no strategic plan to facilitate the investment they did manage to attract, however unrelated to the plan it was. The EPZ concept relies on the state providing land, buildings, utilities and transport facilities at low prices, permitting the duty-free entry of goods for re-export after processing, attracting 100 percent foreign owned subsidiaries whose economic activities are not integrated with the host country except through the employment of low cost labor. (Haggard and Cheng, 1987, 91) Indeed, one key factor needed for the success of an EPZ was the duty remission scheme and the permission to set up a "bonded warehouse" where goods are not "imported", which was a part of the Nineteen Points program many conservatives in the KMT opposed. Without the legal framework in place, an EPZ operations as set up by GI would have been impossible. However, the fact that the law was passed was incidental in the general context of lack of planning and preparations for attracting EPZ investment. There were few other advanced preparations made to attract this type of labor intensive assembly activity prior to General Instruments application in

1963. Indeed, GI had to negotiate with the government to allow them to set up a bonded factory in Taipei. The factory was not set up in the "Export Processing Zone", which would have been ideal because at the time of the GI application, the decision to go ahead with that experiment was still being made.

Despite this disappointment of failing to attract foreign investment as originally planned, with USAID's promotion, seven other American electronics firms applied to set up similar electronics assembly operations in 1965. (Gold, 1986, 79) Thus, in an underdeveloped country desperate for success, a "success" has apparently been delivered according to SRI's recommendations. The USAID mission officially withdrew as of 1965 with Taiwan's economy growing strongly. No longer did the Government of the Republic of China need to be concerned with AID officials looking over their shoulders, they entered into a "close out agreement" in April 1965 that relinquished control of all developmental AID funds to the Chinese government. (Jacoby, 1966, 231-2) The KMT had succeeded in getting USAID off the backs of the government.

The Origins of Export Processing Zones

Another major strategic move that was said to herald in the strategy of export oriented industrialization to promote the electronics industry was the establishment of Export Process-

ing Zones. (Wade, 1990, 94) I will show that this move did not come about as a result of planning. The basic idea for establishing an export processing zone has been around since 1956, when it was proposed by the Economic Stabilization Board. This idea was promoted by the Industrial Planning and Coordination Group (IPCG) in the Ministry of Economic Affairs (MOEA) together with the Industrial Development and Investment Center (IDIC) of the Council on U.S. Aid. (CUSA) The proposed EPZ was to achieve two official goals: earn foreign exchange and create employment in the rural south. However, the very concept of an export processing zone was a grave threat to the power of several ministries, including the powerful Ministry of Finance under which customs revenues were collected, the Ministry of Communications, the Foreign Exchange and Trade Commission, and also local government agencies, which would all have been in some way diminished in the scope of their power. Not surprisingly, all of these institutions tried to stall the idea. The amount of bureaucracy generated was described by K. T. Li as,

"formalities ... much criticized are the entry and exit permits, all kinds of registration for doing business, transfers of land titles, and applications for electric power supply, licensing of commodity imports and exports, customs clearance, bonding and rebate of customs duties payable by export processors and inward and outward

remittances. The cumbersome nature of these formalities has caused investors much inconvenience and hindered the implementation of investment projects." (Li, 102-3)

The inefficiencies were caused by poor public administration endemic to the Republic of China during those years. It also provided opportunities to play favorites and benefit from such inefficiencies for all the officials involved. During the years 1961 to 1963, there was a mini-boom in foreign investments from overseas Chinese and foreigners. It was only in 1962 when a rush of applications for foreign investment was received that the IDIC and the IPCG pushed ahead with this idea. At about the same time, General Instruments visited Taiwan and broached almost the identical idea by asking for a factory to be set up in a bonded warehouse. Thus, the viability of the concept was given a boost. Inasmuch as it was a sure success, the EPZ idea was not given a high chance of success in increasing foreign investment. It was regarded as a low cost experiment that could quickly be closed down if it failed. One official responsible for the project dryly commented, "We financed the project with a small loan from the Development Fund, put up some inexpensive wire fences, and if it didn't work, we could have closed it up in six months."⁷⁸

⁷⁸Interview L.

The Statute for the Establishment and Management of Export Processing Zones (EPZ) was hurriedly passed in January 1965 through a special session of the Legislative Yuan. Had the government's initial goal in 1960 been a coordinated plan to seek EPZ type investments, it would have been rational to have such a measure in place prior to the gradual arrival of the EPZ investments. In fact, the idea was only acted on after it became self-evident that it was likely to succeed both as a result of increasing EPZ-like investments in the early 60s and General Instrument's inquiry. Until the evidence of commercial success was relatively overwhelming, there was no impetus to overcome bureaucratic resistance to the idea. Under the provisions of the law, an EPZ was created and built in Kaohsiung by December, 1966 and two more in 1970. (Haggard and Cheng, 1987, 92) The choice of land in Kaohsiung is again indicative of the unplanned nature of this "success."

Kaohsiung's EPZ was built on a plot of reclaimed harbor land. This site was originally chosen in September 1963 by officials from various ministries. It had the advantage that it was quick and easy to get clear title to the land at a reasonable price. Had the government chosen to acquire and assemble a large site near any major city with good communications and infrastructure, it would have had to go through a laborious process of persuading multiple landlords to sell and obtaining clear title to the land. In the confused and chaotic land

title system of Taiwan, obtaining clear title to any land is difficult --- let alone obtaining clear title to a large plot of land near a major center of communications within a two to three year time frame.⁷⁹ This difficulty of securing land is endemic to Taiwan in those years Jacoby observes,

"In [1961], an attack was begun upon the critical shortage of sites for manufacturing plants by planning an "industrial district" near Keelung. [North side of Taiwan, opposite Taipei on the East side of the island.]" (Jacoby, 1966, 139)

The extent to which the export processing zone idea was not intended originally to promote the electronics industry is evident in that there was no mention of electronics industry promotion in the documents relating to the formation of the Export Processing Zone. Thus, the establishment of the EPZ

⁷⁹Land titles in Taiwan, as in Hongkong and in most places in China, are complex because over the years, land ownership became confused with overlapping claims, illegal occupations which became de facto legal occupations in common law but not in Chinese law. Therefore, much of the land available has multiple and conflicting claims which can take years before the courts to clear up and obtain clear title. Furthermore, all Chinese farmers are intimately attached to the land because their ancestral graves are most likely to be located on the family farm. Therefore, they are very reluctant to sell even at high prices. Even after they have "sold," it does not necessarily mean they will voluntarily give up rights to their land. This problem is compounded when multiple adjoining parcels of land need to be assembled for an "EPZ." Because the KMT chose to respect property rights, the process was not easy.

was not a "targeted" measure aimed at promoting electronics exports as Wade originally suggested. (Wade, 1990, 95)

The arrival of large numbers of electronics assemblers to set up operations in Taiwan's EPZ was neither anticipated nor initially the objective of government policy. It can be demonstrated by looking at the regional activities of U.S. and Japanese electronics firms nearby in Hongkong. Hongkong certainly did not go out of its way to seek foreign investment in electronics or "high technology" in any way or form in the early 60s. Despite this lack of official promotion or industrial targeting, Fairchild opened an electronics assembly plant in Hongkong in 1961, followed by other American, Japanese and European firms. (Haggard and Cheng, 1987, 100) As Hongkong's cost increased with rising prosperity in the mid 60s, it was logical for such types of firms to consider locating in nearby countries like Taiwan and South Korea.

The "breakthrough" company General Instruments that came to Taiwan did not come because of a specific government promotion targeting the electronics industry. As a new player in the Far East EPZ game, General Instruments had the benefit of choosing either to go to Hongkong or any other number of EPZ sites in Asia. Hongkong was considered and rejected for sound business reasons primarily to do with its rapidly rising wages. Indeed, General Instruments ended up with two possible

sites on its list; Taiwan and Puerto Rico.⁸⁰ In this context, General Instrument's decision to locate in Taiwan in 1964 was not based so much on successful state promotion of the electronics industry. It was partly due to state promotion of foreign investment, partly due to the willingness of the state to cut through bureaucratic red tape, and primarily due to Taiwan's substantially lower labor cost for productive labor relative to the existing location of choice for most U.S. electronics firms in Hongkong. Had the government, however, not passed the law or cut through the red tape that would have made the bonded warehouse critical to the operation unfeasible, the project would have died. The cost advantage Taiwan had was a product of not only its country's lower wage level, but also because Taiwan had a larger population, wage costs were likely to remain stable for more years than in Hongkong. Indeed, Taiwan was a comparatively poor choice because it did not possess a highly developed infrastructure that facilitated transportation and minimized bureaucratic controls on imports and exports in particular, and on business in general as Hongkong did. Therefore, General Instruments was taking a chance that these problems would ultimately be remedied in Taiwan.

⁸⁰Interview B and O.

From this perspective, the so called leadership role played by state planning in attracting "sunrise" industries is a misnomer. In fact, the state sought to attract foreign investment in general. It certainly had no intention of creating a domestically owned "high tech" industry in the 1960s except in the most general terms. Consultants identified seven primarily import-substituting industries that might attract investment in Taiwan not because they are "sunrise" or growth industries, but because they might be potentially viable despite all the disadvantages of Taiwan's business environment. As it turned out, General Instrument's investment was made in an export processing facility rather than an integrated industry. It was by sheer chance that at that time, U.S. electronics assemblers were looking for low cost labor beyond Hongkong because of Hongkong's rising costs and many chose to follow General Instrument's lead. Had Singapore gotten into the field at the same time, it would have made Taiwan relatively uncompetitive for this kind of work.⁸¹ Electronics being a future "growth" or "strategic" industry never entered the minds of the planners in 1961. Indeed, none of the seven targeted industries was successful in attracting major foreign investment until GI came. Therefore, the outcome was not anticipated, no strategic

⁸¹Fortunately, at that time, Singapore was "out of the running" because of political disruptions. Indeed, later in the 70s when Singapore did become a competitor, it was very successful.

preparations were made, and by no means can the SRI's recommendations be construed as being the basis of a successfully executed plan to promote the electronics industry. However, all the parties involved, USAID, SRI, and CIECD banded together as vested interests in a "success." Therefore, all these factors are overlooked and the arrival of electronics assemblers was welcomed and is today part of the bureaucratic regulationist story of success in electronics industry promotion. (Gold, 1986, 82) It was not surprising that SRI's recommendations for industries to target for foreign investment was echoed in the debates that led to the 1965-68 Economic Plan.

Ex Post Facto Planning

The 1965-1968 Economic Plan did recognize the electronics industry as an industry worthy of promotion. (CEPD Economic Plan, 1965, 33) However, while it echoed the SRI report's recommendation that targeted transistor radios, electronic components, watches and clocks, these products were - in accordance with the way SRI's recommendations actually turned out - thought to be primarily of interest to foreign investors. There was no preconceived plan that these two industries were to become major export industries by the end of the 60s. When they turned out in the late 70s to be primarily indigenously owned, internationally competitive exporters, it

was not anticipated in the 1965-68 plan. What in fact happened was quick reaction by the state after the fact to an opportunity presented to it. Credit here should not go to successful state planning, but to fleet footed state response to facilitate an unexpected business opportunity after it had presented itself.

There was also no planning that such an industry would be export oriented. Had it been an import substitution industry as originally envisioned, it might have been export oriented had it "matured" behind tariff barriers. However, such an industry did not develop initially. The industry that came about as export oriented was entirely due to it being an EPZ activity. It is not surprising that such an operation would be "Export Oriented from the beginning." (Gold, 1986, 86) The fact that it fitted with the government's officially proclaimed strategy of "export led growth" was incidental. Had the venture attracted been a primarily import substitution venture as originally identified in the SRI report, the outcome would have been totally different. Thus, there was no reason to believe this industry fit into a part of the grand "strategy" of export oriented industrialization planned in the early 60s. Where did the state planners place their emphasis for export industries? On the traditional areas that they had pursued since the first plan: agriculture, textiles and heavy industry.

Although it is unreasonable to evaluate the foresight of planners with 20 years of hindsight, it is useful to look at the planner's view of the place of "light industries" like the electronics and computer industry in their perception of where the economy was heading. The 1965-68 plan stated:

"For further development, stress must be laid on basic heavy industries (such as chemicals, wood pulp, petrochemical intermediates, and large scale integrated steel production) instead of end product manufacturing or processing." (CEPD, 1965, 34)

In other words, the planners envisioned their best opportunities would lie in making investments in capital intensive, heavy industries. In this sense, they are similar to planners in the Soviet Union in being "metal eaters."⁸² Rather than export oriented, these are import substitution industries. The arrival of the electronics industry was a divergence both from the plan's emphasis on heavy industry and from attracting "industries" as opposed to EPZ activities. Planners, however, did not seek to undermine this new industry. Moreover, they were greatly encouraged by this development and aimed to maximize the spin-offs from it. In

⁸²This also coincided with enhancing Taiwan's military production capabilities.

the following chapter, I will demonstrate how the state sought to maximize the "spin off" from this unexpected gain.

Summary

The idea that the state had a long term plan to promote the electronics industry from the early 1960s is a seductive theory to bureaucratic regulationists. The idea of an economics general staff --- free of political infighting and the problem of catering to societal interests --- who can plan a long term strategy to map out the development of Taiwan is an attractive one. However, as we have seen, the institutional base for the planners, CIECD and its latter incarnation, the EPB, did not in fact have such powers. The powers that they did have were the result of particular officials who occupied the post for a period of time. As these officials moved on, powers of the planning body were added and subtracted at will. There was no consistency in planning and implementation needed to sustain the case that this was an "economics general staff." The reality is that the state in fact did not have a clear, well articulated economic plan either from the planning agencies or from elsewhere in the bureaucracy. The plans it did have were originally documents made for entirely different reasons, ranging from seeking foreign aid, securing foreign loans, to soliciting foreign investment to replace foreign aid. State

promotion of industry was done, of course, in a general sense for the good of the nation. However, the choice of industries, choice of projects, and indeed, even the choice of electronics as a targeted industry, was done entirely by chance. Electronics was targeted as a potential investment project for foreign investors. The arrival of General Instruments was an investment marginally related to what the government wanted, and the setting up of the Export Processing Zone was an event hurriedly done to facilitate investors who have already expressed an interest in coming. All of these events were aimed at solving day to day problems rather than the outcome of long-range planning. What the government did was a series of ad hoc measures in response to specific problems it faced. The fact that these measures became coherent afterwards is only apparent after the fact.

Chapter 4

STATE PROMOTION OF INDUSTRIAL UPGRADING (1966-80)

The failure of state planning to achieve its desired outcome in creating the electronics industry did not deter bureaucrats from ambitious tinkering with industrial policy. Despite the origins of electronics manufacturing, through the fortuitous event of being the first major success at attracting Direct Foreign Investment (DFI) for reasons entirely unrelated to industrial policy, the inability to plan and implement policies did not deter policy makers. In this chapter, I will demonstrate how these policy initiatives were ad hoc measures, which did not have the purpose of long term planning, but were geared to deal with particular problems at hand. Other initiatives, such as local content rules, efforts to attract "high tech" industries, the formation of the Industrial Technology and Research Institute (ITRI) and the building of the Hsinchu Science based Industrial Park, were similarly unsuccessful in relation to their original stated goals. In short, what they ended up with was not minimally related to what they thought they wanted.

The Working Group for Planning and Development
of the Electronics Industry.

In 1966, bureaucrats at the Ministry of Economic Affairs (MOEA) set up an informal "Working Group for Planning and Development of the Electronics Industry" (WGPDEI) under the Council for International Economic Cooperation and Development (CIECD). While this was viewed by some researchers as evidence of far-sighted state action to promote the electronics industry, this was in fact far from the case. The Working Group was formed AFTER a rush of U.S. electronics assemblers had arrived rather than before. Had promoting the electronics industry been a planned development, it would have been logical to form the group beforehand. As it was, it was formed to solve problems created by the arrival of the electronics assemblers. The purpose of this Working Group is primarily to coordinate action between different ministries to solve common problems faced by foreign electronics manufacturers. It was a means of dealing with the vociferous complaints from the newly arrived American firms that complained bitterly about the widespread petty corruption, ineptness and inefficiency of the government of Taiwan. Since American firms can translate their complaints not only through Chinese governmental, but American consular channels, it is clear that the Chinese government had to at least make a good faith effort to solve these problems. The task of the working

group was to smooth over these problems. Indeed, one of the principal operating problems faced by foreign manufacturers in those days is the inability to get the lazy and corrupt bureaucracy to do such simple and mundane tasks as approving exports and import licenses. Often shipments will take weeks, if not months to be cleared through import and export controls, and in most instances, everything, ranging from importing, exporting, to almost every aspect of business required numerous permits, which had to be laboriously obtained from numerous different ministries.

One of the problems the Working group had to deal with was corruption and personal connections needed to make the bureaucracy move which is endemic to the Chinese government in those years. Without the ability of seasoned Chinese businessmen who are skilled at making the appropriate payments and cajoling the bureaucracy to move, the bureaucracy normally acted at its normal snail's pace. This infuriated American businessmen who had invested in Taiwan during these years. One item on the hidden agenda of the Export Processing Zone was to centralize processing of export and import documents in such a fashion as to minimize corruption and expedite processing of documents.⁸³ By having an "in house", one stop service for

⁸³With respect to this problem, an official who was familiar with the creation of the Export Processing Zone argued that the cumbersome processing of documents by bureaucrats is not necessarily caused by corruption, but by the natural inertia of bureaucrats who prefer to do nothing.

almost all import, export permits and factory licenses, it permitted the senior official in charge of the site to keep a close eye on his charges and to expedite any documents. The EPZ provided firms the opportunity to import goods without paying the duty at all, thus saving the time-consuming task of applying for a rebate of duty on export, which other firms outside the EPZ had to do. In effect, the deal offered by the EPZ is a direct model of the deal General Instruments was able to negotiate: A bonded warehouse. The primary task of the Working Group was to coordinate and solve problems created by the cumbersome bureaucracy for primarily American firms that did not have the savvy to deal with Taiwan's bureaucracy. The burden of dealing with everyday operating problems faced by foreign firms did not prevent the Working Group from adventurism in policy making.

Plan for an Electronics Industry Center

Once American electronics assemblers arrived, the Working Group sought to take full advantage of its good fortune. Bureaucrats soon hit upon the idea of making the island into an "electronics industry center". By this, they mean attracting more and more American electronics firms until they become the leading "offshore" manufacturing site in the world

Of course, for friends of the officials, they were always prepared to make an extra effort. Interview O.

that can make completely integrated finished products like televisions and radios. Recall in the last chapter that when they saw General Instruments and its fellow electronics assemblers were nothing more than just job shops to assemble unsophisticated components, they were profoundly disappointed. They wanted to have Taiwan acquire the capability to manufacture complete televisions and radios. Here, senior officials went to every manufacturer of components in, for example, a television, and asked them to set up a plant in Taiwan.

While the promotion of Taiwan as a site for offshore manufacturing by senior officials generated much goodwill and awareness of Taiwan, the so-called plan for an "electronics industry center" did not have any "carrots" or "sticks". There was no direction of financial resources to encourage manufacturers to come to Taiwan beyond the usual favorable tax treatment. As it turned out, many component makers eventually came to Taiwan, but their arrival can be minimally attributed to the promotional efforts by these senior officials.⁸⁴ While senior officials at that time spent much time traveling to the United States seeking foreign investment, the outcome of their early efforts was relatively limited.

⁸⁴Interview N.

This ineffectiveness in industry was demonstrated by the efforts to bring complete television assembly to Taiwan by Minister Li in the late 60s. Minister Li Kwo Ting visited many American firms soliciting their investment in Taiwan. He related that he tried very hard to seek the manufacturer's advice on what are the "high technology" components of a television. In those years, the "high technology" component was the picture tube, which required a large amount of capital investment to build a plant. He set that as his target to bring to Taiwan. While American manufacturers were generous with ideas and advice to help Taiwan develop industry, they were not interested in setting up a tube plant in Taiwan in the late 60s.⁸⁵ From their point of view, they already had a fixed investment in plants in the United States. Unless they were to build a brand new plant in Taiwan in addition to their capacity in the United States, they would have to effectively shift a plant from the U.S. to Taiwan. This would involve disassembling the plant and shipping it to Taiwan. Along the way, they would incur substantial costs of firing employees in the U.S. as well as an interruption in production. Because the market for television was relatively saturated by the late 1960s, there was little incentive for American firms to set up new plants. Moreover, they already had problems of excess capacity caused by Japanese production and exports to the U.S.

⁸⁵Interview N.

market. (Dertouzos, Lester, Solow, 1990, 224-225) Consequently, it made no sense for them to set up new plants in Taiwan even if the costs were substantially subsidized by the Government of Taiwan. Thus, it is easy to see why the government's efforts to promote the manufacture of a whole television from raw materials by foreign firms would be a non starter from the beginning. They had failed to take into account how setting up a new television tube plant in Taiwan would benefit the American firms.

In those early years, the Working Group's bold vision was not matched by Taiwan's industrial capacity. The reality at that time was that Taiwan possessed neither the skills, capital nor technology to be much more than an assembler of components for the electronics industry. In the late 60s, there were clear advantages to exploiting low-cost labor in Taiwan and using it to manufacture a few components that are, by their nature, particularly labor intensive. This served both the interest of the American firms, which needed lower cost labor, and the interest of Taiwan, which needed employment and foreign exchange. However, many of the other parts of, e.g., a television, were in fact not labor intensive. Nor are there large production scale economies that would have made setting up a new plant in Taiwan to take advantage of a small differential in labor costs for only those components which

are labor intensive uneconomic.⁸⁶ Moreover, while small batches of labor intensive components could be economically shipped back to the U.S., the shipment of large numbers of components to be assembled into whole televisions would have added greatly to their cost. However, these economics were to change in later years, in the 70s, as U.S. costs continued to rise. To sum up, to promote the manufacture of whole televisions in Taiwan was an unachieveable dream in 1966. Consequently, the promotion efforts that aimed at attracting full-fledged integrated electronics industries that made "whole" goods like televisions was initially unsuccessful and the idea rapidly moved to the back burner. Although key ministers continued to do "selling" by visiting large American electronics firms and promoting Taiwan as an offshore assembly site, the efforts had little effect until later, in the early seventies.⁸⁷

Promoting an integrated electronics industry in the late 60s, could, on one hand, be seen as great foresight today. On the other hand, it could also be seen as entirely inappropriate. It was an idea five years ahead of its time. The activities of this Working Group represents a continuity of a pattern

⁸⁶At that time, the assembly labor cost of a television was about 15% of the direct cost of production in the United States. (Detouzos, Lester and Solow, 1990, 223).

⁸⁷Interview B.

whereby an unexpected event created an opportunity, resulting in the bureaucracy scrambling to catch up and exploit this "success." While trying to catch up with this "success," the state made an audacious move with little understanding of the industry or of the underpinnings needed to develop an indigenous electronics industry. Most significantly, the bureaucrats involved neither really understood the business rationale nor the economics that made the assemblers manufacture what they do in Taiwan and why they do not manufacture whole radios and televisions there. Therefore, it was not surprising that their efforts met with little success.

The failure to have a flood of foreign investors coming to develop an integrated electronics industry did not deter MOEA officials. However, they were in for a bit of a shock when they realized how primitive the investments committed to Taiwan really were once they arrived in the late 60s. The Working Group (WGPDEI) accurately saw the foreign owned electronics industry for what it was: nothing more than an enclave industry, with little backward or forward integration into the economy. Being planners, their first goal was to encourage the development of forward and backward linkages through a dose of administrative regulation through a tried and true tool: Local Content Requirements.

Local Content Rules?

Local Content Rules were an old tool of the Nationalist regime in promoting local industry. Indeed, the first local content rules for televisions were instituted in 1962, which resulted in the setting up of a few joint ventures between Japanese and local firms to assemble televisions from kits. However, the Japanese electronics firms did not use these joint ventures with local firms to assemble television and radio products for reexport. They were the archetype branch plant manufacturer whose reason for being is to hop behind tariff walls in order to maintain their dominance of the local market for televisions.

Japanese Consumer Electronics Manufactures

One would expect that the segment of industry that ought to have been most responsive to local content requirements was the consumer electronics industry. Here is a relatively "low tech" segment of the industry where Taiwan companies possessed a high potential for "learning from doing." However, this industry was dominated by Japanese assemblers or joint ventures that did a minimum of assembly of electronics goods destined for the Taiwan market. Had local content requirements been gradually introduced and then upgraded, it ought to have created the forward and backward linkages

desired by the bureaucrats. However, this was not the case, for a number of reasons.

Japanese electronics firms took a dim view of state actions to promote local industry because they saw the joint ventures or assembly operations as captive importers for their components. Moreover, they had no interest in creating potential competitors by transferring technology. It was not so long ago that many of them used the same tactics to establish joint ventures and acquire technology from U.S. and European firms while heavily protecting their home market. (Detouzos, Lester, Solow, 1990, 221) Why should they now teach Taiwan how to compete with them? Furthermore, this form of captive import also provided them with a way of repatriating profits through transfer pricing of components. Given Taiwan's strict licensing and control of imports to "essentials" and limitations on the repatriation of profits, it was in the interest of Japanese firms selling to the domestic market to minimize local purchases in order to have the largest possible base of imports to spread their indirectly repatriated profits through transfer pricing. Unlike commodity items like bulk chemical, basic steel or raw materials, local content requirements for manufactured items made up of hundreds of discrete items were difficult to enforce. Had a manufacturer wished, it was always possible to "design in" components in such a way that local industry could not make them. Without

customs officials being electronics engineers and manufacturing experts, it was next to impossible to precisely classify what was "essential" and what was "non-essential."

The crude tools of import classification systems were woefully inadequate in enforcing local content rules without barring ALL imports, which would have eliminated the industry in the short-and-medium-term. No economy could accept the costs of eliminating as critical an industrial sector as electronics without severe repercussions. Thus, the efforts to use administrative guidance to raise local content were never backed up with stiff trade rules, and the electronics industry was never heavily protected by tariffs or licenses across the board from components to finished products.

Administrative guidance and toothless regulations on local content were effectively and efficiently bypassed by Japanese firms using numerous ruses. Manufacturers would find ways to make the simplest parts of their equipment in Taiwan while importing as much of the higher value components as possible. Other techniques included the splitting of imports among other related firms in Taiwan, which then added a little value and called the entire value of the item "locally made" when it was sold to the Japanese owned assembler in order to maximize the apparent total local value. Moreover, Japanese joint ventures

and assemblers went to extraordinary lengths to prevent diffusion of technology or knowledge that may create competitors in Taiwan. When they signed technical cooperation agreements during this period, it was often only with the strictest rules prohibiting the export of products made under license and otherwise restricting competition. When the government prohibited or vetoed such agreements, other tools such as "informal" understandings and "informal" foreign investments were used to bypass the bureaucracy. Through a variety of measures, they were frequently able to circumvent much of the "teeth" in the government's regulation of foreign investments. To this day, many of the locally manufactured consumer goods made under license are barred from export by these rules.⁸⁸

American Firms' Response to Local Content Regulations

The frustration of local content Rules by the Japanese did not deter the government from using the same methods on the American assemblers. The Working Group saw the arrival of American firms as an opportunity to upgrade the local electronics industry through requirements to increase local procurement from these firms. Thus, as with the original "success" at attracting investment in the electronics

⁸⁸Interview B.

industry, the state tried to create more spin-offs from the existing circumstances. Using a two-track strategy, the Working Group first sought to increase the number of electronics assemblers and component makers that produced entirely for export. Secondly, EPZ firms and import substitution assemblers were both encouraged to produce locally by local content rules.

Even at that time, the Working Group did not see electronics manufacturing as within the capability of most local firms. Thus, the Working Group also sought to increase the value added by local industry by encouraging the industry through promoting joint ventures in parts and components manufacturing. Two exhibitions to introduce local manufacturers to foreign investors were held in 1967 and 68. (Gold, 1986, 83) Here, American electronics makers agreed to put on an exhibit of the products they produced so that local businessmen could see what raw materials they needed to buy. Businessmen then went to purchase technology and equipment needed to produce what the US firms imported. Both of these shows were spectacularly successful in that they resulted in the creation of many business opportunities that did not initially exist. Thus, local content was increased not with legislation, but by facilitating market activities. However, because of the low capability of local firms to manufacture most components, their supplies of goods to US assemblers

remained relatively simple, low technology, low value-added items. The bulk of the business in components and parts continued to be imported by the US assemblers. The policy of guiding the industry toward increased local content was partially successful to the extent of broadening the U.S. electronics assembly enclaves. The real surprise was that once U.S. electronics assemblers came to Taiwan, their component suppliers followed them to the EPZs. To the extent that the economic bureaucrats placed no barriers in the way of these firms and held two exhibitions to promote foreign investment by them, it can be said that the policy was successful in promoting industry.⁸⁹

The Exhibitions to Introduce Foreign and Local Manufacturers

Two exhibitions by foreign manufacturers were organized by the Working Group in 1967 and 68. By all accounts, both official and from business, the shows were tremendously successful.⁹⁰ The exhibitions were intended to increase the amount of commodities supplied by local firms to the foreign assemblers. Foreign assemblers were asked to make up a display where they opened up their products and showed exactly what they needed to purchase in the way of components and materials. There

⁸⁹Interview O.

⁹⁰Interview O.

were, indeed, some products the assemblers imported that were in fact available from local manufacturers at reasonable prices. The American firms showed no hesitation in buying locally made inputs when it was justified on the basis of price and quality. When U.S. firms felt local or regional (meaning Japanese and other East Asian suppliers) industry could make simple parts like screws and cabinets, they did not hesitate to purchase items from them. After all, their goal was to lower costs and the cost of importing low technology, low value and bulky items from the U.S. did not make much sense when it could be procured locally or within the region. However, for any other items not immediately within the local industry's capacity, U.S. firms politely declined to either buy from unqualified sources or systematically transfer technology to them to produce the goods needed without compensation. This, however, did not deter local entrepreneurship from working.

While many of the components and products were beyond the local industries' existing manufacturing capability, some of the most enterprising Chinese businessmen sought out foreign investments from both Japanese and American firms who had the requisite technical skills, and created a number of joint ventures and signed technical agreements to produce them in order to supply the enclave industries. This resulted in ultimately increasing the number of Japanese and American

component makers active in Taiwan. However, the migration of Japanese and U.S. component makers to Taiwan, so critical in upgrading local industrial capacity, would not have happened irrespective of "guidance" if it were not for sound business reasons of seeking lower costs and to be closer to their customers who have moved to Taiwan or East Asia. To the extent that local joint ventures provided a vehicle for exploiting a local market with little risk, it was attractive to many multinationals that were reluctant to invest in a distant, small market they neither understood nor cared about.⁹¹

Since both the government and the firms knew it would be simple to move the rudimentary EPZ assembly operations set up initially by most firms, little pressure beyond gentle persuasion was put on U.S. firms to improve local content. Indeed, given the relationship between the Republic of China and the U.S., it would have been foolish to "act tough" with U.S. firms. While these geopolitical constraints did not apply to Japan, giving the state more leverage with Japanese electronics assembly firms, the state was still constrained by the fact that companies could move to competing EPZs like Hongkong with little loss. Consequently, state guidance to promote forward and backward integration, while it did not

⁹¹Interview O.

achieve its goal of creating U.S. investment in an integrated electronics manufacturing industry for the local market, did succeed in achieving an increase in local content through a broadening of enclave activities. The point is, the bureaucrat's initiatives only really succeeded when they facilitated market activities, not when they tried to force the industry to do what it did not want to do. The goal of promoting an electronics industry based on forward and backward integration with a domestic market was still elusive.

Frustration of Guidance

By the early 70s, it could be seen that the Working Group's goal of creating a local electronics industry able to produce finished goods through guidance and administrative controls was frustrated in the 1960s. Rather than being foresighted, the Working Group was hastily formed to take advantage of what appeared to be a reasonable possibility that happened almost by chance. When it sought to work against market forces or the interest of key players by fostering local content rules and other measures to fostering an indigenous electronics industry, it failed. For example, Taiwan was not able to persuade an American television tube manufacturer to invest in

a wholly owned plant in Taiwan.⁹² When the Working Group tried to nudge firms already predisposed to go in a certain direction, it succeeded as long as it did not go further than the private sector wished to go. The reality was, given the absence of effective sticks and carrots that could be used without fear of repercussions, state guidance and administrative controls on a complex, difficult to regulate industry was but a limited tool.

To sum up, efforts to promote the electronics industry in the 60s were not a consistent, coherent or conscious strategy from the beginning or during the decade. The original "breakthrough" for the industry came as a result of efforts to promote direct foreign investment to provide foreign exchange to the cash strapped economy. Beforehand, planners did not move actively to establish an export processing zone until after they were given the idea by the arrival of EPZ processors throughout the early 60s. The surprise arrival of an American firm as an export processor galvanized the bureaucracy to act quickly to capitalize on their success by hastily drafting legislation and setting up an EPZ. Even

⁹²This frustrated Li Kwo Ting and eventually, he solved this perceived "bottleneck" by promoting joint ventures between local and foreign firms. This was ultimately successful. Several tube plants were eventually set up in Taiwan in 1971; one was a joint venture between American Chinese and Chinese interests; the other was a joint venture between American and Chinese interests. (ADL, 1973, Appendix D.)

then, the EPZ was an experiment that would have been abandoned had it failed after six months. Further efforts to strengthen the industry in 1966 by promulgating a grandiose vision of creating an "electronics industry center" were comparatively unsuccessful. While such actions may have been seen as visionary, they were in fact premature. Taiwan did not have any of the prerequisites --- markets, infrastructure, manpower, or technology --- necessary to promote an integrated electronics industry. Nor did the state pour significant investments into the electronics industry at this time to "buy" the needed technology and skills the nation did not have. At the same time, the state did not hesitate to pour vast sums into the development of what it thought were strategic industries. Thus, efforts to promote the electronics industry amounted to little in substance. This contrasted sharply with industries such as steel, petrochemicals and automobiles, which the state saw as key policy areas and poured vast amounts of funds, established state enterprises and utilized every means at its disposal - ranging from trade and tariff barriers to strict regulation of imports - to establish the dominance of these industries.⁹³ Consequently, the electronics industry was to play only a limited role in development plans. It was more or less left

⁹³See Arnold (1989) for his description of the extent to which the government financed the local automobile industry by way of contrast.

to develop on its own with relatively little interference or overt promotion from the state.

Ambiguous State Guidance 1970-78

The government's policy toward the electronics industry was to change during the 70s. One of the reasons for this fundamental shift was the appointment of Sun Yuan-suan as Minister of Economic Affairs in 1969. Sun was formerly the Minister for Communications for two years. His background was in electrical engineering. Prior to returning to Taiwan, he was the CEO and general manager of the Electricity Corporation of Nigeria. Minister Sun brought to this job a world of experience with heavy engineering and administration that made him stand out among his peers. He had few illusions as to the primitive state of Taiwan's electronics industry. To him, the industry was nothing but a labor intensive assembly operation that was increasingly facing tough competition from other countries with sources of cheap labor. In this regard, Sun was clearly on the right path. His reasoning was that no matter how much the existing activities could be broadened, they would remain nothing more than a second-rate activity. He felt that,

"We have already gone through developing agriculture, labor intensive manufactures, the next step must be to build high technology products"⁹⁴

What were high technology products to him? They were capital and technology products that were familiar to someone with his background: integrated steel mill, automobiles and heavy trucks, large generators, heavy Machinery, precision manufactures such as electronics, machine tools, instruments, and communications equipment.⁹⁵ Minister Sun was an impatient man. He did not hesitate to make use of state power in the fullest sense of the term to make his ventures successful. Speaking of the efforts to build a successful steel industry, he observed,

"I helped Chao Yao Tung [the manager in charge of the state owned venture] with everything. Tariffs [on imported products], quotas... to make this venture a success." (CEPD, 1976, 8-10)

Premier Sun was a man of his word. All of the above capital intensive projects were launched by Premier Sun within a few

⁹⁴Premier Sun Yun-suan. Interview P.

⁹⁵See Six Year Plan for Economic Development of Taiwan 1976-1981, (1976, 8-10).

years of his assumption of power. The principal instrument he used to promote electronics and high technology was the establishment of the Industrial Technology Research Institute (ITRI) in 1973.

The Founding of ITRI

ITRI was to have been formed as an applied research organization whose goal was to bring state of the art technology to improve the capabilities of the local manufacturers. Minister Sun pushed for the formation of this institute together with a "Science Based Industrial Park" from the time he became Minister of Economics in 1969.⁹⁶ The idea was that ITRI was to be an applied research institution that would develop "high technology" goods that could be immediately commercialized into industrial products. Moreover, the institute was to be a free standing institute that was not subject to civil service regulations. The Science Based Industrial Park was to have been a mirror of the Institute's activities. Both of these were to have been initiated immediately after Minister Sun proposed them in the late sixties. However, Minister Sun encountered stiff resistance to both ideas and he was barely able to fund ITRI. The "Science Based Industrial Park" idea was shelved for ten

⁹⁶Interview P.

years before Minister Sun succeeded in funding it. The reasons for this bureaucratic opposition to Minister Sun's initiatives were numerous.

While the budgets for the existing research facilities were under the control of the Legislative Yuan, Minister Sun demanded that the new institute's budget be directly under the control of his ministry. In other words, legislators who had been able to make use of their power and influence in the operations of the institute were to lose it under the new institutional arrangements proposed by Minister Sun. Moreover, the bureaucracy vociferously objected to the creation of this free-standing agency because it would not be subject to the administrative regulations under the civil service code.⁹⁷ Like any government, government organizations had to follow a myriad of regulations on all matters ranging from staffing, procurement, and organization. ITRI being a free-standing agency would have meant that all government agencies were strictly limited in the amount of influence they could have on this new agency. As one would expect, the Legislative Yuan and Cabinet were deeply divided on this issue. It was only with the confidence and trust of President Chiang Ching-kuo that the proposal was accepted in 1972 after almost two years of delay.

⁹⁷Interview G.

Minister Sun secured the go-ahead for the establishment of ITRI in 1973 by a sleight of hand: Rather than adding insult to injury by demanding a free standing institution with "new money," he merely asked to have three existing laboratories amalgamated, the Union Industrial Research Laboratories, the Metal Industries Research Laboratories, and the Mining Research and Service Organization, and gained control of their budgets and operations directly under him as a free-standing agency.⁹⁸ Minister Sun argued that in order to make this institute attractive to outstanding overseas Chinese scholars and scientists, the Institute had to pay a competitive wage relative to salaries in the United States. The Legislative Yuan was infuriated by his suggestion that the Institute would become an elite institute that paid salaries well above the norm in Taiwan at the time.⁹⁹ However, because these laboratories had already been transferred to the Ministry of Economic Affairs, the segregated budget was no longer subject to the scrutiny of the Legislative Yuan except as a part of the larger budget for the Ministry. In other words, Minister Sun had the freedom to do as he pleased with this institute.

⁹⁸Interview P.

⁹⁹Interview G.

One of the first acts Minister Sun did was to recruit from the United States a prominent professor and scientist, Dr. C.C. Wong, to head this institute. Taiwan's local scholars and scientists were angered by this appointment of an "overseas" Chinese to one of the top scientific jobs available in Taiwan at the time.¹⁰⁰ Whereas today's history boasts that ITRI was able to obtain the majority of its funding from contracts with the private sector, initially that was not the case. For the first five years under Dr. Wong, the institute was a disaster and an endless drain on government revenues. The reason for this was because Dr. Wong turned out to be an outstanding scholar and academic, but he was ill-equipped to be placed in a job that required "mid-tech" applied research that was closely coupled to the market.¹⁰¹ This type of research had to be sold to a skeptical private sector that neither Minister Sun nor Dr. Wong really understood. While Dr. Wong's ITRI conducted very esoteric "high tech" and basic research of very good quality, it required vast sums of funds that had an unknown payoff. In that respect, the research conducted by ITRI under Dr. Wong was not unlike many of the scientific research projects funded in the United States. While such research may be necessary for the world's scientific superpowers, for a poor, developing country such as Taiwan,

¹⁰⁰Interview A.

¹⁰¹Interview A.

such basic research was neither understood nor valued. Nor could the government of Taiwan afford it. Moreover, ITRI, during those early years, made little effort to "sell" its technology to the private sector. There were perilously few linkages and contacts between its work and outside industry, contrary to its stated mandate. Consequently, under Dr. C. C. Wong's leadership, ITRI was to be a perpetual drain on government resources and a source of numerous tongue lashings by legislators for Minister Sun.¹⁰² ITRI was not to be what it was intended to be until Dr. Wong was replaced in 1977 and the entire institution cleaned up by the new management. This was to result in the departure of much of the staff initially built up under Dr. C.C. Wong.¹⁰³

The founding of the IC laboratory at ITRI, which we deal with later, is another effort in parallel with this pattern: State intervention under a forceful Minister Sun to move Taiwan's economy toward a vision of high technology based industry with little regard for the existing base of industry. Later in the next chapter, I will discuss the developments in the electronics industry independent of state intervention. It was developing on its own in a rapidly changing pattern that Minister Sun really never really fully understood.

¹⁰²Interview A.

¹⁰³Interview A.

State Leadership and Guidance to High Technology?

The extent to which the state misunderstood the process of change the electronics industry was undergoing was demonstrated by the 1972-75 Plan. In this plan, the electronics industry was mentioned in passing as a growing sector. However, it viewed the existing industry with derision either as EPZ activities that employed semiskilled labor or as a low technology, small, indigenous industry with little capability beyond producing shoddy consumer goods or parts. While the plan regarded electronics as an industry worthy of support, a detailed look at the actual items the state thought suitable for state investment is indicative of their thinking. The plan called for products like computer terminals and peripherals to be developed.¹⁰⁴ However, rather

¹⁰⁴Both of these products were only used by mini or larger computers in the early 70s. The microprocessor was not to be invented until the early 70s. Steve Jobs of Apple computers founded his firm in 1974. Had the state had an accurate vision of promoting a feasible local electronics industry for the late 70s, it might have suggested promoting microcomputers. In fact, this was not the case. Nor would these products have benefitted much from the relatively small domestic market for computers. The reason is because most computers are sold as systems. While computer terminals and peripherals are the least specialized components of a system and in theory, any terminal or peripheral can be used with any computer, in practice, most manufacturers try - and succeed - in limiting customer purchases of "third party" components as this would hurt one of the most profitable parts of their business. Thus, IBM computers have awkward and complicated terminal communication protocols that are incompatible with other major brands, and peripherals of one brand are more likely than not incompatible with other brands. While it is always possible to produce "third party" peripherals, the small size of the domestic market would have made scale

than a planned objective that had allocations of resources to back their implementation, it was in fact a statement of the IDB's aspirations. The way these items ended up in the plan is itself indicative of the way bureaucrats thought.

The Arthur D. Little Consultants Reports of 1973

The Industrial Development Bureau (IDB) commissioned Arthur D. Little to prepare another series of consultants reports in 1973 to explore the possibility of upgrading industry. While the report explicitly states that its purpose is to,

"identify... industrial investment opportunities and review... the overall strategy of Taiwan's industrial programs. ... the study program involves the production of a series of prospectuses for the most promising investment opportunities identified... a general investment promotion brochure.... a national industrial

economies impossible to achieve, in which case, reliance on the world market would have necessitated either a willingness of multinationals to distribute the products for the Taiwan firm or the establishment of such a network in at least the U.S. market. Moreover, this would run the risk of selling a relatively untried and untested product on the world market. Given these factors, the cost of developing the product would represent but a fraction of the cost of actually making it a financially viable venture. Given the dismal economics, it is perhaps fortunate that no state funds were wasted on such a doubtful venture.

development overview with guidelines and strategy for industrial development."(ADL, 1974, 1)

While this series of studies appears on the surface to be a case of the state seeking outside professional assistance through a major consulting firm to improve its development strategy, in fact, the reasons for commissioning these reports were not as they would appear. First, the project was a very extensive study that involved nineteen consultants from Arthur D. Little. This represents one of the largest consulting projects even for a major consulting firm like Arthur D. Little. However, the majority of the consultants from Arthur D. Little were from the United States, with only one member resident in Taiwan during the entire term of the contract. Therefore, the project team did not come to the assignment with the degree of familiarity and in-depth know-how that may have prepared them for the task. How did they circumvent this problem? First, they employed a small local firm which provided them with hands-on guidance; second, the government in turn provided them with the assistance of 13 professional staff that collected data for the teams. These "counterparts" provided by the government's CIEPD and IDB,

"accumulated statistical and other industry-related information. This effort, which required knowledgeable interpretation by the counterparts, was important as a

means of filtering pertinent information from massive data. In addition, the counterparts were responsible for screening a list of Taiwan manufacturers in the electronics sector to divide the list into key respondents and companies of lesser importance. From this list the study team selected for interviews a group of companies which represented a cross-section of Taiwan's capabilities in manufacturing electronics products." (ADL, 1974, 4)

In other words, the research team did little independent investigation that was not pre-screened by the "counterparts" from the government. Given the interest of the consultants, no sensible consultant who was attuned to the need for securing follow-on contracts - for which this project is just a beginning - would be so insensible as to be more than mildly critical of government policy. (ADL, 1974, 4) In fact, the very way in which this form of contracting was structured was made to ensure that the team said the "right" things in the report. The question then becomes: What might have been the motivation of the government in giving this major contract to Arthur D. Little?

The issue of what motivated the government to engage Arthur D. Little is an intriguing question. While this study can only make an informed speculation, the general opinion of many of

the informants who were interviewed suggested the following reasons: First, the reports were used to promote a point of view that had already been decided a priori within the IDB or the CIECD. They were used as tools to lend credibility to a faction of the bureaucracy (MOEA) against other ministries and officials who opposed them. Second, the studies were a way of indirectly engaging Arthur D. Little's international contacts and networks to promote foreign investment in Taiwan in the targeted industries that had already been substantially decided prior to letting the contract. Indeed, several informants interviewed explicitly said this was the primary goal of the reports.¹⁰⁵ Indeed, considering the scope and details in the project, the reports recommended perilously few useful ideas for upgrading local industry.

Indeed, there is a striking parallel between the way Arthur D. Little viewed the local industry and how local government officials perceived it,

"With notable exceptions, the Chinese firms appear to have relatively inadequate technology and management and are oriented to processing components for the foreign organizations - in the case of the assemblers - and to

¹⁰⁵Interview O, A and B.

the low-cost export market in the case of the components manufacturers.

For many of the Chinese companies there are difficulties with access to technical assistance and good manufacturing technology, modern and efficient equipment, reasonably-priced capital for expansion, an integrated sub-contracting and supporting infrastructure, quality control and quality assurance, internal research and development capacity, and general management capability - including marketing and access to international marketing channels." (ADL, 1974, 5)

Their derisive view of the existing foreign manufacturers parallels that of government officials. The report called existing manufacturers of computers, integrated circuits and electronic calculators "[not] fully integrated project[s]; that is to say, a project that begins with the basic components and produces a finished product." (ADL, 1974, 63)

The idea that government should give technical assistance to new firms through its applied research organization ITRI (Industrial Technology Research Institute) was broached in the report. However, as we will see later, this was not to happen for many years. The outcome of this report was to identify "a group of new opportunities for investment in the electronics

industry that would be worthy of promotion" (ADL, 1974, 6)
What the government wanted was echoed by the report,

"projects which will be fully integrated, or at least approaching the level of integration of their overseas counterparts. Naturally a computer is more than an assembly of memory planes. Integrated circuits need first be fabricated, assembled and finally tested. Scientific or engineering calculators of a more complex design (more than the four function, personal calculators) draw on many technologies and demand far more sophisticated supporting and subcontracting industries" (ADL, 1974, 63)

What are the items that met this criterion? Computer peripherals, computer terminals, minicomputers, numerical control systems, integrated circuits and electronic calculators. These items were neither within the existing industrial base's capabilities nor reasonably readily developed without substantial investments in research and development. Yet the items were placed into the next economic plan without a program to back its words with deeds. The development of such products did not draw on the capabilities and serve the needs of the existing electronics industry. In other words, the government's vision of the future, while driven by the goal of promoting "capital- and technology-intensive industries," certainly did not regard the existing

industrial base worthy of consideration in its future plans. Indeed, many of the key individuals involved in the IC project explicitly stated that it was their intention to build up a technical capability that would allow industry to "catch up" to them, it was not to have any use immediately.¹⁰⁶ Their vision of what such industries were was based on an idealized vision of the existing state of U.S. industry in the early 70s. It was not based on a vision of the future that was achievable with Taiwan's existing local industry.

The real purpose of the Arthur D. Little reports was obvious and transparent in the feasibility studies for the identified products. These feasibility studies made no pretense that they were only aimed at American manufacturers. They said nothing about upgrading locally owned industry. For example, the report on computer terminals stated:

"This prospectus has been prepared primarily for use by an experienced manufacturer of computer terminals in reaching a decision to giving serious consideration to production in Taiwan. However, it may also be of value to a prospective investor who does not have such experience provided he associates himself with a knowledgeable manufacturer or obtains professional

¹⁰⁶Interview G.

assistance from competent specialists in the field."

(ADL, 1974, 27)

The reports provided cost data only in U.S. dollars, and provided comparative cost data with existing U.S. costs. The detail provided included estimating the extra cost of shipping from Taiwan. The most clear evidence of their purpose was the fact that all of these reports were reprinted in English and distributed by officials of the IDB widely in the United States.¹⁰⁷ Therefore, it is fair to say that the intent of these reports was not to upgrade local industry, but to attract "high tech" investments from abroad. The fact that "high tech" equipment was mentioned in the economic plan as an item worthy of promotion did not mean that the regime was to invest substantial funds or "guidance" for local manufacturers to produce these items. Even if projects to produce computer terminals and peripherals had been fully funded and operative, it would have but created an enclave industry of another hue - a state owned island of "high technology." In fact, had the efforts to attract foreign investment in these targeted industries been successful, they would have been nothing more than enclaves.

In this context, it is not surprising that the whole effort

¹⁰⁷Interview C.

to attract integrated "high technology" industries failed. The Arthur D. Little report ranked industries selected for further feasibility study as follows:

1. Computer Peripherals
2. Computer Terminals
3. Minicomputers
4. Numerical control systems
5. Television Sets and Radios
6. Integrated Circuits
7. Electronic Calculators

Source: ADL Report (1974, 63).

However, the report excluded category 5, televisions and radios, because it regarded those goods as labor intensive and therefore, Taiwan would not be competitive in this area in the future. The outcome was that six feasibility studies were conducted. The IDB shopped those reports to just about every major manufacturer but they were not successful in any one for the above products. In later years, all of the above "targeted" products except for minicomputers and numerically controlled systems were to be produced in Taiwan. However, it is doubtful whether promotion during the years 1974 to 75 had

an impact on the manufacturer's decision to produce such "high technology" goods in Taiwan.¹⁰⁸

State Entrepreneurship into IC Manufacturing?

The tendency for the state to have grandiose visions of what was possible while disregarding the capabilities and needs of the existing industry was repeated in 1974 when Minister Sun pushed ahead to create an Integrated Circuit (IC) industry. Minister Sun realized that the Arthur D. Little reports were likely to generate little interest from foreigners. Moreover, he wanted to develop the high technology capability locally. He was therefore, not content to wait for foreigners to come to set up the "high technology" industries identified as feasible in the Arthur D. Little reports.¹⁰⁹ Since Minister Sun's background was in heavy industry and electrical engineering, he had little current knowledge of electronics. On this, he relied on the expertise of a friend and confidant, Dr. Pan Wen-yuan, who was invited to visit Taiwan in 1974 on

¹⁰⁸A crude interpretation of the "raw" statistical data will show that Taiwan produced large numbers of ICs in 1966 and large number of calculators beginning about 1975. This would appear to "prove" state policy had an intended outcome. The reality is both the calculator and IC manufacturers operating in Taiwan did not assemble "integrated" components. They just did labor intensive assembly work in Taiwan. This is not what the government wanted.

¹⁰⁹Interview A.

a two week trip to visit the local electronics industry with a view of making suggestions as to how it could be improved. Dr. Pan was an electrical engineer at RCA in the United States with a background in microwave electronics. After the visit, Dr. Pan met with Minister Sun and other senior officials including Dr. C.C. Wong (President of ITRI) and made a presentation on the changes he perceived to be necessary to enhance industry.

Dr. Pan argued that in order to develop applied industrial technology, research must be highly focused. Moreover, broad based research programs - typical of what was then conducted by ITRI under Dr. Wong - cause resources to be dissipated.¹¹⁰ He argued forcefully that they needed to concentrate on one technology. The common denominator in electronics was ICs. Dr. Pan suggested that a government program might establish a local IC manufacturing technology within 5 years. Dr. Pan suggested that this program must not be implemented by committee, but by a well-established organization with the administrative, technical, and managerial capacity to carry it out. It was to be managed like a business. Moreover, it must be a multi-disciplinary organization rather than just a technology transfer. It had to transfer not only the know-how for making ICs, but the entire management infrastructure, at

¹¹⁰Interview G.

which point Dr. Pan was asked how much the project to bring IC technology would cost. Dr. Pan said \$10 million without a slip even though he had no idea at the time. This became the government's planning figure. The idea to proceed with the project was accepted without further question by Premier Sun. It was decided on the spot by Minister Sun that ITRI was to be the organization to house this new project.¹¹¹ This was to generate much resentment within the bureaucracy. (Sun, 1989, 129-31) The Ministry of Communications wanted the project under its control. They pointed out that ITRI already had chemical, mining and mechanical engineering. ICs were for telecommunications and naturally belonged there.¹¹² At that time, there already was a government funded program for ICs research funded by the Ministry of Education. Of course, they were also disappointed that they were not given the project.¹¹³ Thus, the Electronics Research and Service Organization (ERSO) was formed as a division of ITRI. Dr. Pan did not recognize how IC technology at the present time would be anything but an enclave activity. It did not fit into the existing industrial structure. It was his expectation that local industry would advance in time to meet it. Thus, the

¹¹¹Interview G.

¹¹²Interview G.

¹¹³Interview A.

linkage with existing local industry was not a factor in the initial conceptualization for the IC project.¹¹⁴

At that time, the capability for manufacturing ICs from raw materials did not exist in Taiwan nor did it meet an established need in Taiwan. In 1974 the manufacturing of ICs was a relatively sophisticated technology whose most basic products had few applications in consumer electronics until the late 70s. Therefore, the products had no clear prospects of synergy with the majority of Taiwan's existing electronics industry. Nor could the future success of such a venture be foreseen. No one in 1974 could have foreseen that micro computers would become commonplace and alone generate a large market for ICs by 1980. Most of all, no one could have foreseen Taiwan being a major manufacturer of micro computers by 1984. Therefore, a desire to set up an IC manufacturing facility in Taiwan could not have been driven by foresight about the future market trends except in the most general of terms. While such general terms are useful, they are not sufficiently specific to insure that a prudent business investment can be made. Consequently, the venture to build an IC manufacturing facility was, from the start, an uneconomic enterprise. Nevertheless, this industry fit the government's vision of aspiring to pursue "high technology" industries.

¹¹⁴Interview G.

Minister Sun received approval for this project despite strong opposition from many quarters. (Sun, 1989, 127-8) The request for proposal was let in 1975 and the project funded by 1976.

While this project would appear to be a clear case of state leadership into commercial high technology, this is only partially true. At that time, ICs were primarily imported or produced by MNCs that had branch plants in Taiwan. When the state sought to build an indigenous IC industry, it was not originally with the intention of making it a viable business proposition. In fact, it was meant to be no more than a state funded research, technology project that may potentially pay off by helping train industrial talent and enhance local research skill. First, the facility purchased was the most advanced technology available. It was a relatively small scale, comparatively unsophisticated facility that only had a maximum capacity of 15,000 4" wafers a month.¹¹⁵ The plant was not suitable for producing any large volume production. It was best described as a research and small batch processing facility for only a few technologies in the spectrum of IC technologies available.¹¹⁶ However, for the intended purpose,

¹¹⁵It did, however, have the capability to be scaled up quickly if it succeeded. Interview G.

¹¹⁶See Simon, (1980, 560-574) for a description of the different technologies companies that bid on the project offered. Had the project chosen another bid with a different

which was research, education, and training, it provided an excellent low cost vehicle. This facility was purchased for a little more than US \$12 million. At that time, a world-class digital fabrication facility cost roughly US \$50 million. While there are many skills that a small facility can teach that would have expedited a future investment in a commercially viable venture, that was not a consideration at the time. Had it been a consideration, the venture's backers would have noted that a world-class venture at that time required a six-inch wafer facility and chip masks for a broad range of products.¹¹⁷

Moreover, the facility did not provide the marketing and distribution channels for products that might be made profitably from such a facility into established markets even though one was later set up.¹¹⁸ In other words, the facility posed no threat to any established IC maker even if it was intended to be a full-scale commercial venture. As it was not intended to

technology, the results would have been totally different. Interview G.

¹¹⁷Chip fabrication involves etching on silicon wafers a series of circuits using different "masks." The technologies transferred included masks for RCA's 7000 series of CMOS logic chips, which is a relatively limited range of ICs. Interview G.

¹¹⁸There was a small amount of ICs RCA was obligated to purchase from them. However, that was far from sufficient to make the venture pay off economically.

be, it posed no threat to any local or multinational firm. While it fitted with the state's vision of high technology, it certainly did not fit with any vision of potential business opportunities as seen by the established IC industry in the U.S. The fact is, the state did not hesitate to make sizable commercial investments when it saw opportunities. In this case, the state did not do so. If the intention of the state was to "lead" industry towards a new "high technology" industry, it would have made sense to eliminate the sizable risks of entering manufacturing in pioneering the venture by buying a genuine, state of the art manufacturing facility together with setting up distribution and marketing tie-ups with other firms. Since it was not the original intent of the ERSO facilities to be commercially viable, these actions are understandable in hindsight. The true entrepreneurial inspiration to make chipmaking a commercially viable venture was to come later from the individuals the state trained. However, that could not be readily foreseen in 1975.

In spite of these obvious difficulties, Minister Sun was able to push the project through the bureaucracy to obtain US \$12 million to fund his project from 1975 to 1979. Thus, an IC manufacturing capability was introduced to Taiwan in 1976 without regard to the applicability of its technology to the existing industrial base or to what forward or backward linkages it could have. It was not surprising that after the

birth of this enterprise, it stayed essentially a non-commercial venture until 1977. While the initial technology transfer agreement transferred only designs for a standard series of chips to ERSO, ERSO was, thus, able to produce a limited range of standard chips, which were available at low costs from US manufacturers. They neither possessed the large scale economics needed to produce in quantity to compete with established makers nor were they a niche producer initially. The project was almost destined to become a bust until the engineers who were trained on this project suddenly hit upon the idea of producing a custom IC for telephones. How this market came about was completely unanticipated by anyone.¹¹⁹

Market Change and the Creation of a New Opportunity

In the late 70s, because of a series of regulatory changes in the United States telephone market due to the break up of American Telephone and Telegraph (Bell), consumers were able, for the first time, to purchase telephones from suppliers other than the telephone companies with a minimum of difficulty. Overnight, a market for "add-on" phones was created. Now, because the phone companies controlled or owned their own telephone manufacturing firms, they were used to functioning in a highly structured, regulated environment and

¹¹⁹Interview G.

were not adept at responding to market conditions. Secondly, the telephone companies also had extensive specifications for telephones that severely restricted the design of a telephone to designs that had long service lives and met other stringent regulations. Deregulation meant that it became possible to manufacture and legally sell phones that met none of these specifications beyond the interconnect electrical specifications. Eventually, a few chip makers in the U.S. and Japan began to offer a chip set that reduced the number of components needed in a phone to a very small number. Taiwanese manufacturers, which at that time already had a strong capability in injection plastic molding, electronics assembly, consumer electronics, and marketing, observed that there was a growing market opportunity in making a "one piece" telephone that could be sold for US \$30 in the North American market. The critical ingredient that made a "one piece" phone possible was a microchip that reduced the majority of electronic components in the phone to a single IC. This custom IC was initially made by only a few firms in the U.S. and sold to Taiwanese assemblers who carried out the labor intensive part of assembling it into a telephone. Initially, only a few firms manufactured "one piece" phones. Soon, the idea spread to others and within a year, hundreds of manufacturers of "one piece" telephones appeared on the market. By 1983 - about five years after the first phone appeared - the market was glutted with "one piece" phones

selling for an average price of US \$7 per phone versus the telephone companies' phones, which cost about U.S.\$30 to manufacture in the U.S. In the next chapter, I will discuss how Taiwan came to be a major site for the assembly of telephones. While this created a huge demand for this type of ICs in Taiwan to be assembled into telephones, it did not create much demand for local IC makers. The custom IC required by the phones was imported either from the US or Japan.

ERSO was able to produce its own version of a telephone chip by 1977. It is interesting to note that this was not a part of the chip designs initially transferred, but developed locally from the technologies learned. However, local firms rejected ERSO's products because they had no confidence in the quality and reliability of Taiwan-made ICs.¹²⁰ The first commercial customer for the chip was in fact a firm in Hongkong.¹²¹ However, by 1978, the quality of the ERSO-made chip was sufficiently well established that local makers began to purchase it as well.¹²² Thus, due to a whole series of fortuitous events, ITRI was able to have its first real

¹²⁰This lack of confidence was not unfounded. Taiwan-made chips initially had a very high 90 day to 1 year failure rate.

¹²¹Interview I.

¹²²Interview I.

"commercial" success of being an applied technology research facility transferring its expertise into commercial products. The management of ITRI and Minister Sun were both overjoyed.

Formation of United Microelectronics Devices

The news of a successful commercialization of a product out of ITRI was well received by Minister Sun. Minister Sun at that time was under increasing pressure for his profligate spending on "high technology" at ITRI that had, thus far, generated few results.¹²³ Thus, the failure of ITRI was a clear black mark on his record as Minister of Economics. It was not surprising that when the news of this success came, Minister Sun was anxious to exploit it.¹²⁴ When the principals who made the success of the IC project possible tried to put together a proposal to have the successful portion of the lab made into a commercial venture, they first sought funding from the government. Given the relative lack of success of ITRI up until this time, Minister Sun was not able to provide full funding for the venture. The entrepreneurs were told to find private sector investors for the venture. However, when the principals went to solicit funding to form a private company to make the telephone chip and other products, they met with

¹²³Interview P.

¹²⁴Interview A.

no support from the private sector. The major local companies that had the funds neither understood the product nor the commercial viability of the venture.¹²⁵ However, by this time, Minister Sun was desperate for a success to vindicate his investment in ITRI. Moreover, the lack of success of ITRI hung like an albatross around his neck and prevented him from further advancement in his career. Minister Sun placed his entire influence and energy into promoting this venture. He personally telephoned many wealthy industrialists asking them to put money into this venture as a personal favor.¹²⁶ Reluctantly, a few of them agreed to, never expecting to see the money again. Thus, a state-private sector joint venture was formed that became United Microelectronics Corporation. (44% government, 45% private investment, balance of shares held by the principals and employees).

Although United Microelectronics Corporation (UMC) was profitable on paper from the beginning, the company was relatively precarious for many years.¹²⁷ Indeed, in 1985, when it went public, many of the staff who held shares immediately sold their own shares as they had no confidence in

¹²⁵Interview I.

¹²⁶Interview G.

¹²⁷Interview S.

their own company.¹²⁸ This state funded venture became successful because they learned they had to build linkages into the existing industry from the beginning rather than to lead it and wait for it to "grow up" to their level. In the next chapter, I will discuss the implications of this state IC venture and explore some of the reasons why the investment turned out well in spite of its apparent lack of commercial calculation from the beginning.

Premier Sun's memoirs talk of his intention to build ICs from the beginning. This is not the whole truth. He states in his memoirs,

"In order to upgrade Taiwan's industry and move away from labor intensive industry, I focused on two targets: set up ITRI and manufacture ICs in Taiwan." (Sun, 1990, 126)

He is only talking about what was the only project at ITRI that succeeded beyond his wildest dreams. The parts of ITRI that failed to gain such successes - the precision machining and optoelectronics lab, chemical, mechanical and mining laboratories - have quietly been deemphasised.¹²⁹ The success

¹²⁸Interview S. This caused a drop in the stock price from NT \$13 opening to NT \$12 in the first day of trading.

¹²⁹Interview A. Optoelectronics would include lasers, light amplifiers, night vision devices, infra-red cameras, etc.

of the IC project served Premier Sun's interest. It vindicated his nearly ten-year reign as Minister of Economic Affairs, and moreover, Minister Sun was promoted to Premier in 1979. Minister Sun's tendency to push high technology on the U.S. model was in fact a failure from the point of view of his original vision. Although electronics was a major project right from the very beginning, the Institute Minister Sun founded, ITRI, never succeeded in terms of its original mandate of being a diversified group of laboratories that served the electronics, computer, mechanical engineering, chemical engineering, material science, energy and mining, electro-optics and measurement technology. The reason for this is that ITRI's leadership during the early years, Dr. C.C. Wong, was simply the wrong man in terms of understanding how to do applied research in a commercial setting. Premier Sun had the right idea for ITRI for Taiwan, but sadly, he executed it through the wrong man. That was to cause him much pain and criticism from the public during his years as Minister of Economic Affairs.¹³⁰

Perhaps the best way to understand Minister Sun's modus operandi is to look at his efforts to promote the manufacture of heavy trucks in Taiwan. In the case of the controversy

¹³⁰Interview A, G.

over Hua Tung Heavy Trucks, an inefficient truck maker that he and his hand picked Minister of Economic Affairs Chao Yun Tung supported, the venture collapsed because it turned out to be grossly uneconomic. Here, the venture was driven by the need to have a large-scale commercial project that was very public to demonstrate the strengths of Taiwan's ties to the United States in the immediate aftermath of the derecognition of the Republic of China in 1978.¹³¹ Thus, a politically motivated industrial venture was initiated with little regard for business economics from the very beginning. Furthermore, meddling by different factions in the bureaucracy added to the uneconomic nature of the project until it became clear that trucks made by the venture would be 40 percent above the world price. Ultimately, the venture went ahead and collapsed. Sun and his technocrats were described as,

"... engineers, trained in science and technology... [whose] natural inclination was to go out and build something rather than recite economic theory, and they held a conviction that dynamic economic development could not be based on complete acceptance of current comparative advantage..." (Noble, 1987, 704)

¹³¹The United States recognized the People's Republic of China in 1979 and downgraded relations with Taiwan.

In electronics as in the case of Hua Tung Heavy Trucks, Sun was driven by a vision of heavy industry and high technology in terms of sophisticated microelectronics, precision instruments and industrial automation of which IC manufacturing was a part. The vision that drove this desire to set up an IC manufacturing project with little linkage to the existing electronics industry was a vision of the need for Taiwan to play "catch up" with what he saw was an existing example of high technology on the U.S. model as of the early 70s. He saw the success Korea had with hiring expatriate Koreans back at relatively high wages and wanted to duplicate the feat. (Sun, 1989, 127) Indeed, with his reliance on technical advisors from the U.S. to inform him about the technology, he could have done little else. Had it been driven by a forward vision of the market rather than a static vision of the U.S. economy, he ought to have gone into something else like microcomputers.

Whither the Planners?

The extent to which the personalities of individuals, as opposed to institutions and long-range planning, matter is demonstrated by the treatment of the IC venture in the economic plans. IC making was not a planned or foreseen commercial activity in the 1976-81 Plan. In that plan, the existing electronics industry was once again seen as

peripheral to the future of Taiwan. (CEPD, 1976, 8) Under the plan's goal to improve the industrial structure, its primary concern was enriching energy resources. Coming out of the era of rapidly increasing energy prices, this concern was natural. Thus, the first priority was to enrich energy resources, followed by accelerating development of capital and technology intensive industries, then promoting modernization of production technology and capital intensive equipment in export industries, followed by promoting national defense industries, increasing research and development in industrial technology and others. (CEPD, 1976, 8-10) The computer industry was not mentioned while the electronics industry was mentioned once under measures to promote capital and technology industries. The Hsinchu Science Based Industrial Park, now a showpiece of the government's effort to promote computer and electronics, was mentioned in the plan as part of a program to develop industrial technology. However, it was not funded until 1979. By that it meant not a specialized facility for electronics and computers, but all the areas that ITRI supported.¹³²

A central issue here is whether the 76-81 plan targeted electronics as the future "growth industry" because it is "technology intensive." While the plan did not specifically

¹³²Interview A.

define what were "capital- and technology-intensive" industries explicitly, it can be garnered from its description of these industries. The plan's goals for capital- and technology-intensive industries states:

"1. Development of the basic metals industry will be actively promoted; first-phase, second-stage plans for the integrated steel mill will be carried out; and aluminum and copper refineries will be expanded to meet the development needs of related industries and lay a firm foundation for heavy industry.

2. Development of large generators, heavy machinery and precision manufactures (electronics, machine tools, instruments, communications equipment, etc.) will be intensified; new technology and equipment will be actively introduced; designing and manufacture of package plants and complete sets of equipment will be promoted; and basic processing technology will be introduced.

3. Development of the petrochemical industry will be stepped up; plans for third-stage petrochemical industry development....

4. Legislation will be amended to provide greater incentive for investment in capital- and technology-intensive industries." (CEPD, 1976, 44-46)

In other words, this definition of what is "capital- and technology-intensive" industries represents a continuation of the previous plans' emphasis on capital intensive, heavy industry at the expense of light industry. The existing electronics industrial base, being neither capital nor technology intensive by this definition, was not regarded as worthy of accelerated development. The priorities of planners were explicitly stated under the section on industry:

"Top priority will be given to the development of intermediate products and mechanical and electrical equipment to foster the establishment of second-stage import-substituting industries and thereby raise industry's ability to respond to economic vagaries as well as develop its potential for self-sustained growth." (CEPD, 1976, 45)

Not only was there no mention of electronics and computer industries as being key export industries in the next decade, but the planner's view of what were primary export industries in the planning period is interesting. Under the section on "Promote modernization of production technology and equipment

in export industries," it picks out three industries: textiles, plastics and food as "export industries." There was no mention of electronics as a significant export industry.

Because of the centrality of promoting "high technology," the plan's emphasis on capital- and technology- intensive products, it would appear that the state was interested in making Taiwan a computer and electronics leader. In fact, there is a wide discrepancy between the state's vision of what were "capital- and technology-intensive industries" and the existing electronics industry. The plan, while not defining what qualifies as "capital- and technology- intensive," stated:

"In addition, efforts will be strengthened to step up research in industry and the applied sciences, elevate the quality of labor-intensive manufactures, expand the export of intermediate and precision products, and gradually increase the ratio of exports of capital- and technology- intensive product." (CEPD, 1976, 45)

If one assumes that electronics is a "technology intensive" industry, this statement may appear to demonstrate that it was an industry that the planners wished to promote. This was not the case. The planners only regarded the industrial and

defense electronics portion of electronics as technology-intensive. That is why they spoke of the capital and technology intensive industries in the same breath. The existing industry was regarded as "no more than assemblers" who did no research and development. Although they did not dismiss the industry outright, it was certainly beyond their conception that these industries could become major segments of the industry at the time of implementing the plan. A measure of surprise was noted in the plan's section dealing with electronics:

"There are over 800 electronics factories in Taiwan, employing over 130,000 workers. The industry has expanded at such an accelerated pace in recent years that production of parts and components as well as basic raw materials has lagged behind.... The bulk of the industry's output consists of household appliances while only an insignificant portion is for business, industry and communications." (CEPD, 1976, 61)

In other words, the planners implicitly regarded consumer electronics as "low technology" while products made for "business, industry and communications" were "capital- and technology-intensive." Planners did not regard the rapid development of the electronics industry as being consistent with their objectives. What they wanted was something else.

Accordingly, the plan envisioned the following developmental path for the industry:

- "A. The investment environment for electronics will continue to be improved in order to attract foreign investment in technology- intensive and capital-intensive electronics manufacturing.
- B. Manufacture of basic raw materials and parts and components including integrated circuits for the electronics industry will be encouraged. Current production technology will be improved to raise quality, lower costs and expand exports.
- C. Manufacture of products used in industry, business and the communications system will be promoted, including small electronic calculators, computer terminal and peripheral equipment, telephone exchanges, control and display systems, and sophisticated instruments.
- D. High-quality household electronics products such as color television sets, high-fidelity stereo equipment, cassette color video tape machines, and household security equipment will continue to be developed.

- E. National standards for electronic products will be established as soon as possible and product quality inspection will be intensified in order to raise quality and expand exports.
- F. Development of electronic products used for national defense will be stepped up.
- G. Transfer of electronics industry-related technology from abroad will be strengthened." (CEPD, 1976, 61)

While this appears to be an impressive list of goals that demonstrated foresight by the planners to promote the development of an indigenously owned export oriented electronics industry, in fact, it said the opposite. The planners were actually frustrated by the success of their previous goal of attracting foreign investment that resulted in only the migration of electronics assemblers to Taiwan. Rather than attracting manufacturers, they discovered that the domination of the electronics industry by a few foreign owned assemblers did little more than transplant the highly labor intensive portion of their consumer electronics manufacturing

business to Taiwan.¹³³ Therefore, while it is true that a high percentage of products, 44 percent of the value of production in 1969, rising to 80 percent by 1972 were exported, they actually represented little value added as much of the value of the exports were composed of components imported to manufacture them. They were only export oriented in that the only rationale for locating a plant there was to take advantage of low-cost local labor available near the export processing zones. Almost all of the products so assembled were not sold in Taiwan markets. From the planner's point of view, this was not really an "industry". It was certainly not a "capital and technology intensive industry". The planners also remembered their previous failure to upgrade this industry through local content rules. Therefore, the only way to advance appeared to be through foreign joint ventures or technology transfers.

Taken in this sense, the above goals may be read in terms of a prescription to address what the planners thought were the industry's failings. Goal "A" was in fact a statement of the failure of the Export Processing Zones to develop "genuine" technology- and capital-intensive electronics manufacturing

¹³³Later in Chapter 4, I will provide a more detailed explanation as to how this resulted in an industrial structure where a few foreign owned assemblers were surrounded by numerous small foreign and locally owned component suppliers.

that did more than just assemble and sold components onto printed circuit boards, and then bolt and wire the boards into boxes. Likewise, Goal "B" was aimed at trying to capture more of the value added locally from these assemblers - a recognition of the low value added and the lack of technology transfer in these operations despite the increase in component manufacturers coming to the EPZs. This represented the old local content / import substitution impulse in new clothes. Goals C and F" are telling statements of what the planners wanted: their vision of capital- and technology-intensive products rather than the relatively simple and inexpensive consumer goods and assemblies the foreign assemblers were making. What the planners wanted was an industry able to produce business, telecommunications and sophisticated electronics like military electronics. However, the plan was partly cognizant that the existing industry was not completely beyond help. Goal "D," for the first time in any planning document, recognized that "high quality" consumer electronics was worthy of attention. The problem was, by this time, most of the firms that really needed state assistance when they were getting started three or four years earlier had already become prosperous businesses. Once again, it was a case of the state plans trailing industrial needs.

The most telling indicator of where the planners really saw the electronics fit into their plans in 1976 was in the plan's

investment plan. If the planners had really been interested in moving industry into the next growth industry in electronics, they ought to have begun to make major investments in this industry. In fact, the plan shows exactly the opposite: It listed state investment projects slated for implementation between 1968-88 worth a total of NT\$ 704,900 million (US \$17.6 billion). Not a single project in the electronics and computer industry was sufficiently significant or large to be listed separately. Even Minister Sun's US \$20 million investment failed to get a separate listing. This is hardly the kind of support the leading industry of the next decade deserved.

This neglect of the potential of the existing electronics and computer industries was repeated in the plan's forecast of production of "major industrial products". The 1976-81 plan listed the following targets for major electronic products production in Table 32:

TABLE 32

PLANNED VERSUS ACTUAL OUTPUT

Product	Unit	1975 Actual	1981 Planned	Actual Units	Value (Shipment) NT\$ Million
Electric Calculators	1,000	2.200	3,900	22,164	2,549
Digital Watches	1,000	277	5,700	5,800	3,015
Transistor Radios	1,000	10,470	17,500	87,540	2,797
Color T.V.	1,000	263	1,200	1,650	18,358
Black & White T.V.	1,000	2,600	5,300	5,273	12,891
Electric Components and Parts	NT\$m	17,500	\$38,390	-----	69,909
Total Value of Electronics Industry Output in 1981:					NT\$ 158,000 million ¹
In addition, the following finished products were not foreseen as major electronics industry production:					
Product	Unit	1981 Production		Value NT\$m	
monitor	1,000	197		820	
Computer Terminal	1,000	13		132	
Printer	1,000	.8		5.8	
Kara OK Machine	1,000	7		140	
Cassette Deck	1,000	14,923		3,802	
Loud Speaker	1,000	172,000		5,424	
Record Player	1,000	857		2,095	
Car Radio	1,000	1,013		773	

Video Game	1,000	16,358	10,046
Picture Tube	1,000	10,321	8,738
Total NT\$ Million:			\$31,976

Source: 1976-81 Six Year Plan (1976). Industrial Production Statistics Monthly, October, (1989, 150-60, 183). op. cit (82, 150-60, 183).

¹ Chinese Commodity Classification (C.C.C) Categories No. 3621. 3622 and 3623. Excluding Comms, 3524 and Electrical products categories 3611-3619. Value of Currency stated in New Taiwan Dollars (NT\$)

In other words, the plan failed to anticipate at least NT\$ 31,976,000 in production. At the prevailing rate of exchange of NT\$ 40: US \$1, this represents a shortfall of nearly US \$800 million, or 20 percent of all goods in production that were unanticipated. This is before adjusting for the differences that resulted from over or under production of planned commodities. This demonstrates the extent to which planners misjudged the importance of the electronics industry to Taiwan's economy as late as 1975. Had the purpose of the planners been to forecast growth products and spot new opportunities, their performance would have even been worse because all the unanticipated products were to become major growth products in the next plan period. As is expected from any attempt to forecast in detail the future of a dynamic industry four years hence, the results are disappointing. Not only were the production goals wildly off, they also failed to make significant investments in this rapidly growing industry as they did in other industries that they sought to promote. Thus, the only plausible explanation was that planners never envisioned that the electronics industry would do any more than take a back seat to efforts to promote "capital and technology intensive" industry. This is consistent with the complete absence of even a mention of the importance of the computer industry in the economic plans up until the 1980s.

The formation of Hsinchu Science Based Industrial Park

The Hsinchu Science Based Industrial Park is hailed as a key measure aimed to promote science and technology business in Taiwan today. It was meant to be the logical outcome of research done at ITRI and therefore, was intended as a mirror image of the research activities at ITRI. The park provides a vast array of subsidies ranging from low cost land, capital, subsidized loans, etc., to encourage "high technology." Today, the park is dominated by electronics and computer companies. Many scholars have pointed to Hsinchu as an example of the success of long-term planning and effective applications of targeted industrial promotion incentives. For example, Wade argues,

"Over the 1970s and 1980s the government intensified its efforts to deepen an R&D capacity for the new growth sectors... [A] landmark is the Hsinchu Science-based Industrial Park opened in 1980 (but originally conceived in 1969), where foreign and domestic high technology firms operate in close proximity to ITRI laboratories and where the government is willing to take up to 49 percent equity in each venture." (Wade, 1990, 98)

In reality, Hsinchu is a failure in terms of its original mandate. It was the failure of ITRI that led to the blocking

of funding for Hsinchu for ten years. Only after the "success" of the IC laboratory and Sun's promotion to Premier was he able to force the project through in 1979. Even then, the park had great difficulty finding qualified firms in its initial years. Therefore, they had to give much of the incentive to many firms that marginally met the criteria in those early years.¹³⁴ If its original mandate would have been adhered to, there should be a balance of firms engaged in all areas of scientific research. The fact that it is skewed in favor of electronics was completely unexpected and unanticipated. Indeed, this so called "strategic move" only employed 518 employees as of 1981. It was not to exceed 10,000 employees until 1987. Considering that a majority of employees in the park were no more qualified than senior high school or other graduates, this is a relatively disappointing result. See Tables 33, 34. The only firms that could have passed were electronics firms that were "near" high tech. Although one can argue that Hsinchu was the result of a long-term plan, it was only the long term plan of Minister Sun, not of the state. The outcome of a successful science-based industrial park in the 80s was only achieved by drastically rewriting the definition of success.

¹³⁴Interview A.

TABLE 33

Status on Hsinchu Science Industrial Park

Field of Companies Items	Computer & Peripherals	Integrated Circuits	Electronic Information	Opto-electronic Technology	Automation
No. of Companies (1988)	30	24	17	9	9
No. of Companies with Products (1988)	29	16	12	7	7
Value of Products (1988) (U.S. Million)	1,358	261	173	61.5	61.5
Ratio of R & D Expenditures to Value of Products (1987)	44	4.2	7.1	4.2	4.2

Field of Companies Items	Bio-Technology	Environmental S & T	Energy Technology	Others	Total
No. of Companies (1988)	4	1	1	2	96
No. of Companies with Products (1988)	4	1	0	17	75
Value of Products (1988) (U.S. Million)	20	0.77	---	0.19	1,885
Ratio of R & D Expenditures to Value of Products (1987)	10.3	---	---	---	---

Source: National Science and Technology Development, 1989.
 Science and Technology Advisory Group, The Executive Yuan.

TABLE 34

Hsinchu Science Industrial Park Manpower

1. Number of Employees

Year	1981	1982	1983	1984	1985	1986	1987	1988
No. of Employees	518	1216	3583	6454	6670	8275	12201	16456

2. Educational Level (1988)

Ph.D.	Master	Bachelor	Junior College	Senior High School	Others
0.6%	4.2%	18.2%	17.8%	47.6%	11.5%

Source: National Science and Technology Development.
Science and Technical Advisory Group, The Executive Yuan, 1989.

Summary

Up until the late 1970s, state planning aimed at regulating the development of the electronics industry was, at best, a series of ad hoc measures that did not develop out of strong institutions acting through long-term plans. These measures had results ranging from indifferent to ineffective. Planners, as with senior officials, rather than being omniscient and omniscient, both failed to understand the dynamics of the industry and to foresee the success the electronics and computer industry were to become by the early 80s. It was only by the late 1970s that planners and government bureaucrats woke up to the development of a dynamic electronics and computer industry as more than just an Export Processing Zone or "low technology" industry. By that time, the electronics industry was already well established with little help from them. Had state assistance - even only a small amount - been offered to the entrepreneurs early, it would have been both crucial to their success and well deserving of praise. In fact, state assistance was not offered until well after the industry was established. Where the state intervened extensively with investments, it was to support its aspiration to build their vision of a "capital- and technology-intensive" industry. While such a vision could be seen to exist as early as the 1970s from the state, it had little to do with the existing electronics industry, which the

state never understood until it matured. Therefore, the suggestion that Taiwan's economic bureaucracy was successful in picking "winners" in its industrial policy from the early 60s is unwarranted. The state planners did not demonstrate such foresight. Even when the state promoted the industry, it did not do so with a long or medium term vision fused with pragmatism and business sense to make them state entrepreneurs in the true sense of the term. The single case of major state intervention in the IC project was not a commercially viable venture as originally envisioned. In the next chapter, I will demonstrate how the venture became successful only after it succeeded in creating a fusion between it and the existing industrial base. This was not anticipated by the state except in the most general terms. It is, perhaps, too demanding to ask the state to be an entrepreneur. Had the officials been endowed with these traits, they would have been under a great deal of pressure to go out and make a fortune for themselves instead of working for the state. In fact, many of them did precisely that once the opportunities arose.¹³⁵

The preceding discussion does suggest that state intervention is not entirely without merit. Indeed, it was and still is a critical factor in Taiwan's success. The state did many things that did not have a self-evident payoff initially.

¹³⁵Interview F.

Where many other developing states squandered their resources on politically expedient measures like subsidizing daily needs, "investing" in large, unneeded megaprojects, build grandiose schemes to "leapfrog" into full modernization, or using state power as an opportunity to do no more than enrich the ruling elites, Taiwan's ruling elites consistently demonstrated a degree of self-restraint and conservatism together with a degree of technical competence that avoided the worst of these pitfalls. By doing so, they were able to provide a relative island of calm economically, politically and socially while the private sector developed. Despite their abysmal failure to liberalize the economy or to free up the appalling inefficient state regulated or controlled sectors, the bureaucrats at least allowed enough scope for the private sector to find a way around their hidebound and archaic systems. In spite of their ostensibly systematic efforts to plan development, the planners demonstrated little more skill at foretelling the future than any other group of human beings. The economic plans, while they did not help the electronics industry very much, at least did little to injure it due to the absence of will to force the plan on the electronics industry. Had there been real "sticks" and "carrots" harshly applied, the picture might have turned out tragically differently. While there was no systematic plan to promote industry, the bureaucrats demonstrated from the very beginning a dynamism and entrepreneurialism in promoting what

they foresaw as good opportunities, or at least, in exploiting opportunities shown to them. Where the initiatives failed in the electronics industry, the bureaucrats were quick to pull back and not let the ghost of past policy errors weigh like a nightmare on the living. It is this nimbleness and willingness to take risks that sets them apart from much of the world's selfish, staid, conservative and risk adverse bureaucrats. While the evidence would appear to suggest by default that market regulation is responsible for the success of these industries, the story is indeed more complex. In the next two chapters, I will explore the reasons that led up to the development of the electronics and computer industry despite the absence of effective state intervention in the early 60s and 70s.

Chapter 5

MARKET DRIVEN SECTORS OF INDUSTRY

The preceding discussion demonstrated how industrial policy had an uneven record of success in promoting industry. The question becomes why has Taiwan been such a fertile ground on which the electronics industry came into being? This chapter will examine some of the factors in the success of the electronics sector that were only marginally influenced by the state. Looking back to 1965, the economy of Taiwan had a very dynamic manufacturing base in textiles. Textiles are classic labor intensive products where assembly is a large fraction of the cost. This chapter argues that it is, first, the skills learned through the base of manufacturing in textiles that made electronics assembly a viable industry. This factor was to combine with the dynamic environment of business in Taiwan, which resulted in a large number of skilled employees opening their own electronics firms, which contributed to the ease in which businesses can be started. The interaction of these factors was to create a large, "low tech" electronics sector, which made it possible for the state's "high tech" policies to succeed.

The Origins of Export Oriented Chinese Capitalism

The rise of textile exports is the key to understanding the origins of electronics assembly work in Taiwan. As we noted in earlier chapters, the original "EPZ" type of work brought to Taiwan by General Instruments was basically industrial handiwork, the assembling a few labor intensive components. The skills needed to do this type of work are similar to the skills involved in producing textiles. Therefore, the origins of textiles can be said to be both a training and preparation ground for the type of EPZ work originally brought to Taiwan by the foreign assemblers. Thus, the two sectors rose side by side with each other sharing a strikingly similar pattern of labor needs.

Taiwan began its rise as a major exporter of textile and plastic products in the 1960s. Although state enterprises did play a role in the promotion of textiles, the industry predates the KMT's arrival in 1949. Its initial growth in the 1950s was fueled by four factors: the end of World War II (WW II) which forced Taiwan to become autarkic in textiles, the arrival of a million mainlanders, which created a demand for textiles for civilian and military purposes, the economic boom caused by successful agricultural reform, and the recovery of Japan after World War II, which forced buyers from the United States and Europe to seek lower-cost alternatives to their

traditional textile suppliers in other lower-cost Far East states. It is interesting to note that this pattern of rising costs in Japan and the United States also similarly affected the electronics industry. (Dertouzos, Lester, Solow, 1990,219)

Entrepreneurship and Flexibility

One of the legacies of Japanese colonialism is the Japanese pattern of industrial organization. Japanese firms have a structure and organization that made them favor small batch, highly flexible forms of industrial product mixes. (Dore, 1987, 13) They made Taiwanese firms that were developed in their image similarly flexible. In the early 60s, export orders represented the most profitable outlet for the output of Taiwan textile products. Consequently, this sector rapidly became "export oriented" when the negative incentives in price structure were gradually eased in the 60s. The brunt of export promotion was carried out by small- to medium-sized Taiwanese firms that were not state owned or dominated. Taiwanese firms were known among foreign buyers for their willingness to change, adapt and meet their customer's requirements even if it involved costly, small runs of special orders.¹³⁶ Thus, they were able to respond rapidly to changes in fashion or trends as expressed by buyers in the developed

¹³⁶Interview O.

economies. The ability to be flexible came from a number of factors.

An important factor that accounted for the flexibility of Taiwanese firms was the dominance of small- to medium-sized firms in the export sector. Although small size itself is not to be equated with innovation or efficiency, small firms are more willing and able to change quickly because they have less invested in any fixed process. The dominance of small firms also enhances the degree of competitiveness of any market they operate in. The pressures of competition mean that it is vital for each firm at least to match the flexibility of its competitors. Thus, the developing economy of Taiwan in the late 1960s can be said to have had a backward industrial sector, dominated by small firms. However, it is precisely this feature that permitted them to develop in a more flexible fashion.¹³⁷ In contrast, firms in the U.S. became more and more bureaucratized and unionized in the 1960s, with strict work rules and regulations governing wages and conditions of work. These forms of institutional barriers to flexibility were unknown in Taiwan's small scale private businesses at that time.

From the perspective of liberal economic theory, small is not necessarily an asset if there are significant economies of

¹³⁷ Interview O.

scale in production. Although it is true that scale economies are vital if one talks about large production runs, in the real world such large production runs are all too rare. This is especially true of Taiwan's textile exports in the 1960s to 1973. The fashion industry is inherently engaged in producing a highly diversified, heterogeneous product where production runs are small and diversified. Even today, few textile items except basic raw materials such as cloth can be produced in continuous processes rather than through batch production. Consequently, the small firms were actually not at a large disadvantage in those initial years. Therefore, although the absolute scale economies available to this group of small Taiwanese firms was small, their relative scale economies in relation to the size of the average batch order was highly competitive. Greenhalgh, reviewing a series of studies on small enterprises in Taiwan, observed:

"... rapid growth of manufacturing in the 1960s was characterized by the active participation of small firms throughout the sector. More surprising is the finding that small- and medium-sized firms were technically more efficient than large firms in all but one of the fastest growing manufacturing industries. (textiles, wood, paper, basic metals, metal products, and miscellaneous manufactures, but not chemicals.) Furthermore, increasing return to scale, an argument often used

against family firms, which are considered too small to realize them, turned out to be unimportant in five of the nine manufacturing industries. Ho's work thus suggests that small, family run businesses may have made a positive contribution to Taiwan's export-oriented growth especially in the 1960s, when labor-intensive industries dominated the growth process. This hypothesis gains additional support from the work of Samuel P. S. Ho..., whose study of small-scale enterprises (those with fewer than 100 workers) in Taiwan and South Korea shows that in many industries small establishments were as productive or more productive, in terms of total factor productivity, than large establishments. Small plants were particularly productive in simple assembly and mixing and finishing industries (e.g. textiles) and, increasingly over time, in separable manufacturing operations (e.g., metal working)." (Greenhalgh, 1988, 229)

In other words, the success of Taiwan's first phase of Export Oriented Industrialization in textiles can be readily understood from the behavior of firms responding to prices. The paradox is how small businesses in Taiwan seem not to face the same constraints faced by small businesses worldwide.

The classic problems faced by small business are fourfold: under-capitalization, lack of management skills, lack of technology and the inability to exploit scale economies. The issue of scale economies may not be relevant to this discussion. However, the problem of under-capitalization remains. This is especially interesting in that the buyers that flocked to Taiwan wanted, first of all, assurance that the firms they were dealing with had the capacity to carry out the business. This capacity is normally verified by buyers visiting a potential supplier's factories and making a visual inspection of their facilities. While this is but a minimum level of assurance that the firm has the capacity to fulfill a contract, it is, nevertheless, essential. When a firm succeeds in winning a major bid, that single order is frequently much larger than the firm's total capacity. This is especially true if the bidding process favors firms that already do a reasonable volume of business, as the plant would have to be occupied by other business in order to satisfy the buyer's inspection. In other words, under-capitalization would normally be a barrier to firms doing export business because, in order to be competitive, they would have to have large surplus capacity within the firm. Normally, in a typical North American enterprise, if a firm has no surplus capacity, it would not normally seek business that is above its ability to meet capacity in the short term. However, Taiwanese firms will consistently attempt to bid for contracts

well above their own firm's internal capacity limitations. They are able to do this because they do not rely on their internal capacity alone. They are, in effect, a small firm in a part of a much larger network that is often based on family and relatives. (Greenhalgh, 1988, 234)

Small scale Taiwanese firms adopted what can best be termed the strategy of a guerrilla. They would have the audacity to bid for many orders without regard to their ability to fill the orders. In order to fill contracts they cannot do themselves, they would rely on subcontractors. In this regard, if an order came through that they could not fill even with subcontracting, they are content to squander their "reputation" and "goodwill" by not filling the order at all. One official from ITRI commented that much of their business was brought to them by businessmen who have overcommitted themselves:

"In the early years of ITRI, it was hard to get businesses to understand what we could do for them. Many of my initial contacts in industry were made when businesses agreed to produce a certain item for a customer only to find out after the fact that they did not know how to do it. They then come to me in desperation for help."¹³⁸

¹³⁸ Interview J.

The use of an extensive network of subcontracting relationships among all competitors in an industry is a common pattern with all Taiwanese firms. Therefore, although it is true that the winning contractor benefits the most from a lucrative foreign order, they are able, in effect, to have the slack capacity of the entire industry available to them through sub-contracting. This prevalence of subcontracting networks extends to ownership patterns. Almost all firms in an industry own each other's shares, leading to a de facto ownership relationship among all of them. Silin's pioneering research raised the question of whether these investments strengthened a firm's competitors, to which the respondent replied,

"Q. Are these companies your competitors ?

A. Yes. But you forget that now things are good and that we have more orders than we can fill. We give them to other people. When the foreign market collapses, things will change and we will have problems. Then things like cross investments will be important and friends will be able to help each other." (Silin, 1976, 18)

This enhances the efficiency of the market in two ways. First, it allows the winning contractor to make above-normal profits through his knowledge of the local industry. Thus, he

would normally subcontract to firms that have surplus capacity that they will sell at marginal rather than full cost. Second, it assures the continued existence of other firms by keeping them in work. In other words, rather than a zero sum game typical of the bidding process in western nations, in Taiwanese business the winner takes most, but the loser may also benefit from having less lucrative, but still profitable sub-contracting work. Since foreign buyers are not well connected in the local industry, as long as the prime contractor meets quality specifications, there is no way they could actually tell if the goods are in fact produced by the firm they purchased from. Frequently, they are not. This process explains how a layer of small firms can circumvent the limitations that would normally be placed on them by under capitalization and the inability to handle large orders. The intricate subcontracting network makes Taiwanese industry able to respond more as a unified organism rather than as discrete units. Moreover, the system of Taiwan's industry encourages the formation of small firms. As a firm grows larger, often a senior manager is "spun off" to start a new firm on his own. This new firm will represent a sub-unit of the old firm. The old firm would not only help the firm with loans for equity, but retain an equity interest in the new firm. The new firm is at once guaranteed orders for its goods through its continuing relationship with its old firm. At the same time, the new "boss" is free to look for other business. This

pattern at the same time both reduces bureaucracy and satisfies the craving in Taiwan that "everyone wants to be boss".

Capital Ownership Patterns

The consequence of this pattern of structural fission is that it creates an extensive, overlapping myriad of interlinking ownership and sub-contracting relationships among firms. The network of subcontracting relationships extends into another pattern of industrial organization also unique to Taiwan. Whereas industries on the western model typically consist of a factory with a collection of capital equipment collectively owned by one firm, Taiwan's industry is dominated by a form of capital ownership where each piece of capital equipment is owned by one entrepreneur. (Myers, 1984, 515) For example, an electronics circuit board assembling factory built on the western model would own a group of machines that does board masking and etching, drilling, maybe automated component inserters, wave soldering machines, and possibly a computerized testing machine at the end of the line. In Taiwan, each of these pieces of equipment would be owned by a separate entrepreneur.

There are serious disadvantages to such a form of ownership. For one, extensive quality control of goods that pass through

so many independent subcontractors is almost impossible. Secondly, a manufacturer is always at the mercy of a bottleneck anywhere in the process. Thirdly, the chance of being able to purchase the services of the ideal type of machinery to do the job by an entrepreneur is remote because it is more than likely not available. But looking at it from a Taiwanese perspective, the system as a whole has immense flexibility. No one is "stuck" with a fixed investment in specialized capital plant that might be idle much of the time. Indeed, even in a typical modern western factory, goods are actually being worked on by either labor or machinery only 5 percent of the time. They spend the balance of the time in transit either waiting or moving from process to process. Moreover, much machinery in a western plant is idle much of the time because it is not possible to ideally match scale economies of a collection of discrete capital equipment. In contrast, in the Taiwanese form of capital organization, capital equipment is not "locked" to one industry. This facilitate the use of capital equipment from one "industry" to another.

Taiwanese industrial owners tend to see their capital equipment as commodity producers rather than equipment for specific industries. Therefore, there are few institutional barriers to capital mobility, i.e. metal stamping machines that normally stamp buckles can be readily adapted to stamping

automobile parts if needed. This flexibility enhances the ability of industry to respond rapidly to new market demands. In contrast, in a geographically dispersed form of industrial organization on the western model, it is neither practical nor feasible to have as extensive a pattern of discrete capital goods ownership as is possible in an urban economy like Taiwan.

The implications of this form of capital ownership for industrial flexibility in Taiwan are critical to understanding Taiwan's flexible industries. Following the western model of capital ownership, specific manufacturing "services" can still be purchased from discrete sources, but the prices for such services are high. If an entrepreneur in America wished to manufacture goods in small quantities, such as ten units of a prototype, it would be costly unless he had access to corporate resources that can command those services on an in-house basis. On the other hand, an entrepreneur in Taiwan who wanted to create a new product need only find capital to pay for the cost of using the manufacturing "services", which are typically much lower than the cost of ordering a small batch from a manufacturer in the U.S. Certainly the start-up cost is lower than the cost of entry into an industry that has to purchase specialized capital equipment. Thus, the pattern of capital ownership contributes greatly to Taiwan's flexibility

in manufacturing.¹³⁹ In Taiwan's business environment, it is easy to start a business. Only after it has "grown up", does it take on the form of a "mature" firm. Being small also gives many Taiwanese firms the advantage of being less likely to risk retaliation from established companies for thefts of intellectual property and permits them to blissfully engage in counterfeiting and other quasi-legal activities.¹⁴⁰

Blend of Chinese and Western Managerial Skills

The second major problem faced by small firms is the lack of management skills. Normally, in a western enterprise, substantial management skills are necessary to plan, organize and best utilize the limited resources of a small firm. Since small firms are most frequently those with the weakest management skills in the West, it is they who often fail. This makes the success of small Taiwanese firms even more inexplicable. They ought to be the ones most prone to

¹³⁹Note that this form of flexibility is very different from the idea of capital intensive "flexible manufacturing" advocated as the solution to industrial decline in America. For example, Piore and Sable's flexible manufacturing involves the adaptation of capital intensive high technology CAD/CAM/CAE to allow manufacturers to adapt to changing market demands. The Taiwanese "flexibility" is clearly not necessarily a capital or technology intensive form of "flexible manufacturing". See Piore and Sabel (1986) and also Friedman (1988) for an application of this concept to understanding Japan.

¹⁴⁰ Interview J.

failure, yet they seem to be on the cutting edge of Taiwan's success. One of the problems with the western conception of management skills is that it is very much based on an idea of skills in best utilizing resources in an essentially static framework of analysis. Thus, managers are synonymous with people who are able to consistently wring the highest output out of a relatively static, unchanging market. Even firms like IBM, Hewlett Packard or Digital Equipment in highly competitive industries such as information processing think in terms of six months or more. They have a very limited ability to bring out products rapidly for a variety of reasons, such as the inertia of their organization, commitment to an existing customer base and built-in conservatism. Given the dynamic nature of Taiwan's markets, these characteristics become a liability rather than an asset.

The rapid rate of change in Taiwan also makes sophisticated management skills such as organization building, marketing and planning less important and less able to capture the efficiency from a large, inflexible bureaucracy. Because the organizations are smaller they have less need for sophisticated managerial accounting, control and organization as the entrepreneur, as the owner, is able to make decisions independent of other managers.¹⁴¹ The replication of account-

¹⁴¹See Chandler (1977) for a summary of the arguments concerning the separation of ownership and control in western capitalism and also discussion on the cause of large

ability and management systems that simulate the idealized owner-entrepreneur in western corporate organizations is simply not necessary in a smaller firm. Moreover, there are cultural barriers to the development of a western-style, functionally-divided form of firm organization.

A major cultural barrier to adapting a western form of functional specialized firm organization divided into branches such as sales, marketing, production, accounting and general management is Chinese culture and the business environment. Chinese are a group-oriented people who place a premium on trust of insiders and conversely, distrust of outsiders. Therefore, people who are related are, by definition, more trustworthy than outsiders. In fact, the distrust of outsiders is so intense that frequently, outsiders - even those with technical skills that are greatly needed in a firm - are not brought into the firm because they cannot be trusted.¹⁴² This is not simply an unjustified paranoia. In

businesses. Taiwanese businesses would appear to diverge from his model of modern American enterprise.

¹⁴²There has always been a historical tension in Chinese society between ties of tribal loyalty and the need to recruit talent. In the traditional imperial chinese system of government, talented but not trusted officials would be checked by a trusted official. See Pye (1985) for a discussion of the distinct insider / outsider feelings in Chinese culture. Also see Wellington Chan (1982) for his discussion of how a traditional and "modern reform" chinese firm managed the problem of trust in business relationships.

Taiwan, there are few moral or effective legal barriers to someone in a position of trust embezzling funds and disappearing to Hongkong or elsewhere beyond the reach of the law. In fact, it happens frequently despite substantial safeguards by firms. Thus, in a typical Chinese firm, the owner-entrepreneur is normally surrounded by his immediate family members as his most trusted assistants. No outsider is trusted. There are exceptions to the rule. Those who are not family relations but occupy positions of trust normally begin in very junior positions; only over a period of many years do they gain the status of being an insider. As an insider, their status becomes indistinguishable from that of family members. The advantage of using family members is critical to the success of small firms,

"... because it ensures a core of dedicated and trustworthy managers and workers, who will not abandon the enterprise when the going gets rough or brighter opportunities appear elsewhere.... This is particularly critical on Taiwan, where the desire to be boss is extremely strong, and workers who are not personally committed to a firm through familial obligations often depart to set up their own companies, taking with them important technical information and managerial experience. Having a group of individuals committed to stay with the firm through strong familial obligations

gives the family business important advantages over other firms. Not only can it maintain greater secrecy about its operations --- a critical asset in Taiwan's hypercompetitive environment--- but it also enjoys greater continuity over time in management and operation." (Greenhalgh, 1988, 233)

Therefore, the preference for familial ties in employee selection imposes constraints on the ability of Chinese firms to grow. Chinese firms in Taiwan are not just small because of economic constraints, they stay small because there are definite barriers to the formation of corporate forms of organization which, although not impossible, are difficult for most to overcome.¹⁴³ In studying "big business" in Taiwan, one is frequently struck by how it is nothing like a western notion of a corporation, but is in fact, a collection of small firms in discrete businesses that are often not even remotely related.¹⁴⁴ In other words, the western hierarchical model of bureaucratic, meritocratic, functionally-specialized organization is not the dominant form of firm organization in small- to medium-scale enterprises in Taiwan. Taiwanese firms rely on the expertise localized in one man - the owner. Of

¹⁴³Pye (1984) and correspondence with author.

¹⁴⁴Chen, (1985, 13-17), cited in Hamilton, Gary G. and Biggart, Nicole Woolsey. (1985).

course, this means there are limitations to the size of any one firm that is managed by the owner and his immediate family members. It limits a firm size to roughly 200 employees before they encounter major problems with managerial coordination.

The inability of Chinese firms to grow large is not entirely a disadvantage. The problems of planning and accounting are less of a burden for them. Moreover, the neglect of formal records, detailed written plans and accounting also allows a firm to more effectively play a cat and mouse game with the state's tax collectors. This is a crucial problem for Taiwanese firms as they must all play a "game" with officials. Few of the smaller firms bother to obtain the myriad of permits needed to legally start a business. Thus, they are able to evade most of the more burdensome regulations that strangle large firms. Small firms are better able to evade the tax burden placed on private enterprise in Taiwan. Another major factor limiting size is the rapidly changing nature of the business environment in which they operate. Because of the high degree of uncertainty created by the competitive nature of the market place and the need to be flexible, long-term planning is irrelevant to most small- or medium-sized Taiwanese firms. A very long term plan would be for six months. This lack of "foresight" is appalling to western notions of business, but in Taiwan, it is the norm.

Given a rapidly changing business environment, it makes sense. It represents an excellent adaptation of local management style and skills to the needs of the Taiwanese business environment.

Taiwanese firms have historically had a high capacity for accommodating customer demands because they began as small entrepreneurs who were hungry for new business. This has carried over to a general industrial trend to be willing to innovate. By innovation here I mean not necessarily technological innovation, but innovation in evolving new products primarily out of existing productive capacity. For example, in the North American or European industrial culture, manufacturers in one industry have a strong inclination to stay within that industry, while manufacturers in Taiwan tend to take a much more relaxed view of these essentially arbitrary psychological boundaries. A shirtmaker would think nothing of moving his sewing machines aside and starting to assemble toasters if there were a sudden demand for assembly capacity that he could accommodate. Many of the electronics and computer firms today are former textile makers who gradually learned how to assemble computers. Business in Taiwan is not about industrialization, but about making money. If making money is the goal, then industrialization or enhancement of manufacturing output is neither a necessary nor sufficient condition towards achieving that goal. In that

sense, manufacturers in Taiwan are not industrialists in the sense of being specialized in one industry, they are generic manufacturers. Manufacturing as an activity is an intermediate step in satisfying Taiwanese desire to make money. If manufacturing were not to become profitable, as it did in some industries in the 1980s, many of the same manufacturers moved into the service sector. In this respect, they were entrepreneurs in the sense that they are not concerned with manufacturing as an end in itself.

Technological Adaptation

The barriers that prevent access to technology can be a major hindrance to small businesses. Taiwanese small firms seem to have overcome this using a variety of techniques. They overcame it initially by the linkage to Japan. Although the Japanese occupation was not entirely benign, it did leave some legacies with unintended consequences. The first legacy was the industries that the Japanese initiated, which included excellent infrastructural facilities. This introduced the concept of industry to a population composed largely of agricultural peasants. Secondly, during the fifty years of occupation, many Taiwanese, - not Mainlanders - learned Japanese and developed extensive business ties to Japan. This was to have unintended consequences. As Japan's economy recovered in the fifties, its textile industry became

increasingly uncompetitive on the world market. The Taiwanese had a comparative advantage over Mainlanders in dealing with the Japanese because of their historical links.¹⁴⁵ This was soon to result in two things: first, imports of obsolescent Japanese textile technology to serve the growing demand for textiles within Taiwan, and to a lesser extent, small subcontracts from Japanese contractors. Thus, the product life cycle model so frequently touted as industry transfer from North America and Europe to the Third World in fact took place between Japan and Taiwan. Taiwan was able to obtain a low cost, reliable source of technology for many industries. These sources and linkages for textiles readily translated into similar linkages in the electronics industry.

The characteristics of Taiwan business described above, however, do not explain how Taiwanese firms moved from making textiles to "high tech" in the 1970s. As we have seen in the earlier chapters, government policy to encourage this move had at best, mixed results. The real problem was that not only did Taiwanese firms move into "high tech" manufacturing, but also into export oriented manufactures that were able to compete in the global market. A major problem is how these small firms could overcome the barriers to success in direct

¹⁴⁵Gold (1986, 32-46) discusses this. Many other authors who are not natives have much difficulty understanding why there is such ill will between these two ethnic groups.

exports: the high cost of establishing direct market linkages to the markets of the first world, the problem of acquiring detailed market knowledge, and even simple matters like the logistical problem of maintaining a sales force in any country. Moreover, how did a "high tech" industry emerge from nothing? As we have noted earlier, the electronics industry was only partially affected by state policy for much of the 1960s and 1970s.

Guerrilla Capitalism

Guerrilla Capitalism is an expansion of the pattern of business discussed above. It is a further refinement and enhancement of the model with the following factors: A network of multinational market linkages was created by the overseas Taiwanese community, resulting in a flow of technology and market knowledge from the developed world to Taiwan. MNCs also unintentionally transferred their technology to local managers. These factors were then blended with the successful exploitation of transient market opportunities for manufactured goods in the developed world by Taiwanese small to medium scale firms to create the phenomenon termed Guerrilla Capitalism. In order to understand this process, it is necessary to understand the context of the electronics industry in the early 1970s. This was the

original enclave industry created by the electronics assemblers that began with General Instruments.

The Developing Electronics Industry in the 1970s

Six years after the arrival of the first foreign EPZ assembler in Taiwan, the electronics industry continued to grow strongly from new arrivals of assemblers, either in "bonded factories" or in the now bustling EPZ enclaves. At the same time, locally owned assemblers became increasingly sophisticated as their industrial capabilities increased. Finally, many local assemblers serving the domestic market, who had grown large and prosperous behind tariff and trade barriers, reached a point where they were able to afford purchases of technology or more "capital intensive" machinery. Despite this growing industrial potential, the state's direction and support to industry remained ambiguous, long on aspirations and short on substance. There were, however, consequences of state action which were neither foreseen nor anticipated.

Unforeseen Consequences

As the state promoted Taiwan as a site for off-shore assemblers and continued to make improvements in facilities and administration to facilitate the arrival and operation of

off-shore manufacturers, Taiwan gradually became a more attractive place to invest vis-a-vis the established sites of Hongkong and Japan. Consequently, much of the future growth of the industry that might have gone to these other sites was channeled to Taiwan. The explosion of growth in turn created its own dynamic.

A strong drive to the local industry came from the large number of new arrivals of assemblers and component makers. As with any industry experiencing rapid growth, there was a large turnover of labor. New arrivals are by nature risk adverse. Logically, the most efficient means to acquire skilled managerial labor was to hire from an established competitor. That is precisely what they did. Every new entrant created more and more opportunities for both the trained local staff and the expatriate staff of the established firms. Naturally, wages and benefits for experienced and skilled managerial staff ratcheted upwards with each new arrival. As experienced managers left established firms, it created more opportunities for junior staff to move upwards. In due course, further arrivals of new companies resulted in the same thing for the newly promoted staff. This rapid turnover of managerial staff was instrumental in creating a large number of highly experienced managers who had extensive experience with a number of firms in the whole industry within a short time in their careers. The geographic proximity of the firms to each

other made it easier for staff to move around and added to the volatility of managerial talent. Furthermore, being a relatively small industry, friendships between managerial talents were rapidly made and extensive networks between staff from ostensible competitors became commonplace. It was not difficult for them to see that in fact, the operations they were employed in were not highly sophisticated. This was to have unexpected results.¹⁴⁶

Officials at the IDB (Industrial Development Bureau) took a dim view of this rapid turnover of locally hired staff. The government's position was that they would have first preferred locally hired managers to stay on for the long term in order to increase their knowledge of the industry and firm they were working for. Second, this high level of mobility of staff was playing havoc with the state's recruitment efforts in attracting new firms to locate to Taiwan. However, since individual career choices were beyond the control of the state, nothing could be, nor was done about the high turnover of staff.¹⁴⁷ Whereas it was not in the interest of a MNC to either lose staff to competitors or to transfer technology to local firms without compensation, in practice, being able to prevent it was quite another matter.

¹⁴⁶ Interview B.

¹⁴⁷ Interview B.

Managers who worked at assembly operations quickly saw that there was little that was beyond their capabilities to set up with relatively little capital. Naturally, many of them jumped at the opportunity and left their MNC employers to set up assembly operations on their own. Sometimes this was done entirely on their own, sometimes in collaboration with a few colleagues, and other times, with the support of large local conglomerates that wished to enter a new business. These new entrants then competed for subcontracts for sub-assembly from other firms. Over a period of time, these relatively unsophisticated assemblers would gradually build more and more complex assemblies and finally, either learned or purchased designs from experienced designers and began to manufacture full assemblies for simple consumer electronics products like radios. Over time, their sophistication improved enough to build tape recorders, record players and other more sophisticated consumer grade electronics until they ultimately became sophisticated manufacturers in their own right.¹⁴⁸ This is reflected in the transition from exports from primarily foreign based firms to locally owned firms which were created as former managers from these operations opened their own businesses. See Tables 35, 36.

¹⁴⁸ Interview B.

TABLE 35
CHANGES IN EXPORT MODES FOR INFORMATION PRODUCTS

Year	Exports made in proprietary brand names			OEM			Products made by foreign- invested firms		
	Abso- lute	%	Export growth rate	Abso- lute	%	Export growth rate	Abso- lute	%	Export growth rate
1984	30	3%	100%	402	40%	12%	572	57%	24%
1985	61	5%	475%	451	37%	78%	708	58%	28%
1986	351	17%	111%	805	39%	89%	---	---	---
1987	740	20%	---	1,518	41%	---	---	---	---

Source: Institute for Information Industry Handbook (III, 1989, 41)

TABLE 36

CHANGES IN EXPORT MODES FOR INFORMATION PRODUCTS

Year	Exports of foreign firms on OEM basis			Exports of proprietary brands from foreign firms		
	Absolute	%	Export growth rate	Absolute	%	Export growth rate
1984	---	---	---	---	---	24%
1985	---	---	---	---	---	28%
1986	165	8%	102%	743	36%	49%
1987	333	9%	---	1,110	30%	---

Source: Institute for Information Industry Handbook (III, 1989, 41)

MNC component makers who came to the EPZs to be closer to their customers found the same problem with employee turnover. For many low end consumer products, the equipment to manufacture simpler components like resistors and capacitors were neither expensive nor hard to find. They were readily available on the international machinery market. In fact, locally hired managers were in a privileged position in that they knew exactly the cost structure of the MNCs and thus, could make an investment in manufacturing products with little risk. Being local entrepreneurs, they were able to economize on many areas like marketing, and eliminate expensive, overpaid headquarters or expatriate staff, and unnecessarily high wages. Thus, experienced managerial staff who worked for the makers found it easy to purchase exactly the same machines and set up as a direct competitor to their former employers. Still others went on to make use of their contacts to make parts and other things they knew their former employer or friends in the same industry would buy. Thus, before long, the MNCs spawned a whole corps of small competitors that manufactured parts to satisfy the demand of MNC assemblers. Indeed, one former official of General Instruments observed that the road to General Instrument's plant in Taipei was lined on both sides with firms that were formed by former General Instruments employees.¹⁴⁹ Although many of them produced poor quality goods initially, the inevitable diffu-

¹⁴⁹ Interview O.

sion of technology from the large MNCs helped them gradually improve quality. With locally made parts costing a fraction of the MNC produced parts, they gradually found buyers not only in Taiwan, but from the local electronics industry developing along the same line in many other Asian NICs: Hongkong, South Korea and Singapore.

During the same time, local manufacture of consumer electronics - import substitution industries - profited handsomely from protectionism and grew very prosperous. They were able to in turn take their earnings in the protected sectors to finance expansion in electronics components and products manufacturing. Technology and machinery were purchased from abroad where needed, and before long, their business expanded.

Overseas Kinship Linkages

This type of trickle down of technology would have only created a relatively primitive industry if not for the interaction of this with the network of overseas Chinese. The mystery of Taiwan's "adjustment" to "high tech" can be explained by other factors. First, immediately after the arrival of the KMT on Taiwan, there was a large outflow of emigrants from Taiwan. It is estimated that there are roughly one million Taiwanese abroad, mostly residing in the U.S.

That represents approximately five percent of the entire population. In other words, almost every family in Taiwan has at least one distant relative overseas. In addition, there are many more Taiwanese educated abroad who have returned to Taiwan. Over 80,000 students went abroad between 1950 and 1983.¹⁵⁰ This corps of returnees who returned with practical skills learned from on-the-job experience was able to fuse with the existing trained manpower coming out of colleges and universities locally. Moreover, because Chinese students who went abroad concentrated on technical subjects such as engineering, it was to give them exposure to the growing field of electronics in the late 70s and 80s. The coincidence of this with an industrial base of basic electronics was to achieve a synthesis of skills necessary for successful businesses. See Tables 37, 38, 39, 40, 41, 42.

¹⁵⁰Gold op. cit. 141.

TABLE 37

NUMBER OF STUDENTS RECEIVING SECONDARY EDUCATION,
ACADEMIC AND VOCATIONAL

Unit: person

Period	Total	High School	Vocational School		
		Senior	Subtotal	Industrial	Commercial
1952-53	139,388	21,046	40,092	8,868	12,877
1955-56	212,977	30,043	60,397	11,279	18,905
1956-57	243,263	37,155	65,903	12,041	21,910
1957-58	270,895	43,830	69,823	13,137	25,134
1958-59	287,818	48,394	71,832	12,805	28,259
1959-60	317,044	54,314	77,800	13,182	32,782
1960-61	354,561	57,512	84,337	13,030	36,612
1961-62	408,739	62,548	88,335	13,142	38,941
1962-63	462,466	70,900	91,693	13,367	40,758
1963-64	524,331	82,741	96,888	13,714	44,542
1964-65	593,109	100,611	106,811	15,152	50,988
1965-66	661,961	115,898	117,246	17,396	58,444
1966-67	711,777	127,200	127,891	19,266	66,130
1967-68	782,321	137,451	143,296	24,123	75,178
1968-69	917,400	152,317	150,131	31,877	75,922
1969-70	1,024,298	160,767	155,870	43,488	74,857
1970-71	1,149,529	177,662	175,819	63,084	76,178
1971-72	1,232,438	189,863	198,779	80,527	84,241
1972-73	1,316,287	195,996	216,587	93,260	91,102
1973-74	1,366,549	190,034	232,233	103,557	97,030
1974-75	1,426,077	183,962	255,536	116,640	106,164
1975-76	1,497,848	183,692	281,820	127,529	120,438
1976-77	1,530,745	180,505	295,762	133,404	126,829
1977-78	1,555,028	179,792	304,198	135,852	130,785
1878-79	1,564,663	176,838	311,294	140,188	131,483
1979-80	1,585,341	180,126	327,559	149,150	137,730
1980-81	1,598,028	179,497	348,169	163,597	140,423

Period	Total	High School	Vocational School		
		Senior	Subtotal	Industrial	Commercial
1981-82	1,620,165	181,253	373,142	180,908	146,076
1982-83	1,656,086	185,871	393,022	194,550	149,113
1983-84	1,763,212	277,624	403,185	201,126	149,110
1984-85	1,760,287	281,223	406,365	202,468	148,465
1985-86	1,763,385	285,753	420,212	208,994	149,833
1986-87	1,780,962	296,171	436,276	214,987	150,970
1987-88	1,802,870	307,334	445,747	217,160	149,905
1988-89	1,842,243	314,637	442,690	210,206	148,725
1989-90	1,871,892	313,781	436,743	214,716	151,849
1990-91	1,926,008	321,853	447,761	202,161	159,119

Source: TSDB (1991, 285).

TABLE 38

PERCENTAGE OF GRADUATES ENROLLED IN NEXT HIGHER
LEVEL OF SCHOOLS

Period	% of School-aged Children Enrolled in Primary Schools	% of Primary School Graduates Enrolled in Junior High Schools	% of Junior High School Graduates Enrolled in Senior High Schools	% of Senior High School Graduates Enrolled in Schools of Higher Education
1952-53	84.00	34.85	56.96	26.27
1955-56	92.33	43.94	63.13	44.27
1956-57	93.82	47.75	71.39	41.94
1957-58	94.61	49.27	71.44	37.16
1958-59	94.84	51.07	71.57	36.85
1959-60	95.44	51.76	75.98	37.49
1960-61	95.59	52.24	75.88	43.41
1961-62	96.00	53.79	78.60	44.65
1962-63	96.52	55.14	76.16	41.83
1963-64	96.71	54.06	73.32	45.02
1964-65	96.83	55.64	76.53	41.07
1965-66	97.15	58.23	78.52	38.30
1966-67	97.16	59.04	75.80	38.62
1967-68	97.52	63.66	77.97	40.52
1968-69*	97.67	74.17	83.95	38.95
1969-70	97.62	75.53	83.15	39.73
1970-71	98.01	78.59	82.66	41.92
1971-72	98.02	80.85	69.62	43.47
1972-73	98.13	83.31	71.17	42.62
1973-74	98.09	83.71	67.90	37.92
1974-75	98.46	88.03	67.57	39.68
1975-76	99.29	89.47	65.82	39.80
1976-77	99.42	90.41	61.57	42.39
1977-78	99.57	93.60	60.04	43.59
1978-79	99.64	94.08	60.42	40.43
1979-80	99.68	95.58	62.75	43.96

Period	% of School-aged Children Enrolled in Primary Schools	% of Primary School Graduates Enrolled in Junior High Schools	% of Junior High School Graduates Enrolled in Senior High Schools	% of Senior High School Graduates Enrolled in Schools of Higher Education
1980-81	99.72	96.14	65.16	44.64
1981-82	99.76	96.77	68.11	45.39
1982-83	99.79	97.96	71.52	46.03
1983-84	99.81	97.95	69.55	46.40
1984-85	99.82	98.70	70.54	44.36
1985-86	99.85	98.73	71.31	40.19
1986-87	99.87	99.04	77.13	40.98
1987-88	99.89	99.51	79.32	46.26
1988-89	99.90	99.09	79.51	45.53
1989-90	99.90	99.62	79.60	44.40
1990-91	99.89	99.77	84.70	48.58

Source: TSDB (1991, 286).

TABLE 39

NUMBER OF STUDENTS BY LEVEL OF EDUCATION

Period	Total	Higher Education	Secondary Education	Primary Education
II. % of Total Population				
1952-53	14.60	0.12	1.71	12.34
1955-56	16.84	0.20	2.35	13.63
1956-57	17.78	0.24	2.59	14.23
1957-58	18.97	0.26	2.79	15.19
1958-59	20.21	0.28	2.86	16.29
1959-60	21.14	0.29	3.04	16.96
1960-61	21.92	0.32	3.29	17.42
1961-62	22.69	0.34	3.67	17.82
1962-63	23.38	0.38	4.02	18.13
1963-64	23.64	0.44	4.41	17.97
1964-65	24.06	0.52	4.84	17.86
1965-66	24.56	0.68	5.24	17.77
1966-67	24.90	0.87	5.48	17.65
1967-68	25.47	1.04	5.88	17.54
1968-69	26.33	1.18	6.72	17.34
1969-70	26.43	1.29	7.15	16.82
1970-71	27.05	1.39	7.83	16.55
1971-72	27.39	1.48	8.22	16.27
1972-73	27.76	1.64	8.61	15.98
1973-74	27.69	1.74	8.78	15.51
1974-75	27.57	1.78	9.00	15.08
1975-76	27.40	1.79	9.27	14.55
1976-77	26.99	1.81	9.27	14.10
1977-78	26.77	1.84	9.25	13.72
1978-79	26.20	1.84	9.10	13.17
1979-80	26.02	1.88	9.07	12.84
1980-81	25.71	1.92	8.98	12.48
1981-82	25.49	1.98	8.93	12.15

Period	Total	Higher Education	Secondary Education	Primary Education
II. % of Total Population				
1982-83	25.49	2.04	8.97	12.01
1983-84	25.52	1.64	9.41	11.92
1984-85	25.51	1.69	9.25	11.91
1985-86	25.56	1.75	9.16	12.01
1986-87	25.85	1.78	9.15	12.11
1987-88	25.95	1.84	9.16	12.16
1988-89	26.03	1.96	9.26	12.06
1989-90	25.84	2.11	9.31	11.82
1990-91	25.86	2.27	9.46	11.53

Source: TSDB (1991, 282).

TABLE 40

NUMBER OF STUDENTS RECEIVING HIGHER EDUCATION BY DISCIPLINE

Unit: person

Period	Total	Human- ities	Social Science & Behavior	Natural Sciences	Engine- ering	Medical Science
1952-53	10,037	1,919	1,939	693	2,590	325
1953-54	11,943	2,077	2,270	683	3,517	374
1954-55	13,670	2,053	2,503	776	4,018	506
1955-56	18,174	2,476	4,232	1,129	4,467	712
1956-57	22,606	3,591	5,490	1,483	4,982	877
1957-58	25,619	4,316	6,293	1,822	5,544	1,159
1958-59	27,938	4,910	6,569	2,403	5,793	1,576
1959-60	29,770	5,250	6,781	2,822	6,250	2,187
1960-61	35,060	6,359	8,832	3,243	6,958	2,725
1961-62	38,403	6,594	9,443	3,748	7,520	3,151
1962-63	44,314	6,802	11,787	4,190	7,821	3,871
1963-64	51,707	7,984	14,523	4,465	8,493	4,691
1964-65	64,010	9,165	20,335	5,071	9,889	5,655
1965-66	85,346	10,422	32,751	5,511	12,920	7,149
1966-67	113,855	12,128	44,321	6,360	20,490	10,173
1967-68	138,613	13,985	53,354	7,326	27,009	13,161
1968-69	161,337	14,938	61,259	8,104	32,874	16,090

Period	Total	Human- ities	Social Science & Behavior	Natural Sciences	Engine- ering	Medical Science
1969- 70	184,215	16,491	67,301	9,633	41,562	18,406
1970- 71	203,473	19,373	69,470	10,464	49,886	20,689
1971- 72	222,505	21,676	73,426	12,051	55,705	21,826
1972- 73	251,058	24,101	78,745	13,324	65,944	21,626
1973- 74	270,895	26,364	85,610	15,030	76,057	21,239
1974- 75	282,168	27,402	90,078	14,481	84,425	20,825
1975- 76	289,435	29,051	91,897	13,796	87,823	21,336
1976- 77	299,414	29,704	96,633	14,473	93,625	21,781
1977- 78	308,583	29,310	100,635	14,537	98,336	22,318
1978- 79	317,188	28,826	102,900	15,141	103,027	23,316
1979- 80	329,603	28,842	105,998	15,428	109,843	25,056
1980- 81	342,528	28,935	109,062	15,336	115,186	26,641
1981- 82	358,437	28,039	115,728	24,379	120,441	28,077
1982- 83	375,696	28,575	121,695	22,090	128,771	29,352

Source: TSDB (1991, 283)

TABLE 41
STUDENTS RETURNED FROM ABROAD

Period	Total	Employed by Government Agencies	Employed in Industry & Commerce	Teaching in Universities & Colleges
1952-61	48	12	9	10
Average				
1962	63	13	17	11
1963	95	18	13	25
1964	96	16	17	25
1965	120	25	13	42
1966	136	29	21	35
1967	153	40	8	29
1968	184	38	20	48
1969	226	65	49	88
1970	407	69	70	215
1971	320	42	67	99
1972	355	78	69	130
1973	445	53	99	172
1974	486	64	124	199
1975	569	82	127	258
1976	722	81	123	298
1977	624	42	132	289
1978	580	48	102	218
1979	478	104	99	177
1980	640	71	72	162
1981	937	132	123	229
1982	1,106	109	408	266
1983	1,257	161	100	361
1984	1,329	124	136	441
1985	1,350	164	357	448
1986	1,583	191	437	466
1987	1,920	214	577	513

1988	2,296	258	696	578
1989	2,462	279	728	614
1990	2,863	325	855	691

Source: TSDB (1991, 292).

TABLE 42
STUDENTS STUDYING ABROAD

Unit: Person

Period	Total	Humanities	Education	Social & Behavior Sciences	Natural Sciences
1952-61	558	77	10	82	47
Average					
1962	1,833	279	44	306	229
1963	2,125	274	55	398	265
1964	2,514	354	73	541	315
1965	2,339	383	72	501	315
1966	2,189	336	67	445	372
1967	2,472	302	76	483	429
1968	2,711	394	60	555	577
1969	3,444	480	58	728	741
1970	2,056	240	23	318	515
1971	2,558	329	33	500	625
1972	2,149	260	23	473	532
1973	1,966	254	29	350	502
1974	2,285	237	32	442	596
1975	2,301	325	32	448	537
1976	3,641	489	56	790	802
1977	3,852	567	73	928	732
1978	4,756	682	77	1,228	827
1979	5,801	869	112	1,662	853
1980	5,933	903	115	1,761	846
1981	5,363	807	123	1,498	720
1982	5,925	768	97	1,510	856
1983	5,690	724	116	445	515
1984	5,410	659	73	337	439
1985	5,979	768	78	459	471
1986	7,016	862	87	473	517
1987	6,599	781	54	390	453
1988	7,122	902	79	452	482

Period	Total	Humanities	Education	Social & Behavior Sciences	Natural Sciences
1989	3,900	453	286	263	257
1990	94	13	63	9	6

Note: *Since the 1983-84 school year, curricula in Taiwan's institutions of higher learning have been organized according to UNESCO standards.
 *The students studying abroad without government scholarships have been excluded since July, 1989.

Source: TSDB (1991, 291)

STUDENTS STUDYING ABROAD

Unit: Person

Period	Engineering	Medical Science	Math & Computer	Commerce & Business Administration
1952-61	177	22	---	---
Average				
1962	575	42	---	---
1963	693	56	---	---
1964	715	83	---	---
1965	553	94	---	---
1966	521	107	---	---
1967	633	111	---	---
1968	576	104	---	---
1969	717	116	---	---
1970	553	86	---	---
1971	607	79	---	---
1972	439	88	---	---
1973	425	97	---	---
1974	568	98	---	---
1975	528	96	---	---
1976	927	180	---	---
1977	935	198	---	---
1978	1,218	213	---	---
1979	1,390	296	---	---
1980	1,421	279	---	---
1981	1,439	255	---	---
1982	2,058	205	---	---
1983	1,571	230	275	977
1984	1,606	235	258	867
1985	1,759	226	331	967
1986	2,056	287	393	1,199
1987	2,017	279	384	1,044
1988	1,936	284	484	1,163
1989	1,065	187	306	675

Period	Engineering	Medical Science	Math & Computer	Commerce & Business Administration
1990	14	21	2	8

Note: "Since the 1983-84 school year, curricula in Taiwan's institutions of higher learning have been organized according to UNESCO standards.
 "The students studying abroad without government scholarships have been excluded since July, 1989.

Source: TSDB (1991, 291).

Initially, the students who left were people whose parents feared for the security of Taiwan, but eventually, many of them returned for careers in Taiwan after being abroad for as much as six to ten years - long enough to earn advanced degrees and often work at "high tech" industries. This group of emigres provided a direct linkage with the markets of the United States in particular, and other developed economies in general. Thus, it an unintended consequence of this wave of emigrants was that every family could have access to a network of friends who provided timely, on-the-spot information about market and business trends and needs in the largest market in the world. It became self evident to many Taiwanese that the pricing of many goods in the U.S. was oligopolistic and inflated by higher costs. It was possible to make many goods in Taiwan at considerably lower prices than the prevailing prices in the U.S.

Another unintended consequence of this large wave of migrants was that they not only brought back education, but also ideas and technology from their extended stay in the U.S.; thus, much of the export industrialization benefitted from this free flow of technology from Taiwanese students returning from the U.S. This provided an infusion of technology and modern management skills into Taiwan's economy that largely explains Taiwan's ability to upgrade to "high tech" products. Whereas the skills of an engineer in the U.S. with ten years ex-

perience may be only of average utility and value in the U.S., in Taiwan, with low labor costs and a shortage of skilled engineers, their skills can be put to much better use. In a country where entrepreneurship is natural, many of these emigres ended up returning to Taiwan to start businesses. While the government of Taiwan had a general commitment to education that was, indeed, genuine, they did not intend for this education to pay off directly in a thriving electronics industry. One official who was involved in policy making bluntly commented that if his goal was to make better use of state funds in the 1960s, he would have put less money in higher education because he noted, "everyone knows those people who took higher degrees immediately left us and emigrated to the USA". He argued for putting more money in less mobile occupations like vocational training instead.¹⁵¹

Guerrilla Industrialism

This process of "trickle down" of knowledge from MNCs allied with the network of kinship relations abroad enabled Taiwanese electronics firms to exploit high prices for electronics components in the U.S. market. Because these new competitors were all undercapitalized, they did not normally open integrated factories on the western model. They bought the absolute minimum of specialized equipment and relied on

¹⁵¹Interview O.

outside sources for other services they might need. This gave them tremendous flexibility in what they manufactured. Because they were so dependent on winning orders initially, they were willing to tailor products to their customers' specifications, exhibiting the degree of flexibility described earlier as "Chinese capitalism". Because the electronics components industry is characterized by a highly heterogeneous product mix and frequent spot shortages of specific components, Taiwanese entrepreneurs responded to this market environment with an ingenious form of doing business. They took the customary "flexibility" one step further. Entrepreneurs would constantly search for products with high margins that not only their own firm, but the industry was capable of producing. Thus, if margins were good for one product possibly because of a short-term shortage, e.g., low-power resistors, they would enter that market while the margin was high, knowing that they ultimately would not be the lowest cost supplier. Once the market reached equilibrium, they knew they would no longer be competitive with the major suppliers that had specialized, automated equipment. But by that time, they had already made their profits and moved onto other products.

One additional benefit of this pattern of guerrilla capitalism in manufacturing is that Taiwanese manufacturers have been able to stay one step ahead of protectionist measures. It is

neither practical nor feasible for Taiwan's largest trading partner to effectively stem the flood of imports through regulation, given the length of time it takes for regulations to be changed. Indeed, Taiwanese firms that made large capital investments that were not redeployable into other products would invite protectionist measures.¹⁵² Even when such protectionist measures are taken, because of the lack of investment in specialized capital plant, Taiwanese firms find it natural and easy to move onto producing something else.

The pattern of industrialism was ultimately to create in Taiwan two major groupings of firms: large multinationals that were in Taiwan to manufacture a specific product or range of products because of its attractive manufacturing environment for electronics, surrounded by a large number of small, locally owned manufacturers of components and supplies. This was the pattern of industry that existed in Taiwan's electronics industry in the early 70s. What happened next is the real story of Taiwan's "miracle". Labor intensive assembly work created a market for local components, many of which had higher technical content than the basic assembly work done by the local assembly firms. However, were the low tech portion of the work not there, the rationale for the

¹⁵²The example of Taiwan's success in textile imports and its consequent regulation under GATT was indicative of what actions Taiwan's trading partners would take should any particular industry be too successful.

"high tech" also would not exist. Similarly, the television manufacturing business that several large firms had invested in was originally scorned as a "declining" industry. But when the computer revolution came in the late 70s, these lines became the basis for producing "high tech" components like computer monitors. Likewise, labor intensive assembly work for telephones and video games created a market for the IC chips made by Minister Sun's venture. Indeed, the one venture that stands out as a failure was the effort to build "high tech" video cassette recorders. This venture by Tatung Co. failed because it was primarily dominated by an attempt to transplant a capital intensive "high tech" activity into Taiwan without an industrial base to support it.¹⁵³ This pattern of low technology goods providing a basis for which high tech became possible was repeated in the PC revolution which so energized the local industry in the late 70s. In contrast, the official research and development support by the government in the 1970s lagged far behind even South Korea. It was not until the mid-1980s that there was an explosion in R & D spending by the government and local industry. Indeed, much of the government funds for R & D in the 1970s went to relatively unfruitful outlets such as ITRI and academic

¹⁵³ This venture was done because of much prodding and urging by one state official. He deeply regretted the unwise move which he recommended without knowing the feasibility of it. Interview B.

oriented research and defense related research. See Tables
43, 44, 45, 46.

TABLE 43

TOTAL R&D SPENDING AS A PERCENTAGE OF GNP
IN THE ROC AND OTHER COUNTRIES

(unit: %)

Period	Taiwan	Japan		United Kingdom		U.S.A.		Korea
1983	*		*		*		*	*
1984	0.91	2.29	2.28	2.14	1.50	2.56	1.91	1.18
1985	0.95	2.37	2.35	---	---	2.59	1.91	1.37
1986	1.01	2.53	2.51	2.21	1.56	2.68	1.93	1.65
1987	0.98	2.51	2.50	2.27	1.71	2.65	1.81	1.84
1988	1.12	2.57	2.54	2.24	1.71	2.62 ^e	1.80 ^e	1.95
1989	1.22	2.62	2.60	---	---	2.58 ^e	1.80 ^e	2.05
1990	1.38	---	---	---	---	2.53 ^e	1.76 ^e	2.12

Note:

¹Statistics for the R.O.C. are based on calendar year while those for other countries are based on fiscal year.²R&D expenditures for all listed countries, except Japan and Korea, include spending in Humanities and Social Sciences. The R.O.C. started such inclusion in 1984.³*represents R&D expenditures exclusive of national defense spending.⁴Figures marked with "e" are estimates.

Source:

TSDB (1991, 116).

TABLE 44

NATIONAL R&D EXPENDITURES BY GOVERNMENT VS PRIVATE SECTOR

(unit: NT\$ million)

Period	Government ¹		Private	
			Domestic	Foreign
	Amount	(%)	(%)	(%)
1980	6,377	60.4	39.5	0.1
1981	8,652	52.7	47.1	0.2
1982	9,813	58.2	41.4	0.4
1983	11,756	61.3	38.6	0.1
1984 ²	13,951	62.2	36.9	0.9
1985	15,297	60.2	38.7	1.1
1986	17,253	60.1	39.4	0.5
1987	18,701	50.8	48.6	0.6
1988	24,793	56.5	43.2	0.3
1989	26,127	47.7	51.8	0.5

Notes: ¹Including expenditures by public enterprises and by government for supporting measures.

²Since 1984, including expenditures on the humanities and social sciences.

Source: TSDB 1991, page 113.

NATIONAL R&D EXPENDITURES BY INDUSTRY,
ACADEMIC & RESEARCH INSTITUTION

(unit: NT\$ million)

Period	Total		Industry	Research Institute		University	
	Amount	%	%	Amount	%	Amount	%
1980	10,562	100.0	54.6	2,511	23.8	2,280	21.6
1981	16,414	100.0	56.1	4,528	27.6	2,677	16.3
1982	16,864	100.0	47.8	5,660	33.6	3,147	18.7
1983	19,200	100.0	49.8	5,805	30.2	3,842	20.0
1984 ¹	22,444	100.0	48.9	7,325	32.6	4,149	18.5
1985	25,397	100.0	50.1	8,401	33.1	4,282	16.9
1986	28,702	100.0	55.5	8,356	29.1	4,424	15.4
1987	36,780	100.0	59.2	9,844	26.8	5,173	14.1
1988	43,839	100.0	47.8	15,627	35.6	7,265	16.6
1989	54,789	100.0	56.1	15,827	28.9	8,267	15.0

Note: ¹ Since 1984, including expenditures on the humanities and social sciences.
Source: TSDB (1991, 113).

TABLE 45
NATIONAL R&D EXPENDITURES BY TYPE

Period	Total	Basic Research	Applied Research	Development
	%	%	%	%
1980	100.0	8.5	62.4	29.1
1981	100.0	6.8	48.4	44.9
1982	100.0	10.3	57.8	31.9
1983	100.0	12.1	27.8	60.1
1984 ¹	100.0	14.1	32.2	53.6
1985	100.0	14.5	32.9	52.6
1986	100.0	13.3	40.9	45.8
1987	100.0	10.4	33.1	56.5
1988	100.0	12.1	48.6	39.3
1989	100.0	10.5	36.2	53.3

Note: ¹Since 1984, including expenditures on the humanities and social sciences.

Source: TSDB (1991, 114).

NATIONAL R&D EXPENDITURES BY FIELD OF RESEARCH

Period	Total		Natural Sciences	Engineering
	Amt.	%	%	%
1980	10,562	100.0	9.8	61.8
1981	16,414	100.0	4.8	72.5
1982	16,864	100.0	7.1	61.7
1983	19,200	100.0	9.7	62.4
1984	22,044	100.0	6.8	66.3
1985	25,397	100.0	7.8	70.7
1986	28,702	100.0	8.4	68.8
1987	36,780	100.0	5.3	77.8
1988	43,839	100.0	7.8	70.5
1989	54,789	100.0	5.3	77.6

Source: TSDB (1991, 114).

NATIONAL R&D EXPENDITURES BY FIELD OF RESEARCH

Period	Medical Sciences	Agriculture	Humanities & Social Sciences
	%	%	%
1980	7.2	21.2	---
1981	5.8	16.8	---
1982	7.2	24.1	---
1983	9.3	18.7	---
1984	11.0	13.5	2.5
1985	6.3	12.8	2.4
1986	7.8	12.9	2.1
1987	3.6	12.5	0.8
1988	4.7	13.1	3.9
1989	4.5	10.3	2.3

Source: TSDB (1991, 114).

TABLE 46

R&D EXPENDITURES AND MANPOWER IN EIGHT STRATEGIC AREAS

Areas	Expenditure (NT\$ million)				
	1985	1986	1987	1988	1989
Total	9,026	12,650	14,660	19,738	14,115
Information	3,187	3,477	3,755	5,361	5,236
Automation	1,969	2,112	2,119	2,949	934
Materials	1,386	3,246	4,256	4,652	3,842
Energy	796	1,225	1,127	2,422	975
Electro-optics	635	695	774	1,473	615
Food technology	490	742	975	538	1,283
Biotechnology	445	678	445	1,218	538
Hepatitis control	118	113	53	96	27
Environmental science and technology	---	362	1,156	1,030	665

Areas	Manpower (Researchers, FTE ^a)				
	1985	1986	1987	1988	1989
Total	7,557	9,234	11,111	14,435	11,561
Information	2,977	2,776	3,443	3,546	3,527
Automation	1,436	1,736	1,688	1,851	748
Materials	1,060	1,627	2,564	2,838	3,300
Energy	554	824	685	1,661	697
Electro-optics	450	681	660	1,069	519
Food technology	512	734	962	610	1,697
Biotechnology	471	424	384	1,482	415
Hepatitis control	117	60	49	610	38
Environmental science and technology	---	372	676	1,104	620

^aFTE: The abbreviation of "Full Time Equivalent".
Source: TSDB (1991, 115).

PCs Revolution

While the government's official research efforts failed to give industry much of a boost until the early 1980s, the low technology assembly industry was evolving rapidly as a result of the pattern of technology transfer by employees and overseas Chinese noted above. The assemblers of video games, telephones and other low technology components turned to assembling personal computers when they could no longer compete in the telephone market in the late 1970s and 1980s. At first, the local industry began by illegally copying a clone of the Apple II computer. When the IBM computer was introduced in 1981, they too, began making illegal copies of the computer. At that time, Taiwanese computer manufacturers produced goods that were, by all accounts, inferior to the products offered by the major firms. In many instances, their computer products were outright illegal copies of major brand name computers. All but the best of their computers failed to meet FCC regulations for Radio Frequency Emissions in the United States. Their cost of manufacturing was also higher than that of any of the major U.S. manufacturers even when their lower quality and lower labor costs were taken into consideration. This was because the possibilities for cost reduction through automation or large volume purchasing were not available to most of them. Despite this, the oligopolistic nature of computers in the U.S. allowed

Taiwanese manufacturers to make handsome profits. In other words, they were able to make large profits only because of the high prevailing prices for computers in the market. However, this was strictly a transient opportunity that was bound to end at some point. By 1988, four years after the first Taiwanese computer was made, the margins were lowered sufficiently to reduce the number of manufacturers down to only a handful compared to the numbers in 1984. Many manufacturers have gone on to other businesses. However, the opportunity to learn to manufacture computers from assembling low technology PCs gave firms in Taiwan the opportunity to both improve their skills to become more competitive in the tougher environment in the 1980s, and provide a large "internal" market for "high tech" computer components that were to become the basis of the successful "high tech" industry in Taiwan today.

Summary

Taiwan's success in developing an electronics and computer industry is only an unexpected event from the theoretical lenses from which theories of dependent economic development perceive the process of development. The patterns of industrial organization and business that led to the dynamism that resulted in a large electronics and computer industry are not a product of state intervention. They existed irrespective of

it. Indeed, the "guerrilla" nature of the industry could not have been promoted by the state without risking trade sanctions from Taiwan's major partner: the United States. What has happened in Taiwan is a pattern of remarkable adaptability to market opportunities by local entrepreneurs, together with fortuitous events that made many opportunities possible, which were exploited to the fullest because of the dynamic structure of their small to medium scale industry. Indeed, this sector of the economy was viewed by the state with derision until it succeeded.

Chapter 6

CONCLUSIONS

We began with the idea that political institutions are a critical factor in economic development. This is unquestionably true. However, that is not to suggest that state policies and actions are necessary and sufficient to explain economic development. Indeed, this study demonstrates that this is far from the case. No state, even the so called totalitarian state, exercises complete power and control over a society. Even in totalitarian societies, individuals can resist the dictates by using a variety of ruses ranging from feinted compliance to inaction. No state planning and control mechanism can, at the unit level of the individual, force individuals to act against their will all the time. Indeed, even if that were to be possible, the outcome would likely be sub-optimal and inefficient. Individuals can be coerced, but they cannot be coerced indefinitely to deliver their best work. Therefore, in any economic system - even totalitarian systems - the reward system has to be a blend of both "carrots" and "sticks". Taiwan's industrial policy toward the computer and electronics industry is a case in point. The state did apply carrots and sticks, but the result was far from predictable or visualized in advance.

State Guidance

The idea that state guidance and actions can steer an economy toward the path of sustained economic development is a seductive one. The explanation is at once, simple, ahistorical, and insensitive to culture. Were it to be proven correct, it provides a formula neatly in the western tradition of debate on economic development and apparently supports a seemingly counter-orthodox view that proper action by the state is necessary and sufficient to explain development. However, the formula is simplistic and less than entirely satisfactory in explaining development in the computer and electronics industries in Taiwan. The fundamental reason why this explanation fails is because the world is not a predictable or ideal place. As we have seen in this thesis, many of the events that made a particular policy succeed or fail were completely unanticipated by the decision makers at hand. At any given time, no actor - whether state or non-state - can know or predict the future accurately. Therefore, the process of what we call "development" is, more often than not, not the implementation of grand visions or grand designs made a priori, but sophisticated ad hoc improvisations to adapt to changing circumstances. The central core of Chalmers Johnson's idea: that there is an all knowing bureaucracy of technocrats who can forecast far into the future and carry out sophisticated technical analysis of trends, is fundamentally

flawed because they cannot. No one can. Not the private sector, not the state, or anyone else. Indeed, the very techniques used by the planning staff: input-output tables, forecasts of trends, and more recently, market research data, are generated by projection forward of existing information and trends. Such a technique is akin to driving an automobile while looking solely at the rear view mirrors. Because events in the future are indeterminate and by their very nature unknowable, it is impossible to forecast forward with any degree of accuracy for any length of time. Contingent events can all too easily disrupt any forecast even if it is carried out in minute detail. At the same time, unforeseen developments can make what appear to be good long term ideas at a particular time obsolete long before the long term arrives. Therefore, it can be seen in the empirical materials in this thesis that long-range forecasts served relatively little function as more than "wish lists" or points of reference.

While state planners appear to possess grand visions, in reality, they in fact neither possess the capability to forecast nor, in many cases, do they even possess the technical capability even to comprehend what is going on. Thus, the reality of policy making is not a process of conjuring up grand visions, but day-to-day policy making and implementation are - like activities in the private sector -

no more than series of ad hoc measures cobbled together by the players to meet their needs at any particular instant in time. The fact that it has coherence at the end is both a product of chance events, and in some cases, a product of selective memory and doctoring of the official history.

Ad Hoc Measures

State action and policies, unlike grand strategies, are predominantly explainable as ad hoc measures that are created by the interest groups and institutions that are formally in charge of formulating them. Although there is no necessary grand design, there are, however, patterns that one can discern in their formulation. Policies are formulated not only by institutions, but by individuals both within and outside of the institution's economic policy making. To understand why a particular policy is formulated, it is often of little use to refer to grand designs or grand plans for the following reasons: First, if there is in fact a grand design (which is not the case in these two industry studies), then there is no guarantee that actions are taken because of fulfillment of the grand design as opposed to other reasons. Indeed, the very existence of a "plan" is more often than not used by interested parties as a shield for surreptitiously pushing their own interests safely. Whether these interests are personal, institutional or collective is impossible to

know without analyzing the actions of key individuals and institutions in exhaustive detail. Then there is the problem of speculating and imputing motives to individuals and institutions to explain why they acted in a certain way. This then leads us to the problem of implementation.

Implementation and Control

Even if state planning is effective and accurately foresees the future, it is still fraught with the practical problems of implementation and control. As this thesis demonstrates, the more grandiose the plan and the more commitment to the plan given by top leaders, the more likely it is that such plans will be hijacked by other interests. Thus, plans are likely to be only sporadically rather than systematically implemented. Those parts of the plan that fit the interest of key players will be used, while other parts of the plan that do not will be selectively ignored. Indeed, that is exactly what private firms do with the official plan:

"Firms of all sizes attempt to insulate themselves from arbitrary actions on the part of the government... through rapid compliance with all the government directives which they feel will not hinder their own objectives or which they feel the government will actively enforce; or through maintenance of personal

contacts with many government officials in the form of visiting and entertaining." (Silin, 1976, 20)

Without exhaustive and cumbersome control mechanisms to audit and ensure compliance, it is simply impossible for any "economic general staff" to claim that their economic plan has been effectively implemented. Should the state wish compliance with plans from the private sector, small carrots and sticks have, in the case of these two industries, proven to be inadequate. The private sector does not respond to minor incentives, but to relatively large ones. This brings us to the next problem of focus.

Focus and its Consequences

In order for state leadership and policies to work, they must be relatively focused on a small number of relatively clearly defined goals. Resources need to be diverted through policy instruments and action into a number of relatively small sectors. Premier Sun's single minded pursuit of a vague model of high technology, however motivated by earnest intentions, is a case in point. His ITRI was not successful until he received and acted on advice on how to narrow and focus the venture into a more narrow sector.¹⁵⁴ However, this creates two problems. First, if the state concentrates resources into

¹⁵⁴ Interview G.

a relatively small sector, it creates large benefits for one sector at the expense of society. While this may achieve the intended goal, it ultimately creates intense jealousies among the other "left out" sectors. This creates two problems: The left out sector competes intensely for the resources in the "haves" sector. Second, the "haves" become a privileged group that then can exploit their status for private gain. In the case of policy making, we do in fact find evidence of intense competition as characterized by this model. Therefore, the game increasingly turns to one of rent seeking and rent defending behavior, which is counterproductive to the task of engendering economic efficiency.

Misleading Evidence

Finally, this takes us to the problem of evidence. The apparent ease with which earlier researchers have documented the relationship between state planning and development needs explanation. Since all past studies have been done as historical research by researchers who are committed to the idea of state action a priori, their collection of data is highly selective and fragmentary. Publications, by and large, are dangerous to use by themselves as evidence of policy making without reference to detailed documentation of the events that led to their publication by individuals who are

involved in policy formulation. It is difficult to sort out the documentation to obtain a clear and precise account. Indeed, even the document trail is itself inconsistent. More cursory researchers have tended to overlook this fact in their rush to prove their ambitious macro models. Bureaucrats, like anyone else, have a need to look good to researchers. Therefore, their presentation of data and documentation are likely to be highly selective: Forgetting or understating their failures, while trumpeting their successes. Premier Sun's memoirs are a case in point.

Premier Sun's account of his efforts to found the semiconductor industry would appear to demonstrate it was his goal to create the Integrated Circuit industry from early on. Indeed, in an interview with the author, he repeated this entire account by beginning with the comment, "I set out to build ICs".¹⁵⁵ Only after the premier was confronted with the fact that the author knew the history of his efforts in depth, and the lack of success of the other parts of ITRI he founded, did Premier Sun concede that his efforts were mixed. When the question was raised as to why he waited until 1977 to remove Dr. C.C. Wong from the Presidency of ITRI, when it was clear by 1975 that he was unable to build an institution to fill its mandate, Premier Sun replied, "I felt bad for him. I recruited him back from the U.S. personally, and because it

¹⁵⁵ Interview P.

did not work out, he will have to return to the U.S. for a much less prestigious position."¹⁵⁶ Thus, Premier Sun acknowledged that his implementation of his vision of bringing high technology to Taiwan was poorly executed. However, the one spectacular success he had he very lucidly remembered and trumpeted. Is this not but so very human? Is his reluctance to remove someone whom he recruited personally also not so human? In fact, in the detailed and candid interviews completed for this study, Premier Sun's efforts should be noted not for the many failures in programs he started, but for his effort in trying. The saving grace for his efforts is because he committed relatively small amounts of the state's resources to a large number of projects, it was fortuitous that he was able to have one spectacular success that he himself did not foresee except in the most general terms. Premier Sun should deserve an honorable mention for his tireless efforts of trying to help the economy that he so loved. It is perhaps tragic that Premier Sun was maybe a decade ahead of his time. Once again, the micro level study conducted as a part of this research demonstrates the importance of documenting and understanding the context of how he made his decisions.

¹⁵⁶ Interview P.

Explaining the Success of Development

The success of Taiwan's development is best understood from the perspective of the barriers to development it has overcome. A partial list of industry specific barriers to developing an electronics and computer industry in the 1950s might include the following:

1. Electronics and computer industries are capital intensive industries that are not suitable for a capital poor nation.
2. Taiwan was very short of foreign exchange and this is needed to finance imported capital equipment and supplies to begin an industry.
3. Electronics and computers are technology intensive. It requires much skill, know how and other factors of production Taiwan did not possess.
4. Taiwan had a relatively small market for these products.
5. Taiwan had a poorly trained labor force without the skills needed to build a computer and electronics industry.
6. There were few technically trained entrepreneurs in Taiwan to promote this industry.
7. The infrastructure to support a sophisticated computer and electronics industry was absent. (Telecommunications networks, transportation linkages, etc.)

In addition to these industry specific barriers, Taiwan was burdened with the familiar problems of many developing economies: poor government, corruption, high military expenditures, and limited infrastructure. It was in this environment that the electronics industry began.

A look at how these barriers were overcome might begin with some of the assumptions behind these assertions. The idea that the computer and electronics industries are capital intensive is a good place to begin. While it is true that the industry as a whole is capital intensive, the manufacture of particular components can be extremely labor intensive. The operations General Instruments and its followers moved to Taiwan were precisely this kind of operation. Therefore, there was not a barrier to entry for Taiwan as long as it did not pursue the course to build an integrated industry that included the capital intensive elements. Indeed, if the capital intensive elements or components to manufacture electronics goods or computers are readily available at reasonable prices, why should a potential manufacturer be deterred by the idea that an industry is "capital intensive" in the aggregate. They can simply choose to enter via the non-capital intensive elements and then buy the capital intensive components to assemble into goods. That is exactly what the indigenous assemblers did.

The idea that Taiwan was short of foreign exchange is also a myth. While it is true that the economy was short of foreign exchange in the early 1950s and 1960s, the problem was largely solved by the multinational corporations that set up facilities in Taiwan and employed local staff. They paid for these services in dollars. The textile industry, which was well established by the 1960s, also provided an adequate amount of foreign exchange for the economy by the late 1960s as long as the New Taiwan Dollar was kept at low levels.

The notion that Taiwan would be dependent on technology to initiate a high technology is yet another case of a concept misunderstood. Technology is not a physical commodity. It is know how. This ranged from knowing how to define a need for a product, to knowing how to build it, and how to distribute it. These kinds of know how are not always patentable or protected by intellectual property rights. Most of it consists of trade secrets that can be learned. The presence of the MNCs in Taiwan did precisely this. It became a university for future local entrepreneurs. Further upgrading of this skill was also provided by Taiwanese who emigrated abroad and worked for U.S. firms for many years. This type of technological diffusion is natural and unavoidable in any industry.

One of the most critical assertions of development theory is the belief that large internal markets are needed to help local industry achieve economies of scale and scope, making their industry internationally competitive. The reality is, a majority of the electronics and computer industry, which Taiwan had become proficient in the 1970s, had very limited scale or scope economies. There are, of course, segments of the industry, such as building a microprocessor IC chip, which has very large economies of scale and scope. However, this is the exception and not the norm. Moreover, the size of the domestic market did not matter because electronics were relatively freely traded throughout the world. Thus, a local market was neither necessary --- though it might have been helpful --- nor sufficient to create the industry. Indeed, the early industry of export processing zones was entirely dependent on foreign markets.

Taiwan did not possess educated manpower for these industries in the 1970s. However, no one could have forecasted that the basic skills possessed by a majority of the population would prepare them for such things as discipline, tolerance for repetitive, precise work with one's hands, dexterity, and hand-eye coordination, which would help them work in the electronics assembly industry. These are coincidentally the same skills learned from writing Chinese characters. The more advanced skills learned in higher education, in fact, turned

out not to matter because these graduates did not possess industry specific skills. Those skills were provided by employees who had specific work experience in the industry as I have discussed above.

It was also true that Taiwan initially lacked entrepreneurs. However, it turned out that Chinese culture, rather than a barrier to modernization in general, facilitated family based entrepreneurship. It is precisely this form of business that formed the dynamic core of Taiwan's economy.

Finally, as to the poor infrastructure in Taiwan to support an electronics industry in the early years, the infrastructure was in fact more than adequate for the simple tasks multinational firms that came to produce needed. What was not there was relatively cheaply built as Export Processing Zones.

Insofar as the general factors hindering development, like a hostile government towards business and the high military burden faced by the nation, Taiwan demonstrated that an economy could sustain a very large burden as long as the extraction was steady and business can predict the degree to which they have to earn to pay for the burden. Had the government failed to respect private property and confiscated

wealth as it is made, certainty would have been destroyed and this industry would not have grown out of its infant phases.

In going over these factors that were overcome, it is fair to note that few of them were, in fact, overcome as a result of state policy to promote industry. The inability of state planning and action to create an electronics and computer industry in Taiwan is not surprising. However, it is interesting to note that the actions by the state were indeed, not for naught. They were able to, in many cases, accelerate or catalyze the pace of change and development that was already proceeding apace through market forces. Moreover, it was also able to, in many cases, facilitate the creation of a few industries for which there was, in fact, a large barrier to entry. The video tube plants that they promoted local firms to build as joint ventures with U.S. and Japanese firms are an example of this. However, its real failing was its focus on a fixed, U.S. based model of industrial development, which blinded it to the way in which a native entrepreneurial culture and institutions were establishing and evolving into the beginnings of a dynamic industry. The government also did not foresee the kind of linkages these local firms would build on their own, both through the medium of local entrepreneurship, and through overseas ties. It was in this environment that they launched their "high technology"

ventures of setting up ITRI, building ICs, and creating the Hsinchu Science Based Industrial Park. The ICs built originally by the state venture were in fact, rejected by the local firms. It was only because of their ability to prove themselves in the Hongkong market that they were able to persuade local makers to buy them later. Had the "low tech", market regulation driven industry not existed to provide a close coupling with market needs and demands, the "high tech" industrial firm would not have been viable. Yet, bureaucratic regulation theories rarely study the interaction effects between these two sectors of the economy. Finally, there is the burden of the assumption of industrial convergence. By both bureaucratic and market regulation theories, by accepting that all industries have to converge and face similar costs, they have locked themselves into a corner theoretically, leaving them no choice but to accept that "late" development will inherently result in many disadvantages that can only be overcome through exploitation, oppression or other negative consequences. It is tragic for political economy in general, and Taiwan's political economy in particular, to see such assumptions made in most studies. The triumph of Japan, Taiwan, Hongkong and South Korea demonstrates how bankrupt this theoretical assumption is. Western ideas of capitalism, in confronting these societies, have found but a limited model. In speaking of the

confrontation of Marxism-Leninism with Chinese culture, Professor Pye observed,

"Marxism-Leninism has been profoundly dented in its confrontation with Chinese culture. ... Chinese culture---in terms of basic personality, fundamental practices, and the deep and abiding values transmitted in family contexts --- has endured in spite of all the efforts of the Chinese communists to make over the Chinese in the Soviet image of the "New Man". After nearly forty years of Communist rule devoted to obliterating Chinese cultural traditions, the Deng leadership has committed itself to defending "Chineseness" against the evils of "Westernization". In doing so, it has to grapple with questions regarding its own legitimacy. More importantly, it has challenged the legitimacy of traditional Marxism-Leninism." (Pye, 1988, 171)

And similarly, western theories of capitalism, implicit in the theories of political economy both from the market regulation and the bureaucratic regulation perspective, have been dented by Chinese culture. The models of pure market force led development espoused by liberals have been effectively questioned by the extent and importance of state action in Taiwan's development. At the same time, the bureaucratic regulationist's belief that the state is a necessary and sufficient explanation for Taiwan's development, has also been

challenged. The pattern that the Taiwanese formed is not explicable from one or the other perspective, but needs an amalgamation of both, with major "revisions" in both meta theories to allow for the impact of Chinese culture, and the weaknesses inherent in these theories.

Summary

This study argues that state policy making and action are not a panacea for solving the problems of economic growth. Although state policy is a necessary explanation for any account of economic development, it is not sufficient. Indeed, state policy making is a blunt instrument that is poorly suited to economic development. Although it can achieve certain goals under relatively restrictive conditions, state planning and action are, in most cases, a poor substitute for the dynamics of the private sector. The fundamental strength of the private sector is not only that it is responsive to market forces, but a plurality of options and outcomes are permitted to coexist. In an uncertain world that cannot be predicted by central planning - whether public or private - the preservation of multiple, diverse options means that the likelihood that one of the options may be more correct than another at a future time is enhanced. While this may seem to be wasteful of a society's resources, it is in fact less risky than the alternative.

When the state attempts to "see" into the future and then marshals an entire society's resources towards a predetermined strategic goal, the possibility of error means a society risks more than just being wasteful: it risks being wrong and is left without a future option. The object lesson from this micro level study demonstrates that not only is the likelihood slim that state planners can see better, but the normal activities of politics in any organization make "rational" output unlikely to be achieved. The series of "ad hoc" measures taken by individuals in charge can, in retrospect, be construed as what is termed an "emergent strategy".¹⁵⁷ However, then we are forced to abandon the idea that governments can plan ahead.

Another critical problem caused by the state's ability to focus resources on a specific goal even in a limited sector of the economy, is amply illustrated by the difficulties the key players had in actually committing resources. Rather than the state acting as a coherent whole, whenever state action involves significant resources, it is more than likely to result in intense political competition for scarce resources within the state. Under such circumstances, the likelihood of a state acting with a strategic purpose independent of both societal and institutional interests within the state is

¹⁵⁷See Mintzberg for a further discussion of this. (Mintzberg, 1990, 89-123)

rather limited. The exception to this is when policies or goals are championed by a single player or a few powerful players. However, such players are few and far between. When state actions are dependent on such players, it is also dependent on their skills, outlook and ability to "guess" the correct course of action. Premier Sun's efforts demonstrated that many of these projects were beyond his competence to plan, execute and control. Under such circumstances, the ability of the state to "deliver" market conforming policies or to lead the market is no better than anyone else, and often worse. The problem of whether the state has the moral right to commit a society's resources toward projects of such uncertainty is a question that can be answered independently of the feasibility of state action.

Perhaps the most fundamental weakness illustrated by this study is the theoretical perspective of bureaucratic regulation studies. These forms of theories have demonstrably difficult capabilities in seeing beyond actions by the state, as well as accepting that state policies can create islands of economic activity while permitting a market oriented sector to exist side by side. Moreover, such a market-oriented sector can possess distinct Chinese characteristics that are derived from Chinese culture. The existence of such a sector in Taiwan was not foreseen, nor its implication for development theory understood either by bureaucratic or market regulation

theories. By being unable to move away from their theoretically limited assumptions, both theories are limited in what they can say about the causes of success in Taiwan's computer and electronics industries. A comprehensive theory of development must involve elements of both theories, and furthermore take into account the distinctiveness of Chinese business culture and organizations, and furthermore, understand the interactions between different segments of the economy.

Appendix I

PARTIAL INTERVIEW LIST

The following is an alphabetical list of Government Officials, Former Officials and Industry Sources who agreed to be identified by name.

Chang, Morris, Chairman, Board of Directors, Industrial Technology Research Institute.

Fang Hien-Chee, Special Advisor, Board of Directors, Industrial Technology Research Institute.

Hsiang H. Y. Roc, Project Manager, Industrial Technology Investment Corporation.

Hsu C. S. Jason, Manager of Strategic Planning, Industrial Technology Research Institute.

Hwan Chi Huei, Council for Economic Planning and Development, Executive Yuan.

Ku Yen-Chung, Electronics, Electrical & Information Industries Division, Industrial Development Bureau, Ministry of Economic Affairs.

Lee, Dale, International Purchasing Office Manager, International Procurement Office, IBM Taiwan Corporation.

Lee, J.J., Supervisor, Process Engineering Dept., Advanced Semiconductor Engineering, Inc.

Lei Y. L., Financial Analyst, Silicon Integrated Systems, Corp.

Li Kwo Ting, Minister without Portfolio, Executive Yuan.

Lin Kun Si, Quincy, Director, Strategic Planning and Development, Taiwan Semiconductor Manufacturing Company, Ltd.

Liu K. C., Chief, Information Division, Industrial Development & Investment Center.

MacGregor, James, Correspondent, Asian Wall Street Journal.

Pan, Daniel M., Assistant Manager, Hualon Microelectronics Corp.

Pan Wen-Yuan, Senior Executive Advisor, Industrial Technology Research Institute.

Shaw, Henry, Deputy General Manager, Vitelic Taiwan Corporation.

Shih Chin-Tay, Executive Vice-President, Industrial Technology Research Institute.

Soong Tieh Min, Vice Chairman, Chung-Hsin Electric & Machinery Mfg. Corp.

Sun Yun Suan, Former Premier, Republic of China.

Wang, K. S., Deputy Director General, Export Processing Zone Administration, Ministry of Economic Affairs.

Wang, Philip C. M., Director General, Medium and Small Business Administration, Ministry of Economic Affairs.

Wei Duan, Director, Bureau of Statistics, Directorate-General of Budget, Accounting and Statistics, The Executive Yuan.

Wu Pat-zen, Executive Secretary, Science and Technology Advisory Group, The Executive Yuan.

Wu, Stephen H. C., Industrial Development and Investment Center, Ministry of Economic Affairs.

Appendix II

Note on Methodology

Research for this thesis was conducted in Taipei during 1989-90 under the auspices of the Chung Hwa Institute for Economic Research where I was a Visiting Scholar. The methodology used for this project is the key informant method. The reason this method was chosen was because the relatively limited numbers of players involved and the narrowness of the industry precluded the possibility of survey research deriving statistically valid samples. In order to prepare for the interviews, much work went into desk research in documenting the moves made by these players via publically available information both from government and private sources. The informants were then selected according to the importance of the role they played and their availability. The author was fortunate to have been able to interview almost all of the major players, with a few notable exceptions, that were involved in policy formulation in electronics and computers in the years concerned. Where the key players were not available, the author was able to obtain information from less senior players, though these individuals were in many cases working in the same office, and thus, had access to information about the day to day operations at the time concerned. In order to preserve the anonymity of the sources, the individual interviews have been coded except where the

interviewees specifically gave permission to be cited. However, a full list of interviewees appeared in Appendix I. The author was also given a most warm welcome by many businessmen in the industry, who invited the author to many dinners, luncheons and other activities, and in the process, contributed much valuable insight into the operations of the industry. Regrettably, all of them spoke only on the condition of anonymity.

REFERENCES

- Alam, Shahid. 1989. Governments and Markets in Economic Development Strategies. New York, NY: Praeger.
- Almond, Gabriel A. 1988. "The Return to the State", American Political Science Review, 82(3): 853-74.
- Amin, Samir. 1974. Accumulation on a World Scale: A Critique of the Theory of Underdevelopment. New York, NY: Monthly Review Press.
- Amsden, Alice H. 1979. "Taiwan's Economic History" Modern China, 5(3): 341-80.
- Amsden, Alice H. 1985. "The State and Taiwan's Economic Development" in Bringing the State Back In. In Peter Evans, Dietrich Rueschemeyer, Theda Skocpol, eds., New York, NY: Cambridge University Press. 78-101.
- Andrews, Bruce. 1982. "The Political Economy of World Capitalism", International Organization, 36(1): 135-63.
- Arnold, Walter. 1989. "Bureaucratic Politics, State Capacity, and Taiwan's Automobile Industrial Policy". Modern China 15(2): 178-214.
- Apter, David. 1965. The Politics of Modernization. Chicago, IL: University of Chicago Press.
- Arthur D. Little, Inc. 1973. The Outlook for the Electronics Industry in Taiwan. New York, NY: Arthur D. Little, Inc.
- Arthur D. Little International, Inc. 1973. Computer Terminals: An Opportunity for Investment in Taiwan. New York, NY: Arthur D. Little, Inc.
- Balassa, Bela. 1984. "The Policy Experience of Twelve Less Developed Countries, 1973-1979", in Comparative Development Perspectives, eds. Gustav Ranis and Cynthia T. Morris. Boulder, CO: Westview.
- Barrett, Richard E., and Martin King Whyte. 1982. "Dependency Theory and Taiwan: Analysis of a Deviant Case". American Journal of Sociology, 87(4): 1064-89.
- Barrett, Richard E., and Whyte, Martin King. 1984. "What is Dependency ? Reply to Hammer." American Journal of Sociology, 89(4): 937-40.

- Barrett, Richard E. and Soomi Chin. 1987. "Export-oriented Industrializing States in the Capitalist World System: Similarities and Differences." in Deyo ed. (1987). op. cit. 23-43.
- Berger, Suzanne, ed. 1981. Organizing Interests in Western Europe: Pluralism, Corporatism, and the Transformation of Politics. Cambridge, MA: Cambridge University Press.
- Biersteker, Thomas J. 1978. Distortion or Development? Contending Perspectives on the Multinational Corporation. Cambridge, MA: MIT Press.
- Blaug, Mark. 1978. Economic Theory in Retrospect (3rd ed.) New York, NY: Press Syndicate of the University of Cambridge.
- Blaug, Mark. 1980. The Methodology of Economics. London: Cambridge University Press.
- Board of Foreign Trade. 1988. Reference Papers on Economic Development and Prospect of the Republic of China, Vol. I and II. Taipei, Taiwan: Board of Foreign Trade, Ministry of Economic Affairs.
- Bornstein, Morris. 1981. The Soviet Economy. Boulder: CO. Westview.
- Bradford, Colin I., Jr. 1982. "The Rise of the NICs as Exporters on a Global Scale". in The Newly Industrializing Countries: Trade and Adjustment, ed. Louis Turner and Neil McMullen. London: George Allen & Unwin.
- Brenner, Robert. 1977. "The Origins of Capitalist Development: A Critique of Neo-Smithian Marxism." New Left Review, 104: 25-92.
- Bureau of Small and Medium Enterprise, Ministry of Economic Affairs. (Dec) 1988. Chung-hua Ming-kuo Taiwan-di-chu chung-hsiao huo-dung bao-kao, 1987 [Report for Small and Medium Enterprise Activities in Taiwan Area, ROC]. Taipei, Taiwan: MOEA.
- Caldwell, J. Alexander. 1976. "The Financial System in Taiwan: Structure, Function and Issues for the Future." Asian Survey, 16(8): 729-51.
- Caporaso, James A. 1978. "Dependence, Dependency and Power in the Global System: A Structural and Behavioral Analysis." International Organization, 32(1): 13-43.

- Cardoso, Fernando H. 1973. "Associated-Dependent Development: Theoretical and Practical Implications." in Authoritarian Brazil Alfred Stephan, ed. New Haven, CT: Yale University Press. 142-76.
- Cardoso, Fernando H. and Faletto. 1973. Dependency and Development in Latin America. Berkeley, CA: University of California Press.
- Carnoy, Martin. 1984. The State and Political Theory, Princeton, NJ: Princeton University Press.
- Caves, Richard E. 1980. "Industrial Organization, Corporate Strategy and Structure," Journal of Economic Literature, 28: 64-92.
- Chan, Steve. 1987. "The Mouse That Roared: Taiwan's Management Modern China of Trade Relations with the United States." Comparative Political Modern China Studies, 20(3): 251-292.
- Chan, Steve. 1988. "Growth with Equity: A Test of Olson's Theory for the Asian Pacific-Rim Countries", Journal of Peace Research, 24(2): 135-149.
- Chan, Steve. 1988. "Defense Burden and Economic Growth: Unraveling the Taiwanese Enigma," American Political Science Review, 82(3): 913-920.
- Chan, Steve and Clark, Cal. 1989. "Can Good Things Go Together ? A Virtuous Cycle in East Asia," International Studies Notes, 15, 1, Winter 1990.
- Chan, Wellington K.K. 1982. "The Organizational Structure of the Traditional Chinese Firm and its Modern Reform." Business History Review LVI:2 218-235.
- Chandler, Alfred D. 1977. The Visible Hand: The Managerial Revolution in American Business. Cambridge, MA: Belknap Press.
- Chase-Dunn, Christopher. 1975. "The Effects of International Economic Dependence on Development and Inequality," American Sociological Review, 40(December): 720-39.
- Chilcote, Ronald H. 1981. Theories of Comparative Politics: The Search for a Paradigm, Boulder, CO: Westview.
- China Credit Information Service. 1976. Business Groups in Taiwan. Taipei, Taiwan: China Credit Information Service.

- China Credit Information Service. 1989. The Top 500 Companies in Taiwan. Taipei, Taiwan: China Credit Information Service.
- Chu, Yun-han. 1987. Authoritarian Regimes Under Stress: The Political Economy of Adjustment in the East Asian Newly Industrializing Countries, Ph.d Thesis, Faculty of Graduate Studies, University of Minnesota. Ann Arbor, MI: University Microfilms.
- Chu, Yun-han. 1989. "State Structure and Economic Adjustment". International Organization, 43(4): 647-72.
- Clark, Cal. 1987. "Economic Development in Taiwan: A Model of a Political Economy" Journal of Asian and African Studies, 22:1-2 1-16.
- Clark, Cal. 1987. "The Taiwan Exception: Implications for Contending Political Economy Paradigms," International Studies Quarterly, 31: 327-356.
- Clark, Cal. and Lemco, Jonathan. 1988. "The Strong State and Development: A Growing List of Caveats," Journal of Developing Societies, IV: 1-8.
- Clark, Cal. 1989 Taiwan's Development: Implications for Contending Political Economy Paradigms, New Haven, CT: Greenwood.
- Cline, William R. 1982. "Can the East Asian Model of Development Be Generalized?" World Development, 10: 81-90.
- Clough, Ralph N. 1978. Island China. Cambridge, MA: Harvard University Press.
- Coase, R.H. 1937. "The Nature of the Firm," Economica, 4:16 386-405.
- Cohen, Stephen. 1977. Capitalist Planning: The French Model. Berkeley, CA: University of California Press.
- Council for Economic Planning and Development (CEPD). 1989, 1990, 1991. Taiwan Statistical Data Book, (TSDB) Taipei, Taiwan: CEPD.
- Council for Economic Planning and Development (CEPD), Economic Development Plan, for various years. They are cited as (CEPD Economic Plan). A staff member of CEPD donated a full set of the plans up to 1990 to the author which is complete except for the first two plans. There are four

year, six year, and ten year plans that overlap each other.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1976. Chung-hua Ming-kuo Taiwan Ching-chi Chien-she liu-nien chi-hua. [The Six-year Economic Development plan for Taiwan, ROC]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1988. Chung-hua Ming-kuo Chi-shih-liu-nien Taiwan Ching-chi Chien-she chi-hua chih-hsing Chien-tao. [The Evaluation of Executing Taiwan's Economic Development Plan in 1987]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1987. Chung-hua Ming-kuo Chi-shih-wu-nien Taiwan Ching-chi Chien-she chi-hua chih-hsing Chien-tao. [The Evaluation of Executing Taiwan's Economic Development Plan in 1986]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1985. Chung-hua Ming-kuo Chi-shih-san-nien Taiwan Ching-chi Chien-she chi-hua chih-hsing Chien-tao. [The Evaluation of Executing Taiwan's Economic Development Plan in 1984]. Taipei: Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1989. Chung-hua Ming-kuo Chi-shih-chiu-nien Taiwan Ching-chi Chien-she chi-hua. [The Economic Development Plan in Taiwan, ROC, 1990]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1988. Chung-hua Ming-kuo Chi-shih-pa-nien Taiwan Ching-chi Chien-she chi-hua. [The Economic Development Plan in Taiwan, ROC, 1989]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1979. Chung-hua Ming-kuo Taiwan Ching-chi Chien-she liu-shih Chiu-nien Chi-hua. [Taiwan's Economic Development Plan for 1980]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1978. Chung-hua Ming-kuo Taiwan Ching-chi Chien-she liu-nien Chi-hua hou-san-nien hsiu-ting chi-hua. [The Revised Plan for the last Three Years

of the Six-year Taiwan's Economic Development Plan, 1979-1981]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1986. Chung-hua Ming-kuo Chi-shih-ssu-nien Taiwan Ching-chi Chien-she chi-hua chih-hsing Chien-tao. [The Evaluation of Executing Taiwan's Economic Development Plan in 1985]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1974. Chung-hua Ming-kuo ti-liu-chi Taiwan Ching-chi Chien-she ssu-nien- chi-hua ti-i-nien chih-hsing Cheng-kuo Chien-tao. [The Evaluation of the First-year Executing the Four-year Plan of the Sixth-Stage Taiwan's Economic Development Plan]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1978. Chung-hua Ming-kuo Taiwan Ching-chi Chien-she liu-nien chi-hua ti-ssu-nien chi-hua. [The Four-year Plan for the Six-year Taiwan's Economic Development Plan, 1979]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1977. Chung-hua Ming-kuo Taiwan Ching-chi Chien-she liu-nien chi-hua ti-erh-nien chi-hua. [The Second-year Plan for the Six-year Taiwan's Economic Development Plan, 1977]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1977. Chung-hua Ming-kuo Taiwan Ching-chi Chien-she liu-nien chi-hua ti-erh-nien chi-hua. [The Second-year Plan for the Six-year Taiwan's Economic Development Plan, 1977]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1976. Chung-hua Ming-kuo Taiwan Ching-chi Chien-she liu-nien chi-hua ti-i-nien nien-tu-chi-hua. [The First-year Plan for the Six-year Taiwan's Economic Development Plan, 1976]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. (Aug) 1979. Chung-hua Ming-kuo Taiwan Ching-chi Chien-she liu-nien-chi-hua ti-san-nien chi-hua chih-hsing chien-tao. [The Evaluation of Executing the Third-year Plan of the Six-year Taiwan's Economic Development Plan, 1978]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1984. Chung-hua Ming-kuo chi-shih-erh nien Taiwan Ching-chi Chien-she chi-hua chih-hsing

chien-tao. [The Evaluation of Executing Taiwan's Economic Development Plan, 1983]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1981. Chung-hua Ming-kuo Taiwan Ching-chi Chien-she tzu-nien chi-hua. [The Four-year Plan for Taiwan's Economic Development Plan, 1981-1985]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1985. Chung-hua Ming-kuo ti-chiu-chi Taiwan Ching-chi Chien-she chung-cheng chi-hua. [The Ninth Stage of Taiwan's Economic Mid-term Planning, ROC, 1986-1989]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. (June) 1989. Chung-hua Ming-kuo chi-shih-chi-nien Taiwan Ching-chi Chien-she chi-hua chih-hsing chien-tao. [The Evaluation of Executing Economic Development Plan in Taiwan, ROC, 1988]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. (Dec) 1979. Chung-hua Ming-kuo ti-shih-chi Taiwan Ching-chi Chan-she chung-chi chi-hua 1990-1993. [The Tenth Stage of Mid-term Economic Development Plan in Taiwan, ROC, 1990-1993]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1978. Chung-hua Ming-kuo ching-chi chien-she liu-nien chi-hua hou-tzan-nien hsiu-ting chi-hua, 1979-1981. [Revised Plan for Last Three years of the Six-Year Economic Development in Taiwan, ROC, 1979-1981]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1980. Chung-hua Ming-kuo tien-tzu Kung-yeh pu-meng fa-chan chi-hua, 1980-1989 [Plan for Electronic Industry Branch in ROC]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. 1986. Chung-hua Ming-kuo tzu-hsun Kung-yeh pu-meng fa-chan chi-hua. [Plan for Branch Development in Information Industry, ROC, 1980-1989]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. (Aug) 1980. Chung-hua Ming-kuo Taiwan ching-chi chien-she liu-nien chi-hua ti-ssu-nien chi-hua chih-hsing chien-tao. [The Evaluation for

Execution on the Fourth-year of the Six-year Economic Planning and Development in Taiwan, ROC]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. (May) 1981. Chung-hua Ming-kuo Taiwan ching-chi chien-she liu-shih-chiu-nien chih-hsing chien-tao. [The Evaluation for Execution on Economic Development in Taiwan, ROC, 1980]. Taipei, Taiwan: CEPD.

Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. (Dec) 1985. Chung-hua Ming-kuo ti-chiu-chi Taiwan ching-chi chien-she chung-chi chi-hua. [The Ninth Stage of Mid-term Economic Planning and Development in Taiwan, ROC]. Taipei, Taiwan: CEPD.

Council for International Economic Cooperation and Development, Executive Yuan, ROC. 1970. Chung-hua Ming-kuo ti-ssu-chi Taiwan Ching-chi Chien-she ssu-nien Chi-hua Chih-hsing Chien-tao. [The Evaluation of Four-year-Plan Execution on the Fourth- Stage Taiwan's Economic Development Plan]. Taipei, Taiwan: CEPD.

Council for International Economic Cooperation and Development, Executive Yuan, ROC. 1972. Chung-hua Ming-kuo ti-liu-chi Taiwan Ching-chi Chien-she ssu-nien Chi-hua. [The Four-year Plan for the Sixth-Stage Taiwan's Economic Development Plan]. Taipei, Taiwan: CEPD.

Council for International Economic Cooperation and Development, Executive Yuan, ROC. 1973. Chung-hua Ming-kuo ti-wu-chi Taiwan Ching-chi Chien-she ssu-nien Chi-hua Chih-hsing Chien-tao. [The Evaluation of the Four-year Plan Execution on the Fifth-Stage Taiwan's Economic Development Plan]. Taipei, Taiwan: CEPD.

Council for International Economic Cooperation and Development, Executive Yuan, ROC. 1971. Ti-wu-chi ssu-nien Ching-chi Chien-she Chi-hua ti-erh-nien Chih-hsing Cheng-kuo chien-tao. [The Evaluation of the Second-year Executing the Four-year Plan on the Fifth-Stage Taiwan's Economic Development Plan]. Taipei, Taiwan: CEPD.

Council for International Economic Cooperation and Development, Executive Yuan, ROC. 1973. Chung-hua Ming-kuo ti-liu-chi Taiwan Ching-chi Chien-she ssu-nien Chi-hua ti-i-nien nien-tu-chi-hua. [The First-year Plan for the Sixth-Stage of Taiwan's Four-year Economic Development Plan, 1973]. Taipei, Taiwan: CEPD.

Council for International Economic Cooperation and Development, Executive Yuan, ROC. 1972. Chung-hua Ming-

kuo ti-wu-chi Taiwan Ching-chi Chien-she ssu-nien Chi-hua ti-ssu-nien nien-tu-chi-hua. [The Fourth-year Plan for the Fifth-Stage of Taiwan's Four-year Economic Development Plan, 1972]. Taipei, Taiwan: CEPD.

Council for International Economic Cooperation and Development, Executive Yuan, ROC. 1971. Chung-hua Ming-kuo ti-wu-chi Taiwan Ching-chi Chien-she ssu-nien Chi-hua ti-san-nien nien-tu-chi-hua. [The Third-year Plan for the Fifth-Stage of Taiwan's Four-year Economic Development Plan, 1971]. Taipei, Taiwan: CEPD.

Council for International Economic Cooperation and Development, Executive Yuan, ROC. 1969. Chung-hua Ming-kuo ti-wu-chi Taiwan Ching-chi Chan-she tzu-nien chi-hua, 1969-1971. [The Four-year Plan for the Fifth Taiwan Economic Development Plan, 1969-1971]. Taipei, Taiwan: CEPD.

Cumings, Bruce. 1984. "The Origins and Development of the Northeast Asian Political Economy". International Organization, 38(1): 1-40.

Dahl, Robert A. 1961. Who Governs?: Democracy and Power in an American City. New Haven, CT: Yale University Press.

Department of Branch Designing, Council for Economic Planning and Development (CEPD), Executive Yuan, ROC. (Apr) 1988. Tien-tzu Kung-yeh fa-chan hsien-kuang pao-tao. [The Report of Current Development in Electronic Industry]. Taipei, Taiwan: CEPD.

Department of Economic Research, Bank of Taiwan. 1989. Taiwan Yin-hang chi-kan. 40(1) [Bank of Taiwan Quarterly].

Department of Statistics, Ministry of Education. (Feb) 1990. Chung-hua Ming-kuo ta-chuan Yuan-hsiao Kai-kuang tung-chi, 1989. [General Statistics for Universities and Colleges in the Republic of China, 1989]. Taipei, Taiwan: MOE.

Department of Statistics, Ministry of Finance. (Mar) 1989. Monthly Statistics of Exports and Imports, Taiwan Area, Republic of China. 223. Taipei, Taiwan: MOE.

Dertouzos, Lester, Solow. 1989. Made in America. Cambridge, MA: The MIT Press.

Deyo, Frederic C. 1987. "State and Labor: Modes of Political Exclusion in East Asian Development". in Deyo ed. (1987). op. cit. 182-202.

- Deyo, Frederic C., ed. 1987. The Political Economy of the New Asian Industrialism. Ithaca, NY: Cornell University Press.
- Directorate - General of Budget, Accounting, and Statistics, Executive Yuan, Republic of China. (Jan) 1990. Monthly Bulletin of Manpower Statistics, Taiwan Area, Republic of China, 195. Taipei, Taiwan: DBAS.
- Directorate - General of Budget, Accounting, and Statistics, Executive Yuan. (May) 1989. Yearbook of Earnings and Productivity Statistics, Taiwan Area, Republic of China, 1988. Taipei, Taiwan: DBAS.
- Directorate - General of Budget, Accounting, and Statistics, Executive Yuan. (Oct) 1988. The Report on 1986 Industrial and Commercial Census Taiwan-Fukien Area, Republic of China, I,II,III. Taipei, Taiwan: DBAS.
- Directorate - General of Budget, Accounting, and Statistics, Executive Yuan. 1982. Report on Industrial Production in the Taiwan-Fukien Area, Taipei, Taiwan: DBAS.
- Directorate - General of Budget, Accounting, and Statistics, Executive Yuan, Republic of China (DBAS). 1968-90. Statistics Yearbook of the Republic of China, Taipei, Taiwan: DBAS.
- Dore, Ronald. 1986. Flexible Rigidities, Stanford, CA: Stanford University Press.
- Dore, Ronald. 1987. Taking Japan Seriously, Stanford, CA: Stanford University Press.
- Duvall, Raymond, Steven Jackson, Bruce M. Russett, Duncan Snidal, and David Sylvan. 1981. "A Formal Model of 'Dependencia Theory'" in From National Development to Global Community: Essays in Honor of Karl W. Deutsch, eds. Richard L. Merritt and Bruce M. Russett. London: George Allen & Unwin.
- Ellman, Michael. 1979. Socialist Planning, New York, NY: Cambridge University Press.
- Emmanuel, A. 1972. Unequal Exchange: A study of the Imperialism of Trade, New York, NY: Monthly Review Press.
- Erlich, Alexander. 1960. The Soviet Industrialization Debate, Cambridge, MA: Harvard University Press.

- Eastman, Ch'en, Pepper, Slyke. 1991. The Nationalist Era in China: 1927-1949, New York, NY: Cambridge University Press.
- Evans, Peter. 1979. Dependent Development: The Alliance of Multinational, State, and Local Capital in Brazil, Princeton, NJ: Princeton University Press.
- Evans, Peter B., Dietrich Rueschemeyer, and Theda Skocpol, eds. 1985. Bringing the State Back in, Cambridge, MA: Cambridge University Press.
- Evans, Peter B. 1987. "Class, State, and Dependence in East Asia." in The Political Economy of the New Asian Industrialism, ed. Frederic C. Deyo. Ithaca, NY: Cornell University Press.
- The Executive Yuan, Minutes of the First Board Meeting of the Advisors for Science and Technology, the Executive Yuan, the Republic of China. Jan. 28 - Feb. 6, 1980. Taipei, Taiwan: the Executive Yuan, Republic of China.
- The Executive Yuan, Minutes of the Second Board Meeting of the Advisors for Science and Technology, the Executive Yuan, the Republic of China. August. 28, 1980, Chicago, Il. Taipei, Taiwan: The Executive Yuan, Republic of China.
- The Executive Yuan, Minutes of the Third Board Meeting of the Advisors for Science and Technology, the Executive Yuan, the Republic of China. April 6- April 11, 1981 and April 29 - May 27, 1981. Taipei, Taiwan: The Executive Yuan, Republic of China.
- The Executive Yuan, Minutes of the Fourth Board Meeting of the Advisors for Science and Technology, the Executive Yuan, the Republic of China. March 1-6, 1982, Taipei, Taiwan: Republic of China. Taipei, Taiwan: The Executive Yuan, Republic of China.
- Export Processing Zone Administration, Ministry of Economic Affairs. (Jan) 1980. Essential Statistics, Kaohsiung, Taiwan: MOEA.
- Fairbank, John King. 1987. China Watch, Boston, MA: Harvard University Press.
- Fields, Karl. 1988. "Industrial Policy and Industrial Organization". Typescript.
- Frank, Andre Gunder. 1982. "Asia's Exclusive Models". Far Eastern Economic Review, 25(June): 22-23.

- Frank, Andre Gunder. 1969. Capitalism and Underdevelopment in Latin America, New York, NY: Monthly Review Press.
- Frank, Andre Gunder. 1974. Lumpenbourgeoise: Lumpendevelopment, New York, NY: Monthly Review Press.
- Friedman, David. 1988. The Misunderstood Miracle: Industrial Development and Political Change in Japan, Ithaca, NY: Cornell University Press.
- Galbraith, John K. 1967. The New Industrial State, New York, NY: Houghton Mifflin.
- Galenson, Walter. (ed.) 1979. Economic Growth and Structural Change in Taiwan, Ithaca, NY: Cornell University Press.
- Gates, Hill. 1979. "Dependency and the Part-time Proletariat in Taiwan," Modern China, 5:3 381-408.
- Gereffi, Gary. 1983. The Pharmaceutical Industry and Dependency in the Third World, Princeton, NJ: Princeton University Press.
- Gereffi, Gary. and Wyman, Donald. 1990. Manufacturing Miracles, Princeton, NJ: Princeton University Press.
- Gerschenkron, Alexander. 1962. Economic Backwardness in Historical Perspective: A Book of Essays, Cambridge, MA: Harvard University Press.
- Gold, Thomas B. 1981. Dependent Development in Taiwan, Ph.D. Dissertation., Harvard University. Ann Arbor, Michigan: University Microfilms.
- Gold, Thomas B. 1986. State and Society in the Taiwan Miracle, New York, NY: M.E. Sharpe.
- Greenhalgh, Susan. 1984. "Networks and Their Nodes," China Quarterly, 99: 529-52.
- Greenhalgh, Susan. 1988. "Supranational Processes of Income Distribution," in Winckler, Edwin A. and Greenhalgh, Susan (eds.). 1988. Contending Approaches to the Political Economy of Taiwan, New York, NY: M.E. Sharpe. 67-100.
- Gregor, A. James, Maria Hsia Chang, and Andrew B. Zimmerman. 1981. Ideology and Development: Sun Yat-sen and the Economic History of Taiwan, Berkeley, CA: University of California.

- Gurr, Ted R. 1970. Why Men Rebel, Princeton, NJ: Princeton University Press.
- Government Information Office. 1988. Republic of China: A Reference Book, New York, NY: Highlight International.
- Government Information Office. 1990. Republic of China: 1990 Yearbook, New York, NY: Highlight International.
- Haggard, Stephan, and Tun-jen Cheng. 1987. "State and Foreign Capital in the East Asian NICs," in The Political Economy of the New Asian Industrialism, ed. Frederic C. Deyo. Ithaca, NY: Cornell University Press.
- Haggard, Stephan, and Chung-in Moon. 1983. "The South Korean State in the International Economy," in The Antinomies of Interdependence: National Welfare and the International Division of Labor, ed. John Gerard Ruggie. New York, NY: Columbia University Press.
- Haggard, Stephan. 1986. "The Newly Industrializing Countries in the International System," World Politics, 38: 343-370.
- Hamilton, Gary G. and Biggart, Nicole Woolsey. 1985. "Market, Culture, and Authority: A Comparative Analysis of Management and Organization in the Pacific Basin," Typescript.
- Harrell, Stevan. 1985. "Why Do the Chinese Work So Hard ? Reflections on an Entrepreneurial Ethic," Modern China, 11:2 203-226.
- Haulman, Clyde. 1987. "Financial Innovation and the Chinese Enterprise," Journal of Northeast Asian Studies, Summer 87 67-74.
- Ho, Samuel P.S. 1978. Economic Development of Taiwan, 1860-1970, New Haven, CT: Yale University Press.
- Ho, Samuel P.S. 1987. "Economics, Economic Bureaucracy and Taiwan's Economic Development," Pacific Affairs, 60:2 226-247.
- Ho, Samuel P.S. 1980. Small-Scale Enterprises in Korea and Taiwan, World Bank Staff Working Paper No. 384. Washington, D.C.: World Bank.
- Howard Michael C. 1979. Modern Theories of Income Distribution, London: MacMillan Publishing Co.

- Huang, chih-hui. 1990. Kao-ke-chi chan-yeh fa-chan chang-tse
yu tse-luch, [Policy and Strategy for Developing High-
tech Industry.] Taipei, Taiwan: Wu-nan Book Publishing
Co.
- Huntington, Samuel P. 1968. Political Order in Changing
Societies, New Haven, CT: Yale University Press.
- Institute for Information Industry. (Dec) 1989. Chung-hua
Ming-kuo Tzy-hsun Kung-yeh nien-chien, 1989.
[Information Industry Yearbook, 1989]. Taipei, Taiwan:
Institute for Information Industry.
- Institute for Information Industry. (Dec) 1988. Chung-hua
Ming-kuo Tzy-hsun Kung-yeh nien-chien, 1988.
[Information Industry Yearbook, 1988], Taipei, Taiwan:
Institute for Information Industry.
- Investment Commission, Ministry of Economic Affairs. 1988.
Statistics on Overseas Chinese & Foreign Investment,
Technical Cooperation, Outward Investment, Outward
Technical Cooperation, Taipei, Taiwan: MOEA.
- Jacoby, Neil H. 1966. U.S. Aid to Taiwan: A Study of Foreign
Aid, Self-Help, and Development, New York, NY: Frederick
A. Praeger.
- Johnson, Chalmers. 1978. Japan's Public Policy Companies,
Hoover Institute Studies; 60. Stanford, CA: Stanford
University Press.
- Johnson, Chalmers. 1982. MITI and the Japanese Miracle: The
Growth of Industrial Policy, 1925-1975, Stanford, CA:
Stanford University Press.
- Johnson, Chalmers. 1986. "The Nonsocialist NICs" in Power,
Purpose, and Collective Choice: Economic Strategy in
Socialist States, eds. Ellen Comisso and Laura D'Andrea
Tyson. Ithaca, NY: Cornell University Press.
- Johnson, Chalmers. 1987. "Political Institutions and Economic
Performance: The Government-Business Relationship in
Japan, South Korea, and Taiwan," in Deyo ed. (1987). op.
cit. 136-164.
- Jones, Leroy P., and Il Sakong. 1980. Government, Business,
and Entrepreneurship in Economic Development: The
Korean Case, Cambridge, MA: Harvard University Press.

- Katzenstein, Peter J. 1985. Small States in World Markets: Industrial Policy in Europe, Ithaca, NY: Cornell University Press.
- Kohli, Atul, ed. 1986. The State and Development in the Third World, Princeton, NJ: Princeton University Press.
- Koo, Hagen. 1986. "The Political Economy of Industrialization in South Korea and Taiwan," Korea & World Affairs, 10(1): 148-80.
- Krasner, Stephen D. 1984. "Approaches to the State," Comparative Politics, 16(January): 223-46.
- Kuo, Chien-Tian. 1990. Economic Regimes and National Performance in the World Economy, PhD. Dissertation, Department of Political Science, University of Chicago, Chicago, IL: Ann Arbor, Michigan: University Microfilms.
- Kuo, Chien-Tian. 1991. "The Problems of the Developmental State Theory: A Comparison of Taiwan and the Philippines". Typescript.
- Kuo, Shirley; Ranis, Gustav; and Fei, John. 1981. The Taiwan Success Story: Rapid Growth with Improved Distribution in the Republic of China, 1952-1979, Boulder, CO: Westview.
- Kuznets, Simon. 1980. "Notes on Income Distribution in Taiwan" in Quantitative Economics and Development Essays in Memory of Ta-Chung Liu, L.R. Klien, N. Nerlove and S.C. Tsiang, eds. New York, NY: Academic Press. 264-295.
- Lam, Danny. and Tinari, Frank. 1991. "Explaining China's Resistance to Economic Reforms: Institutional, Cultural and Public Choice Considerations," Contemporary Policy Issues, IX(3): 82-92.
- Lam, Danny. 1989. "Independent Economic Sectors and Economic Growth in Hongkong and Taiwan," International Studies Notes, 15(1): 28-34.
- _____. 1989. "Opportunities for Canadian Business in Taiwan," Canadian Business Review, 16(3): 45-48.
- _____. 1988. "Guerrilla Capitalism: Export Oriented Firms and the Economic Miracle in Taiwan (1973-1987)," Journal of Sunology, 4(1): 167-183.
- Lane, David. 1978. The Socialist Industrial State, Cambridge, MA: George Allen and Unwin.

- Lau, Lawrence J., ed. 1986. Models of Development: A Comparative Study of Economic Growth in South Korea and Taiwan, San Francisco, CA: Institute for Contemporary Studies.
- Li, K. T. 1976. The Experience of Dynamic Economic Growth on Taiwan, Taipei, Taiwan: Mei Ya.
- Lieberthal and Oksenberg. 1988. Policy Making in China, Princeton, NJ: Princeton University Press.
- Lin, Yeo. 1986. Technological Change: A Microeconomic Study of the Consumer Electronics Industry in Taiwan, PhD Dissertation, Department of Economics, Northwestern University. Ann Arbor, MI: University Microfilms.
- Little, Ian M.D. 1982. Economic Development: Theory, Policy, and International Relations, New York, NY: Basic Books.
- Little, Ian M.D. 1979. "An Economic Reconnaissance" in Economic Growth and Structural Change in Taiwan, Walter Galenson, ed. Ithaca, NY: Cornell University Press. 448-507.
- Mansfield, Edwin. 1984. Readings in Microeconomics, New York, NY: MacMillan.
- Meier, Gerald. 1984. Leading Issues in Economic Development, (fourth ed.) New York, NY: Oxford University Press.
- March, and Olsen. 1984. "The New Neo-Institutionalism: Organizational Factors in Political Life," American Political Science Review, 78.
- McElderry, Andrea. 1986. "Confucian Capitalism ? Corporate Values in Republican Banking," Modern China, 12:3 401-416.
- Ministry of Economic Affairs, ROC. 1961. Ti-tsan-chi Taiwan ching-chi chien-she ssu-nien chi-hua, [The Third Stage of Four-year Plan for Taiwan's Economic Development]. Taipei, Taiwan: MOEA.
- Ministry of Finance. 1989. Monthly Statistics of Exports and Imports, Taipei, Taiwan: Department of Statistics, Ministry of Finance.
- Mintzberg, Henry. 1989. Mintzberg on Management, New York, NY: Free Press.

- Myers, Ramon H. 1984. "The Economic Transformation of the Republic of China on Taiwan," China Quarterly, 99: 500-28.
- Noble, Gregory W. 1987. "Contending Forces in Taiwan's Economic Policymaking: The Case of Hua Tung Heavy Trucks," Asian Survey, 27:6 683- 704.
- Nove, Alec. 1977. The Soviet Economic System, London: George Allen & Unwin.
- Nove, Alec. 1982. The Economics of Feasible Socialism, London: George Allen & Unwin.
- Numazaki, Ichiro. 1986. "Networks of Taiwanese Big Business: A Preliminary Analysis," Modern China, 12:4 487-534.
- Okimoto, Daniel. 1984. Between MITI and the Market: Japanese Industrial Policy for High Technology, Stanford, CA: Stanford University Press.
- Ozaki, Robert S. 1984. "How Japanese Industrial Policy Works," in The Industrial Policy Debate, Chalmers Johnson ed. San Francisco, CA: ICS Press.
- Piore, Michael J. and Sabel, Charles F. 1986. The Second Industrial Divide: Possibilities for Prosperity, New York, NY: Basic Books.
- Porter, Michael. 1991. The Competitive Advantage of Nations, New York, NY: Free Press.
- Pye, Lucian W. 1985. Asian Power and Politics: The Cultural Dimensions of Authority, Cambridge, MA: Belknap Press.
- Pye, Lucian W. 1988 The Mandarin and the Cadre: China's Political Cultures, Ann Arbor, MI: Michigan University Press.
- Rostow, W.W. 1960 The Stages of Economic Growth, New York, NY: McGraw Hill.
- Rostow, W.W. 1975. How it All Began: Origins of the Modern Economy, New York, NY: McGraw Hill.
- Rueschemeyer, Dietrich, and Peter B. Evans. "The State and Economic Transformation," in Bringing the State Back in, eds. Peter B. Evans, Dietrich Rueschemeyer, and Theda Skocpol. Cambridge, MA: Cambridge University Press.
- Scherer, F.M. 1980. Industrial Market Structure and Economic Performance, (2nd ed.) Chicago, IL: Rand McNally.

- Schive, Chi. 1978. Direct Foreign Investment, Technology Transfer and Linkage Effects: A Case Study of Taiwan, PhD Thesis, Department of Economics, Case Western Reserve University, Ann Arbor, MI: University Microfilms.
- Schreiber, Jordan. 1970. U.S. Corporate Investment in Taiwan, New York, NY: Cambridge University Press.
- Schumpeter, Joseph A. 1934. The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle, New Brunswick, NJ: Transaction Books.
- Science and Technology Advisory Group, The Executive Yuan. 1989. National Science and Technology Development, Taipei, Taiwan: The Executive Yuan, Republic of China.
- Schwartz, Benjamin. 1985. The World of Thought in Ancient China, Cambridge, MA: Belknap.
- Schwartz, Benjamin. 1964. In Search of Wealth and Power, Cambridge, MA: Belknap.
- Scott, Maurice. 1979. "Foreign Trade" in Galenson (ed.) (1979) op. cit.
- Selucky, Radoslav. 1978. Marxism, Socialism and Freedom, New York, NY: St. Martin's Press.
- Silin, Robert. 1976. Leadership and Values, Cambridge, MA: Harvard University Press.
- Simon, Herbert A. 1959. "Theories of Decision-Making in Economics and Behavioral Science," in Mansfield ed. (1975). op. cit. 85-98.
- Simon, Dennis Fred, 1980. Taiwan, Technology Transfer and Transnationalism: The Political Management of Dependency, PhD Thesis, Department of Political Science, University of California (Berkeley). Ann Arbor, MI: University Microfilms.
- Stanford Research Institute 1962, The Feasibility of A Transistor Radio Assembly Plant in Taiwan, Menlo Park, CA: Stanford Research Institute.
- Stigler, George J. 1957. "Perfect Competition, Historically Contemplated," in Mansfield ed. (1975). op. cit. 167-187.

- Sun, Yun-suan, 1989. Sun Yun-suan Memoirs, Taipei, Taiwan: Commonwealth Publications.
- Thurow, Lester C. 1984. Dangerous Currents: The State of Economics, New York, NY: Vintage.
- Todaro, Michael P. 1989. Economic Development in the Third World, White Plains, NY: Longman.
- Vernon, Raymond. 1976. "Storm over the Multinationals: Problems and Prospects," Foreign Affairs, 55: 243-262.
- Vernon, Raymond. 1971. Sovereignty at Bay: The Multinational Spread of U.S. Enterprises, New York, NY: Basic Books.
- Wade, Robert. 1990. Governing the Market: Economic Theory and the Role of Government in East Asian Industrialization, Princeton, NJ: Princeton Press.
- Wade, Robert. 1988. "State Intervention in "Outward-looking" Development," in Developmental States in East Asia, ed. Gordon White. New York, NY: St. Martin's Press.
- Walder, Andrew. 1986. Communist Neo-Traditionalism, Berkeley, CA: University of California Press.
- Wallerstein, Immanuel. 1978. The Capitalist World-economy, Cambridge, MA: Cambridge University Press.
- Warren, Bill. 1973. "Imperialism and Capitalist Industrialization," New Left Review, 81: 3-44.
- Weber, Max. 1951. The Religion of China: Confucianism and Taoism, Glencoe, NY: Free Press.
- Werner, Roy A. 1985. "Taiwan's Trade Flows: The Underpinning of Political Legitimacy," Asian Survey, 25:11 1096-1113.
- White, Gordon, ed. 1988. Developmental States in East Asia, New York, NY: St. Martin's Press.
- White, Gordon, and Robert Wade. 1988. "Developmental States and Markets in East Asia," in Developmental States in East Asia, ed. Gordon White. New York, NY: St. Martin's Press.
- Winckler, Edwin A. and Greenhalgh, Susan (eds.). 1988. Contending Approaches to the Political Economy of Taiwan, New York, NY: M. E. Sharpe.
- World Bank. 1990. World Development Report 1990, Washington, D.C.: World Bank.

Yoffie, David B. 1983. Power and Protectionism: Strategies of the Newly Industrializing Countries, London: George Allen & Unwin.

Zysman, John. 1983. Governments, Markets, and Growth: Financial Systems and the Politics of Industrial Change, Ithaca, NY: Cornell University Press.