DETERMINANTS OF PRIVATE INVESTMENT IN DEVELOPING COUNTRIES - CASE OF KOREA AND TAIWAN

BY

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ABSTRUCT

Submitted to

KDI School of International Policy and Management

in partial fulfillment of the requirements

for the degree of

MASTER OF GROWTH AND DEVELOPMENT STUDIES

Department of Growth and Development Studies

1999

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ACKNOWLEDGEMENT

I would like to acknowledge with gratitude to contribution of others toward the success of this study. My first sincere thank goes to my adviser Prof. Sang-Woo Nam. I have greatly benefited from being supervised by Dr. Nam, with his substantial knowledge and experience about Korean economy and Asian development at large. I am very much indebted for his valuable comments and constructive suggestions with great patience.

I would also like to express my appreciation to our sponsor Daewoo Group and its affiliate Keangnam Enterprise. I have been able to complete my research ahead with their provision of computer at the right time. I am also grateful for the kindly cooperation I found in KDI library during my stay in Korea. Lastly but not least, my sincere thanks goes to Ato Gebreselasse Haile Counsellor in the Ethiopian Embassy, Korea - Seoul for all his unreserved support he offered us to make our life in Korea easy.

ABSTRACT

Korea and Taiwan are known for their impressive economic performance and ability to join the industrial economies within short period of time. The rapid and persistent accumulation of physical capital in both countries is considered to be one of the special phenomenon and that account the large portion of economic accomplishment. Hence, the paper examines the factors behind the rapid capital accumulation under the heading of determinants of private investment in Korea and Taiwan. The study seeks to assess the possible impact of different factors for the unwavering investment growth in these countries in light of developing countries.

As a means of methodology and addressing the controversy about government intervention, the study contrasts the likely effect of quantity and relative price variables in determining private investment decision in these countries. In this regard, availability of fund, accessibility of foreign exchange, government investment and existence of sufficient skilled manpower and capital cost are explored.

The thorough assessment of the rapid investment growth in these countries reveals the complex channel through which government policies affected private investment. Investors in both countries depend largely on borrowing while the contribution of capital market was almost negligible. Government heavily intervened in the financial market to foster investment through different instruments such as, interest rate control, rationing of available credit to preferred sectors and mobilizing of savings as well. The contribution of government investment in total fixed investment was large, particularly in Taiwan about half. In both countries the incentive structure for investors

was so diversified. Tax structure was generous and selective. Governments also encouraged private investors by sharing risk, facilitating market domestic and abroad.

The study provides empirical evidence on the determinants of private investment. The model specifies three main components; demand, resource (quantity) availability and cost of capital as determinants. The common problem of spurious correlation in investment functions is addressed by testing the time series for stationarity and insuring that residuals from the econometric estimation are white noise. Two step estimation; regression at levels and dynamic model of the differnced variables is employed. The use of these two different estimation techniques helped to confirm the validity of the model.

From the empirical test, it is found that the private investment has been largely affected by demand factors (domestic as well as foreign). Fund availability was also crucial factor, suggesting the importance of this variable in resource constrained and interest rate administered countries. Public investments have been found to compliment rather than crowding out the private investment in both countries. Private investment was quite sensitive to relative price of capital goods and output. While effect of interest rate was not that much significant.

The results affirm the positive role of government in boosting private investment in both countries. The positive effect of quantity of credit and public investment obtained undoubtedly takes explicit account of government contribution. Indeed, the other variables were not free of government hands. Both governments boosted demand for domestic production through policies that prosper the domestic economy and their special export promotion strategy. They maintained lower relative price of capital goods through tax, tariff and other mechanisms such as, domestic market protection.

CHAPTER I

INTRODUCTION

1.1 General

It is being natural to be eager about 'success' stories at least to draw some lessons and at most to replicate the model. For the same reason most developing countries that seek to improve their economy have been crazy about success experiences of economic growth. The success story in Soviet Union pre-second World War is not remote story that it got tremendous focus of researchers, policy makers and the public at large.

Meanwhile in the last three-four decades the so-called East Asian 'miracle' economic performance has attracted most of the audience. Nonetheless, the lessons to be learnt seem to be blurred due to different views that try to make the success of these countries as a proof to their own theories. Thus the same group of countries became poster children for conflicting policy advice.[1]

The most heated controversy in the literature on East Asia's growth involves the role of government in the economy. One aspect of this controversy relies on the growth accounting results in line with the new growth theory: factor accumulation versus productivity-led growth.

Many authors claim that productivity growth is the key to East Asian success. Most of them argue one-third to one-half of the growth of the economy in the East Asian countries have been attributed to productivity growth. The World Bank's 1993 report, for instance, states one-third of economic growth comes from TFP growth. This has been a strong support for neoclassical theorist. They argue if productivity is the main source of growth, there is nothing left for governments to intervene rather than getting 'fundamentals' and 'prices' right. According this view high growth of East Asian

[1] Collins and Bosworthy 1996

economies is taken as a proof of that 'market friendly' strategies[2] including open trading regime, promoting domestic and international competition, and low relative price distortions have brought success.

This view has been challenged by the findings of Alwyn Young (1994), Kim and Lau (1994), Collins and Bosworth (1996). Young (1994) argues that except for Hong Kong, East Asia's stellar growth performance can be explained largely by its unusually high investment ratios, not by any extraordinary growth in productivity. Kim and Lau (1994) on their regression analysis for Korea, Taiwan, Hong Kong, and Singapore are unable to reject the hypothesis of no technical progress in the same four countries.

Collins and Bosworth (1996) in an extensive coverage within Asian countries (8 countries) found little contribution of TFP to economic growth. They suggested that the main lesson of this success come not from identifying which policies best promote TFP growth, *but how countries can achieve and sustain high rates of saving and investment.* The saving and investment record in East Asia has been impressive, and government policies may well have been a key contributor to this accomplishment.

1.2 Objective of the Study

The objective of this paper is not to deal with the accumulation versus TFP controversy. Rather I argue this debate has diverted the main issue and lessons to be discussed from the success experience. Thus, I take for granted that, no matter how much the numbers are, capital accumulation played significant role in this fast growing countries. *The main concern of this paper is, then, how was capital accumulated in these countries at such a rapid rate.* In other words, what are the factors (i.e. determinants) behind the capital accumulation? To achieve this objective the study concentrates on the determinants of private investment, taking in to account that the private sector was the prime mover of the capital accumulation in these countries.

[2] The East Asian Miracle, (World Bank 1993:10) asserts this view as it was described in World Development Report 1991

Nevertheless, the factors behind the rapid capital accumulation are also overshadowed by similar debate, ranging from neoclassical, revisionists to development economists. The neoclassical states high private investment in these countries is primarily a result of getting 'fundamentals' and 'prices' right. Their advice rotates on establishment of market friendly institutional environment. Schimit-Habbel and et al. (1996) provide the following general argument, which can well summarize the neoclassical stand in this regard. A less direct, but potentially effective way to promote capital formation are macroeconomic stability, a comparatively distortion free relative price structure, a well-defined and effectively enforced code of property rights, and adequate political institutions.

The revisionist view, on the other hand, asserts East Asian governments 'led – the market' in critical ways. Market failure to guide investment to industries that would generate the highest growth for the overall economy was remedied by governments' deliberate action of 'getting the prices wrong'[3].

Rodrik (1994) developed a model that emphasizes the 'coordination problem' arise in moving from a low growth to a high growth path. According this view East Asian governments increase private capital not only by removing a number of impediments to investment and establishing a sound investment climate, but more importantly by alleviating a coordination failure which had blocked economic take-off. The latter required a range of strategic interventions – including investment subsidy, administrative guidance and use of public enterprise.

Haggard and Kim (1997) supported the above view by asserting that improving investment climate per se doesn't necessarily solve the coordination problem. Rather 'jump starting' growth may require direct subsidies (which lower risk); coordination of private investment decisions to guarantee linkages exists; and even public investment. The profitability of investment may also depend on the prior accumulation a threshold

[3] Amsden (1989) "Asia's Next Giant: South Korea and Late Industrialization"

level of human capital, which itself subject to coordination problems and require government commitment to education.

The development economics argument tries to find the source of the rapid accumulation on the target of government plan (Yusuf 1985). Active intervention of government in the market including significant share of public investment, provision of directed credit at subsidized rate, and discretionary macroeconomic policies were successful to shift the countries to new phase of industrialization.

Most empirical works for the East Asian investment function were in neoclassical line or some eclectic models. Fisher (1994), Collins and Bosworthy (1996) tested private investment with regard to macro stability. Sandrarajan and Thakur (1980) worked on Korea and India, with special emphasis on crowding out effect on private investment. Tun Wai and Wang (1982) regressed investment function for a sample of six countries at which, two of them from East Asia. Blejer and Khan (1984) provided cross-country regression of 24 developing countries and Yusuf (1985) tested eclectic model for Korea. Kwack (1985) Shah (1995) estimated exclusively the effect of tax incentives on private investment for some East Asian countries. However the revisionist view which argues for the coordination failure and active role of government intervention in the capital accumulation process hardly got attention in empirical stance.

The differences between neoclassical and other views are usually reflected as a contrast between relative prices and quantity variables, in the econometric models that analyze determinants of investment. Quantity variables refer to resource constraints impeding private investment in developing countries, such as, financial availability, foreign exchange accessibility, extent of skilled manpower and public investment. Relative prices on the other hand include variables such as, interest rate, tax rate, and cost of capital represented in several ways.

Having this background, the main hypotheses of this study are: -

(i) Apart from demand, quantity variables were more important than relative price variables, in the rapid accumulation of private capital in the high performing East Asian countries.

(ii) Government intervention was also more effective in impeding the coordination problem through reducing resource constraints (quantity variables).

This study concentrates on two countries (Korea and Taiwan) as a sample (non-random) for the successful East Asian NICs. It is different from other previous studies in the following context. First, it exclusively hypothesizes the importance of quantity variables. The resource constraints and government intervention to solve them are the main areas of explanation of the rapid growth of private investment. Comparison between the price and quantity variables is made. Secondly, extension of the period up to mid-90s makes it different from most previous studies that concentrated only up to early 80s.

1.3 Methodology and Organization of the Study

The study employs descriptive and empirical analyses. Under the descriptive section the assessment of trends of private investment and other relevant factors is explored. Important issues such as variety of public policies and institutions designed to foster private investment are assessed.

The empirical section specifies a model of determinants of private investment in the context of developing countries. Investment function is tested against specified explanatory variables. The empirical work in this study is based on statistical analysis that involves time series data. In order to avoid possible spurious results and to obtain interpretable outcome both the levels' and an error correcting dynamic models are estimated.

The rest part of the paper is organized in five chapters. The second chapter gives assessment of recent literature on determinants of private investment in developing countries. Chapter three highlights the economic performance and features of capital accumulation in Korea and Taiwan in the last four decades. As a main body of the study, chapter four provides rigorous explanation of the rapid high investment growth in both countries. This chapter also tries to explore the importance of public policy and institutional arrangement in affecting the private sector. Chapter five provides empirical evidence on the determinant of private investment for Korea and Taiwan. Finally, the main findings and lessons are summarized in chapter six.

1.4 Scope and Limitation of the Study

Attempt is made to pin point the outstanding countries, Taiwan and Korea, in economic performance that, represent the East Asian experience. And the period covers almost the entire years of rapid capital accumulation 1960-1995. Nonetheless, the approach is more of aggregate. Sectoral investment behavior of firms is left unexplained due to scope of the study. The opportunity cost of dealing with these two countries is then the problem of aggregation.

CHAPTER II

LITERATURE REVIEW ON DETERMINANTS OF PRIVATE INVESTMENT IN DEVELPOING COUNTRIES

2.1 General

Determinants of private investment have been studied extensively for several decades. Early classical economists, who advocated capital accumulation as primary mover of economic progress, stated that the economy's rate of growth of capital accumulation depends solely on the savings capacity (i.e. both ability and willingness to save) of the economy (Harrison 1996). The systematic analysis, however, arose with the accelerator principle, which has become a basis for most theories and empirical models. Its origin can be traced back, but the best-known early study is by J.M Clerk. In clerk's model desired capital is proportional to output assuming fixed relationship between capital and output.

This naïve accelerator principle has been modified in many ways. The so-called flexible accelerator model introduced time lag structure. Chenary (1952) modified the naïve model and defined determinant of investment as a function of lagged output. The lagged output is then often considered as a measure of capacity utilization. Koyck (1954) improved the lagged distribution to embody some weighted average of previous output extends over many years, rather than only one year.

A variety of theoretical considerations have been presented for considering profits or cash flow as a determinant of business investment. Current and past profits may be thought of as a good proxy for future profit expectations, which in turn determine investment (Bischoff 1971). Duesenberry (1958) developed cash flow approach in the context of source of funds (in contrast to expected profits). Evans (1969), following Duesenbery, identifies three ways of financing; retained earnings, borrowing from banks or through bond market and equity financing. As a firm passes from the first source of finance to the

second and third the cost increases, implying an upward marginal cost of funds curve. This is because in the presence of risk and imperfect capital markets, the cost of fund to firm rises sharply when internal funds are exhausted. Thus, the optimal decision to invest is thought to be at the equality of marginal cost of funds and rate of return on the last investment unit.

According to Coen (1971) argument the correct way to employ the cash flow variable is to represent the availability of fund and the liquidity effect realized through the speed of adjustment. It is in line with this theory of investment demand, based on capital adjustment process, that speed of adjustment is assumed to be a function of cash flow (or availability of funds). Several theories are also based on the market value of a firm as a determinant of its investment. James Tobin (1969) argues if managers seek to maximize the market value of their corporations, they will add to their fixed capital goods whenever the marginal addition to the firm's market value (in the securities market) exceeds the cost of the goods.[4]

The most popular neoclassical framework is the theory of cost of capital, which is based on an optimal time path for capital accumulation. Modigliani and Miller have developed this theory. According to this theory, the cost of capital is shown to be independent of the financial structure of the firm or dividend policy. This view contrasts sharply with the theory of the cost of capital underlying the liquidity theory of investment behavior (Jorgenson 1996).

Dale Jorgenson, in a large body of work with various colleagues, has developed and applied several related models of investment behavior. Jorgenson and Seibret (1996) employed a model describes the desired capital as proportional to the ratio of the value of output to the price of capital service. In their model the price of capital service depends on the price of investment goods, the rate of return, the rate of depreciation, the rate of growth of the price of investment goods, and the tax structure.

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[4]This is known as Q-theory, because Q is defined as the ratio of the market value of existing capital to its replacement, then investment will take place as long as Q is greater than unity.

This version of neoclassical theory relies on wide assumptions. The objective of the firm is assumed to maximize its market value and maximization of market value is implied by maximization of profit at every point of time. The Standard Neoclassical Model (SNM) employs the critical assumption that the desired capital stock is generated from Cobb-Douglas or CES production function with constant returns to scale and unitary elasticity of substitution. The assumption of perfect competition in both factor and output markets is also made, since the equality relations of output price to marginal costs and marginal net revenues to marginal factor costs are essential to the derivation of the 'user cost of capital'.

Main feature of the standard neoclassical model is the exclusive dependent of investment decision on relative price variables. In most cases these variables refer to the ratio of price of investment goods to output price or the wage rate, interest rate, tax rate, depreciation rule and market value of the firm. This has appeared as a central point of controversy in contrast to the quantity variables with regard private investment decision particularly in developing countries.

2.2 Adoption of the Standard Theories to Developing Countries

Many economists questioned the above surveyed models, especially with respect to their application to developing countries. According to Yusuf (1985) most empirical procedures formalized over the years by Macroeconomists working on the industrial nations are only tangentially related, if at all, to the reality of economic process in the LDCs. Despite their popularized equations, these models mirror the demand constrained and cycle regulated conditions in advanced countries. To use them for filtering the experience of backward, capital constrained economies runs contrary to intuition and institutions.

Blejer and Khan (1984) pointed out analytical and practical difficulties of employing these standard models for developing countries. There are a number of institutional and structural factors such as, the absence of well-developed financial markets, the relatively

large role of the government in capital formation, distortions created by foreign exchange constraints and other market imperfections. The assumptions underlying the standard investment models are typically not satisfied in most developing countries. Furthermore severe data problems, difficulty whether public enterprises to classify as private investment and simultaneous occurrence of foreign and domestic sources of investment aggravate the problem.

Despite their limitation some economists have tried the Jorgenson standard neoclassical model for developing countries. Berhman (1972), Sundararajan and Thakur (1980), Ebrill (1987), Shafik (1992), Schidt-Habbel and Miller (1992) are some of who tested the relative price variables exclusively or incorporating with other determinants.

Berhman (1972) adopted the neoclassical model for his research on Chile. He estimated six Chilean sectors employing variables such as, price of output, price of capital service, real output, the elasticity of substitution between capital and labor, the rate of Hicks neutral exponential technological change and the rate of depreciation. He reported that "considering all estimates, significant response to relative prices in Chilean Sectoral real physical capital investment decisions do not seem to be wide spread. Such responses apparently are important, however, in manufacturing, which generally is considered to be a key sector in developing countries."

Sundararjan and Thakur (1980) tested both relative prices (following Jorgenson model) and quantity variables for India and Korea. Despite the authors hypothesis, they found that relative cost of capital with strong positive efficiency effect on capital but only a weak negative substitution effect on investment demand in Korea, while both effects found to be strong for India. Shafik (1992) estimated different models for Egypt regarding determinants of investment. According to his estimation the relative cost of capital goods variables consistently outperformed the interest rate and the relative factor cost variables. He then explained the reason for poor effect of interest rate in the Egyptian case was due to the existence of markup pricing, the preference of internal funds and the rationing effect of financial repression.

Schmidt-Habbel and Miiler (1992) included the user cost of capital (following Jorgonsons' definition) in their investment model for Morocco and found insignificant result. They also tested the same determinants at sectoral level taking two sectors, buildings and machinery and equipment. But the effect of the user cost of capital was found weaker than at the aggregate level.

Ebrill (1987) used cross section data on thirty-one developing countries for 1980 to examine the effect of cost of capital on investment. Other than cost of capital, independent variables such as, average annual growth rate of exports, share of minerals in exports, annual average growth rate of GDP, current account balance, inflation rate and per-capita GDP were included. He found negative and significant coefficient of the cost of capital for the sample as a whole, but when Argentine and Chile – two high inflation countries (outliers) – were excluded, the cost of capital had the negative sign but statistically insignificant. Thus Ebrill's result confirmed only a weak relation between the cost of capital and the level of investment in developing countries.

2.3. Quantity Variables as a Measure of Resource Constraints

Private investment decision in developing countries is found to be insensitive to price variables as shown in the previous section. The general imperfections in financial and labor markets make it necessary to modify the basic model to place greater emphasis on the effect of resource constraints, both financial and physical, faced by private sectors in developing countries (Blejer and Khan 1984 IMF Survey).

This is why many research works on determinants of private investment in developing countries emphasize (and in fact found a good fit) on quantity variables rather than relative prices. Availability of fund, access of foreign exchange, government investment both on economic and social infrastructure are often cited as to reflect the resource constraint and an area of remedy as well to foster private investment in developing countries.

2.3.1 Availability of Funds

Mckinnon (1973) describes the emergence of clear consensus, in contrast to developed countries; one of the principal constraints on investment in developing countries is quantity rather than the cost of financial resources. Leff and Sato (1975) further argue interest rate changes are not very relevant to LDCs. For doctrinal and political reasons, the governments in these countries generally do not permit interest rates to move sufficiently to clear the financial markets. Rather the monetary authorities create credit more or less independently of saving, often in response to the government deficit. Credit creation in turn, influences domestic investment because firms in LDCs are generally very dependent on credit for financing.

In most empirical works the financial availability is approximated by the bank credit available to private sector. Tun Wai and Wang (1982) explain some channels through which change in bank credit could affect private investment. First, in the absence of developed capital markets and the fact that funds are fungible, any short term and medium term loans for financing business operations would relieve pressures on entrepreneurs for the day-to-day operations and enable them in total to finance a large amount of capital formation. Furthermore developing countries which, experience rapid economic growth especially newly emerging firms, whose number then to increase rapidly may require substantial amount of resources from the financial system. Finally, in countries, where a large portion of machinery and equipment has to be imported and where advance import deposits are required, credit availability will facilitate imports and exercise a positive impact on private investment.

Sundararajan and Thakur (1980) seem to disagree with the above explanation of specifying only bank credit availability to represent financial availability. Instead in developing countries, actual investment in fixed capital is constrained by the total availability of savings. In many developing countries self-financed investment is important and therefore the availability of self-financing for acquiring fixed capital is a

critical aspect. This, as well as the non-price rationing aspect, is best taken into account by postulating a direct linkage between total financial resource availability and fixed investment.

Credit availability is an important determinant not only of new investment but also of capacity utilization of the entire capital stock. If saving is the primary factor determining the real supply of credit, then the implication is that, cetirus puribus, a change in the saving rate will cause an equal change in the investment rate through credit availability. In a financial repressed countries any effect exerted by the rate of interest on private investment is not direct within this rationing framework but, rather occurs via channel of financial savings (Fry 1980).

The financial availability argument has got strong empirical support. Blejer and Khan (1984) in their cross-sectional regression for 24 developing countries found significant and positive effect of change in bank credit to the private sector and net private capital flows on private investment. Sundararajan and Thakur (1980) reported the coefficient of financial resource availability to the private sector variable for India and Korea are 0.63 and 0.24 respectively implying that resource availability had much stronger influence on the actual capital stock toward the desired level of capital stock.

Shafik (1992) on his estimation, case of Egypt, provides a strong evidence of the crucial role of quantity of credit, while interest rate found to be insignificant. Schidt-Habbel and Muler (1992) on the other hand, specify financial constraints by employing separately the variables, such as, the flow of banking sector credit to private firms, terms of trade, and net foreign disbursements to firms to represent the influence of domestic and foreign credit constraints to investment in Morocco. They reported that, "Bank credits to firms has been a statistically and numerically important determinant of private investment in Morocco: for every percentage point increase in the credit/GDP ratio, the investment rate has increased by 0.7 percentage points." The terms of trade variable was also found to be significant determinant of investment but not net disbursements of foreign loans.

The crucial role of financial availability for investment leads to an inevitable question of how government policies affect this variable. Blejer and Khan (1984) explain how public policy could change bank credit and foreign capital flow. As control of total bank credit generally represents the main instrument of monetary policy in developing countries; the authorities can affect the ability of private investors to achieve their desired level of investment and the speed with which they reach it, by varying the composition of credit between the public and the private sectors. Private investment could also be influenced by interest rate and exchange rate policies that cause changes in private capital flows.

Dailami (1992) argues government intervention in directing credit is motivated by three related reasons. First, to supplement the capacity of financial institutions to supply medium and long-run capital to industrial and agricultural sectors. Second, to reallocate resources to priority sectors and activities. Third, to deploy finance as a tool for advancing various social, regional and political objectives. Governments not only provided credit to selected sectors but also subsidized interest rate in order to reduce cost of capital and debt for investors, and share risk of investors. In this context, credit provided by development banks is taken as explanatory variable to capture the directed-credit in some empirical works.

However, the main role of the government is beyond allocating the existing financial resources. Governments often involved in promoting total savings. Lim and Elegar (1996) who studied East Asian (NIEs) success in mobilizing savings, asserted a high level of investment is only possible with commensurate high level of domestic and foreign savings. The NIEs have been more successful in raising three forms of savings: household savings, government surplus and foreign direct investment by pursuing sound economic policies.

Hellman and et al. (1996) state the cruciallity of deposit mobilization in many developing countries. Domestic funds provide a cheap and reliable source of funds for development, which is of great value, for developing countries, especially when the economy has difficulty in raising capital in international markets. Yet in many developing countries a

considerable amount of savings are not intermediated through the formal sector. One of the reasons for lack of savings mobilization is that banks simply do not cater to significant number of households. Market failures are pervasive in the financial sector because of imperfect information and other transaction costs. One way to overcome these inefficiencies is for the government to affect the incentive structure.

2.3.2 Foreign Exchange Accessibility

In the dual-gap model foreign saving is considered to complement the lower saving level and foreign exchange constraint of developing countries. Even in the absence of domestic saving-investment gap foreign saving would be useful. Many of investment capital are not produced domestically and thus foreign exchange is needed. If a country doesn't have enough foreign exchange and foreign exchange gap exists domestic saving remain unused. Therefore in the dual-gap model foreign savings not only supplement domestic savings but also provides the foreign exchange to pay for imported inputs essential for growth.

Although the net effect of foreign capital inflow on domestic saving is yet controversial, the availability of foreign exchange for investment remains crucial. In most developing countries the bulk of machinery and equipment must be imported. Billisborrow (1977) on his study about Colombia emphasized a large part of the funds necessary for financing for investment must be in the form of foreign exchange. Hence a firm not only has to procure the necessary domestic currency, but also transform much of it into foreign currency and finally obtains an import license. Changes in the cost of availability of foreign exchange affect the marginal cost of fund (mcf) schedule and thereby investment decision.

On his estimation, Billisborrow found foreign exchange availability (measured by foreign reserves of Colombia in year (t-1) plus exports FOB in year (t)) to have greater effect on investment. The elasticity of investment with respect to foreign exchange availability was 2.68 implying that, cetirus puribus; a 10 percent increase in foreign exchange would have been associated with a 27 percent increase in the rate of growth of capital stock.

The relation between foreign exchange availability and private investment decision posits the continuing debate around the relation between export promotion strategy and capital accumulation in East Asia's success story. Bhagwati (1996) argues that the export promotion (EP) strategy, which lead to growth of export earnings, had led to rapid investment, being implemented with increasing imports of newer vintage capital equipment, which embodied significant technological change and higher rates of return. Thus, the Ultra-EP strategy with its mild bias in favor of the export market meant that the export incentives must have played a major role in influencing investment decisions, not just in the exporting industries, but also in the much larger range of non-traded but tradable industries.

Rodrik (1995) questioned Bhagwati's view that it is not clear, why export orientation (or the increase in exports) should have led to an investment boom. Extending his argument, in theory there is no reason to suppose that export orientation should be associated with an increase in investment demand. Export orientation makes some sectors profitable and others less so. The same is true of import liberalization. The net effect on investment demand is indeterminate. If any thing, the logic of factor endowments and the Stolper-Samuelson theorem suggests an opposing presumption in capital poor countries, like Taiwan and Korea during the 50s and 60s an increase in the relative price of exports should have been associated with a decline in return to capital and hence reduced investment.

However, the Stolper-Samuelson theorem is only applicable in a full employed economy context. Rodrik himself admitted that during 1950s and 60s Korea had 'some unemployment' (though it is not clear why he made it only some), as well as a productive gap between the modern and traditional sectors of their economies. Under such conditions an increase in exports can be expansionary. Yet, Rodrik insisted increasing export orientation of the economy is quite consistent with investment-led growth, with causality running from investment to imports and imports to exports.

From the above survey one can hypothesize that, export promotion would affect investment through two channels. First, it raises private investment through increasing demand of output and capacity utilization (Chhiber and van Wajinbergen 1992). Second channel is supply side, change in the cost of availability of foreign exchange affects marginal cost of fund and investment decision.

Dailami (1992) pointed out government role in this respect. Government could encourage private business investment through efforts to stimulate external demand (export promotion). Such a strategy could also have a favorable impact on the balance of payments and on the availability of foreign exchange and so, on the supply of imported capital goods. This in turn involves sound exchange rate and monetary policy.

2.3.3 Effects of public investment

The classical argument against public investment asserts that it competes with the private sector for scarce financial and physical resources and thereby exerts a negative influence on private investment. Furstenberg and Malkeil (1977) argue, in the context of full employed economy, that an increase in real government purchases of goods and services crowds out precisely the same amount of real private purchases in the short-run.

Government may crowds out the private sector if it accumulates large budget deficit it can not finance from abroad. The government must then resort to inflationary financing or domestic borrowing by inducing a sufficiently high net private savings or surplus. The high real interest rates needed to increase net private savings will slow down private investment (chhibber and van Wijinbergen 1992). However, the crowding out effect is not realized through high interest rate because in most developing countries the interest rate itself is administered by the government.

Sandararajan and Thakur (1980) identified three possible channels through which public investment can positively affect (crowds in) private investment. First, public investment can complement private investment by creating infrastructure and raising the productivity

of private capital stock, at which private requirements per unit of output are reduced. Second, increased public investment raises the demand for the output of private sectors it thereby influences output expectations and investment requirements of the private sector. Third, public investment can raise aggregate output and savings, supplementing the economies' physical and financial resources and offset at least partially the initial crowding out effects on private investment.

Blejer and Khan (1984) emphasize on the complimentary effect of public infrastructure investment (in contrast to total public investment) on the private investment. Public investment of this type (i.e. infrastructure) can enhance the possibilities for private investment and to raise the productivity of capital, increase the demand for private output through increased demand for inputs and ancillary services and augment overall resource availability by expanding aggregate output and savings.

Blejer and Khan on their rigorous estimation of the effect of aggregate public investment on private investment for 24 developing countries found small and insignificant coefficient. In another test the level of public sector investment has a positive effect on private investment, while the change in government investment shows a negative effect. Based on this result, the authors argued that it is not the level of public investment that crowds out the private sector, rather it is the change in public investment that appear to have strong crowding out effect.

The complimentarity of infrastructure argument has got strong support in both developing and developed countries. Aschaur (1987) advanced the idea that expansion of public investment spending should have a large stimulative impact on private output. He found, for the U.S. economy, that movements in public investment bring forth movements in private sector output which are as much as four to seven times as large as the public sector outlays.

Shafik (1992) found a strong evidence of positive effects of government investment in infrastructure on private investment in Egypt. Schimidt-Habbel and Muller (1992)

reported significant positive effect of infrastructure investment on Morocco private investment but small in magnitude. Chhibber and van Wajinbergen (1992) noted that, public investment on non-infrastructure component has a negative effect on private investment while infrastructure component appears to have positive sign but not significant. Serven and Solimano (1993) examined the effect of public investment on private investment in developing countries and show a positive and significant correlation in a panel of developing countries, as well as in separate studies of Latin America and East Asia.

Another argument apart from infrastructure is even when government invest in secondary or tertiary industries, the establishment of new factories will increase the demand for related products and thus induce higher level of private investment. Government investment can also act as an important catalytic agent by reducing dramatically certain cost of production (Tun Wai and Wang 1982).

2.3.4 Skilled Labor and Capital Accumulation

Endowment of skilled manpower has been considered as one of the important factors in promoting investment. Almost there is consensus on this view though, in specification of investment models often ignored. Schimmidt-Hebbel and et al. (1996) argue the existence of complimentarity between investment in physical capital and investment in human capital. New and technically advanced equipment requires operators with adequate skills and education. The identification and design of profitable and innovative investment projects require resourceful, skilled entrepreneurs with an awareness of business opportunities.

Bhagwati (1996) supports this view with the following argument. The productivity or scale marginal product (SMP) of the imported equipment would be greater with a workforce that was literate and would be further enhanced in many had even secondary education. Hence, the SMP curve could shift to the right with literacy and education, leading to greater surplus for any given international cost of newer-vintage equipment.

Rodrik (1994) considering a small open economy that is initially specialized in the production of traditional goods and simultaneous existence of relatively capital-intensive modern sector, which yield higher factor returns justifies the linkage from human capital to investment. The modern sector relies on specialized inputs such as, specialized labor skills, technologies, intermediate inputs or capital goods. Thus, the viability of the modern sector requires the presence of these inputs, which in turn depends (in part) on the existence of a sufficiently well educated work force. On his cross-country regression Rodrik found a significant and positive effect of initial endowment of education on investment.

However, this argument could be extended further, to include not only initial endowment but also growth of skilled manpower could strongly enhance investment. Barro and Sala-I-Martin (1995) in their cross-country regression found strong positive effect from human capital to physical investment and argue that investment to GDP tends to rise as school attainment increases.

2.4 Private Investment and Tax Incentives

Investment incentive policies are generally justified by the existence of market failure that leads to socially insufficient investment. There are two broad categories of incentives: monetary and fiscal incentives. Since monetary incentives are dealt in previous section, here we concentrate on fiscal incentives particularly tax incentives. Tax incentives have been used in both industrial and developing countries extensively to foster private investment. The most typical of these incentives include direct exemption and deductions, accelerated depreciation, investment tax credit, tax holidays and other tax free reserves.

Boadway and Shah (1995) pointed out wide variety of ways in which incentives induce firms to investment more by increasing the rate of return from holding assets. Firms make a large number of capital decisions and investment incentives can affect each of them

differently. Firms decide how much capital of various types to hold, when to acquire the capital, how durable the capital should be, and how long to hold it. There are many types of physical capital, including depreciable capital of various sorts (machinery, building), inventory depletable assets, renewable resources, and real estate. The tax system can affect these all decisions. It can also affect at the financial structure of firms and choice of financial instrument, which in turn affect decisions on real investment.

Schimmidt-Hebbel and et al. (1996) characterize tax incentives in three ways. First, they may be automatic or discretionary and automatic incentives are more transparent and certain thus more effective than the discretionary incentives. Second, tax incentives may be temporary or permanent; temporary incentives are more likely to affect the timing of investment than the long-term capita stock. Third, tax incentives may be general or selective.

In the Jorgenson neoclassical approach the effect of tax policy on private investment enter the investment function within the User Cost of Capital. It is argued that tax incentives affect investment through changes in desired capital stock by reducing the relative price of capital. Kwack (1985) adopted the Hall and Jorgenson model to estimate the effect of tax incentives on private investment in Korea. The report shows that, the tax incentives have reduced the cost of capital in selected sectors. However, the further estimation of effect of cost of capital on investment found to be statistically insignificant. According to the author, the poor result of cost of capital is assumed to be due to misspecification of curb market rate to represent the optimal interest rate.

Shah and Baffes (1995) also applied the Hall-Jorgenson methodology for the case of Pakistan. They concluded that investment tax credit has not been an effective instrument for stimulation of investment in Pakistan. To overcome such methodological problems some other models were developed. Marginal effective tax rate (METR) pioneered by Feldstein (1987) posits net investment as dependent on the net-of-tax real return to capital. The net-of-tax real rate of return depends on the effective tax rate, which is

defined as a ratio of a comprehensive measure of all taxes assessed on capital income to operating income less depreciation.

Boadway and Shah (1995) criticize the METR model as it tells nothing about the actual behavioral responses to various incentives, ignore tax capitalization, foreign tax credit provision, other taxes and non-tax policies. They argue this model have failed in many empirical researches to show the real effect of tax incentive on investment. Instead they suggest another model called "The Production Structure Approach."

2.5 Uncertainty, Macropolicies and Private Investment

Since the early 1980s it has been popular for economists to explain economic growth as well as capital accumulation with regard sound macro-economic policies. Following the oil crisis, the exacerbated inflation, fiscal deficit, high distortion in foreign exchange market and debt accumulation claimed to be responsible for low growth of an economy and investment in developing countries. In this line of research macro-economic stability has been a drawing line between Latin America's failure and East Asia's success.

Stanely Fischer has worked extensively in this area for successive years. He specified several channels over which macro-economic instability affect investment. Fischer (1983) raises the notorious complementarity between inflation and capital accumulation in contrast to the Mundell-Tobin effect literature that asserts inflation has positive impact on capital accumulation. Fischer (1991) specifies two reasons to justify positive association between budget surplus and capital accumulation: the first is the direct crowding out effect and second large deficit serves as indicator of government that is loosing control of its action. Moreover increase in the black market exchange premium indicates expectation of depreciation of exchange rate and foreign exchange rationing. This implies the likely negative association between black market premium and capital accumulation.

Fischer (1993) estimated cross-country regression and found inflation and black market premium negatively affect capital accumulation and budget surplus was found to have positive effect. Cardos (1991) also found negative relation between the variables standing for the debt overhang and macro-economic volatility and private investment for six Latin American Countries.

The stable macro-economic argument has recently developed to the so-called irreversibility and uncertainty literature. Pindyick (1990) and later Dixit and Pindyck (1994) provide rigorous explanation and possible models. This emerging literature has shown several channels through which uncertainty could affect private investment. According to Pindyck (1990) irreversibility makes investment especially sensitive to various forms of risk, such as uncertainty over the future product prices and operating costs that determine cash flows, uncertainty over future interest rates, and uncertainty over the cost and timing of the investment itself. In the context of macroeconomic policy, this means that, if the goal is to stimulate investment, stability and credibility may be much important than tax incentives or interest rates.

Dixit and Pindyck (1994) emphasize the ability to delay and irreversibility of investment expenditure is the center of their emerging literature under "The Real Option Approach to Investment." Irreversibility and ability to delay investment expenditure can profoundly affect the decision to invest. It also undermines the simple net present value rule and the foundation of standard neoclassical investment models. The reason is that a firm with an opportunity to invest is holding an 'option' but not the obligation to buy an asset at some future time of its choosing. The lost of this option value is an opportunity cost must be included as part of the cost of investment.

CHAPTER III

BACKGROUND

3.1 Economic Performance of Korea and Taiwan

The spectacular economic performance of the East Asian countries, including Korea and Taiwan, has been focus of the whole world. In 1961 South Korea was poorer than most developing countries, including many sub-Saharan African countries, at 82 US dollar per capita income. Taiwan was also poor at about 152 US dollar per capita income per annum. However, these countries managed to increase their per capita income, sharply within short period of time to an unprecedented level. Korea and Taiwan achieved 10,037 and 12,396 US dollar per capita income by 1995 respectively.

Taiwan and Korea grew more rapidly and steadily in the last three or four decades. Average annual growth of GDP in 60s, 70s and 80s for Korea was 8.5, 8.7 and 9.2 percents respectively. By the same analogy Taiwan able to grow at 9.2, 9.7 and 8.0 percents annual average. This progress is remarkable by any standard. International comparison made in this context shows that these two countries outperform all other countries with annual average growth of GDP 8.5 percent and 8.7 percent for Korea and Taiwan respectively in the period of 1960-94. While that of Africa, Latin America and industrial countries registered only 2.9, 4.2 and 3.5 percent respectively for the same period (Collins and Bosworth 1996).

Table-1 Growth of production Korea and Taiwan 1960-95 (%)

	Korea				Taiwan			
	1960-70	1971-80	1981-9	1990-95	1960-70	1971-80	1981-9	1990-95
GDP	8.5	8.7	9.2	7.7	9.2	9.7	8	6.4
Agriculture	4.5	1.4	4.2		3.4	1.8	1.3	0.77
Manufacturing	17.2	14.2	11.5	8 4	17.3	12.8	8.1	3 95
Services	8.4	7.8	8 7		7.8	9	7.8	8.1

Source: BOK, National Income Taiwan Area and other issues.

Change in the structure of production has also been quite extensive. Korea and Taiwan started from agrarian economy with very low industrial base. On the industrialization process Taiwan's agricultural share to GDP declined from 33 percent in 1960 to 4.4 percent in 1989, and for Korea it fell from 37 percent to 9.0 percent for the same period (see Table-2). Instead the manufacturing sector to GDP, in Taiwan and Korea rose from 17 percent and 14 percent in 1960 to 37.5 percent and 34.4 percent in 1989 respectively. But there is a declining trend in manufacturing sector in favor of service since early 1990s.

Table-2 Share of Major Sectors in GDP Korea and Taiwan 1960-95 (%)

	Korea			Taiwan		
	Agriculture	Manufacturing	Services	Agriculture	Manufacturing	Services
1960	37	14	43	33	17	42
1970	28.9	14.3	46.7	17.7	33	41.4
1980	14.2	26.7	48	7.9	36.3	46.1
1989	9	34.4	45.8	4.4	37.5	50.1
1995	6.9	26.8		3.55	28.1	60.2

Source: Ibid.

Social indicators manifest impressive performance for both countries. Life expectancy rose to a high level at which Korea reached 70 and Taiwan 74 in 1989. Infant mortality and adult literacy rate is near to rank of developed countries at which the former is 24 and 5 and the latter 93 and 91 for Korea and Taiwan respectively. In both countries the income growth has been accompanied by a sustained reduction in income inequality. In terms of degree of equality of income distribution these countries remain highly egalitarian by world standard.

Another surprising feature of these countries is their superior export performance, usually described as outward oriented development. In each country the rate of growth of exports exceeded even that of GDP. Korea's export started from a very small base. From 33 million US dollar in 1960, exports grew almost 20 fold to US dollar 882 million in 1970,

and then grew almost 10 fold over the following decade, reaching US dollar 17 billion in 1980. Following this rapid expansion, share of exports to GDP rose from a mere 4.76 percent in 1963 to 30.96 percent in 1990 and 33.5 percent in 1995. Taiwan achieved even higher export to GDP ratio at which it raised from 15.2 percent to 42.7 percent and 48.78 percent for respective period. The export structure has also undergone significant changes. Both countries' exports are being dominated by manufacturing. In 1982 about 90 percent or more of these economies' exports were manufactured goods. This ratio increased to 96.1 percent in 1995 for Korea and remained above 90 percent for Taiwan.

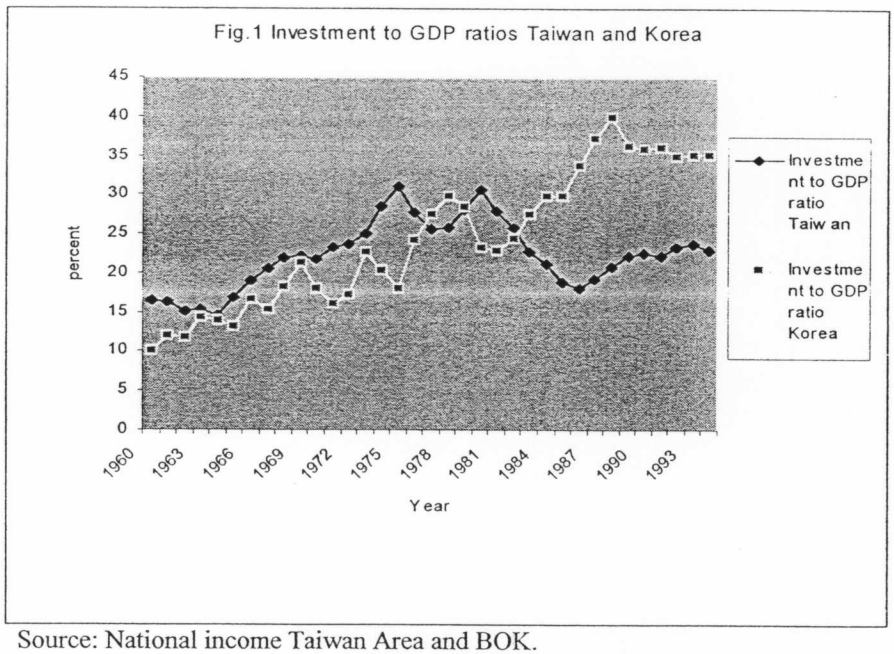
3.2 Features of Physical Capital Accumulation

3.2.1 Trends and Sectoral Shares of Investment

The rapid and consistent accumulation of physical capital in East Asia, particularly in Korea and Taiwan, is one of the special phenomenon and that account for the large portion of superior economic performance. Bhagwati (1996) states that the miracle consisted in the enormous growth in rates of 'private investment' in these countries to levels that are almost certainly unparalleled in the experience elsewhere now or historically.

The usual measure of aggregate investment, gross fixed investment as a share of GDP was low in both countries in the late 1950s. Since early 1960s, this share has risen sharply. Taiwan raised the investment ratio from 16.5 percent in 1960 to 31 percent in 1975 and sustained close to 30 percent in late 1970s. However the ratio started decline since early 1980s and reached at about 18 percent in the late 1980s. This has improved in early 1990s to about 22 percent (see fig-1). Taiwan's decline of domestic investment is usually attributed to the boom of outward foreign investment Taiwan's firms entertained to escape the deterioration of competitiveness in domestic production due to high labor cost and appreciation of domestic currency (Lau 1990:205).

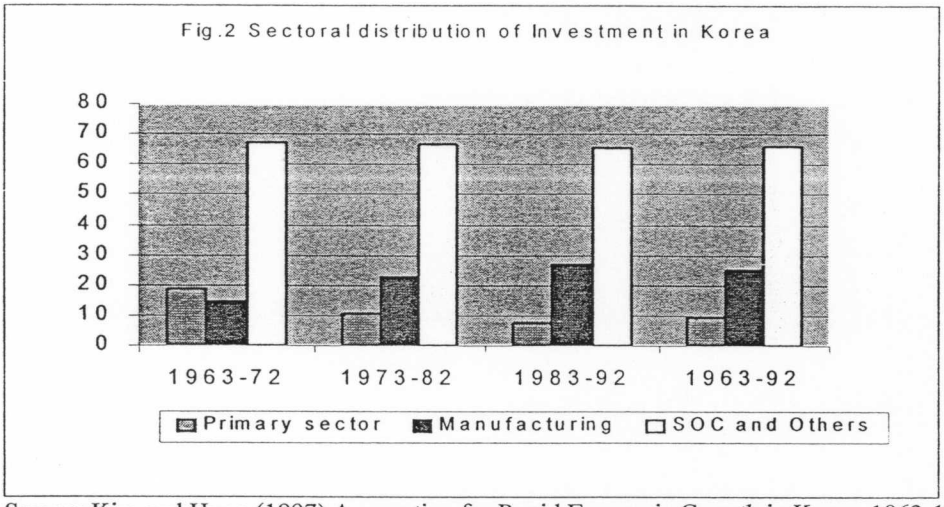
Korea's investment ratio was even much lower, a mere 10 percent in1960. The growth of investment ratio was, however, extraordinary and even ceaseless till early 1990s. The ratio doubled within 8 years by 1967. In the late 1970s it exceeded 30 percent at which this matches with the HCI drive of the government. Unlike Taiwan's declining trend, Korea even able to raise the investment ratio above 35 percent in early 1990s.



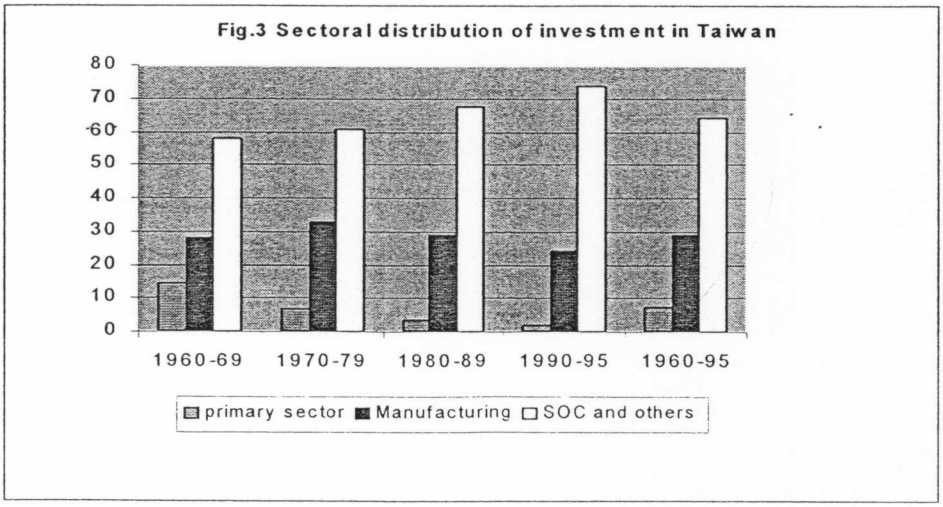
Source: National income Taiwan Area and BOK.

Sectoral break down of the aggregate investment may give clear picture of the pattern of the rapid investment growth. The sectoral distribution of investment reveals the transformation in favor of manufacturing sector since 1960s for both countries. In Korea, the primary sector, including mining that attracted 18 percent of the fixed investment in the decade of 1963-72 received a continuously declining proportion for the following two decades (see Fig-2). The share of social overhead and other services remained unchanged throughout the period (1963-92) at about 66 percent of total fixed investment. While the gross fixed investment allocated to manufacturing sector rose sharply from 15 percent of the nation's total fixed investment in 1963-72 to 23 percent in 1973-82 and later registered a moderate increase to reach 27 percent in the last decade (1983-92).

The pattern of sectoral investment share in Taiwan underwent similar path. Manufacturing share in early 1960s was about 22 percent of total fixed investment and continuously increased the consecutive two decades by which at the middle of 1970s approximated 40 percent. Investment share of primary sector (agriculture and mining) was quite significant in 1960s at which annual average was 14.32 percent. It faced a continuous declining trend throughout the period and touched a mere 2 percent in early 1990s. Unlike the constant ratio in Korea, the social overhead and other service investment in Taiwan took a largest and growing proportion of fixed investment.



Source: Kim and Hong (1997) Accounting for Rapid Economic Growth in Korea, 1963-1995



Source: National Income in Taiwan Area.

Assessment of the trend of light and heavy industries output pronounces useful clue about emphasis of investment through time in these countries. Taiwan's share of output of light industries and heavy and chemical industries declined from about 51:49 in 1965 to 41.5:58.5 in 1984. Korea's ratio was high at about 77:23 in 1960. But it managed to change this proportion of light; and heavy and chemical industries fast to a level 43:57 in 1984 and 28.5:71.5 in 1992 (see Table-3).

Table-3 Trend of share of output from light and heavy industries, Korea and Taiwan

country	Industry	1960	1965	1971	1975	1981	1984	1992
Taiwan	Light		51.2	50.7	46.7	43.4	41.5	
	heavy		48.8	49.3	53.3	56.6	58.5	
Korea	Light	76.6	61.8	54.7	51.6	47.2	43.2	28.5
	heavy	23.4	38.2	45.3	48.4	52.8	56.8	71.5

Source: Bank of Korea and Wade (1990)

Yusuf (1985:40) argues the shrinking output share of light industries in total manufacturing in Korea, has been mirrored by the same composition of manufacturing investment expenditures with the share of light industries diminishing from 65.2 percent in 1966 to 30.7 in 1981. This dramatic change has been attributed to large extent to shift in Korea's comparative advantage, such as real wage rate, increased in skilled manpower, erosion of export market opportunity due to protection and increased competition, and government efforts to transfer to HCI drive.

One and probably important difference between these two countries is the composition of size of firms. Scitovisky (1990:136) provides the following evidence in this regard. *'Between 1966 and 1976 the number of manufacturing firms in Taiwan increased by 150 percent, while the average size of the individual enterprises as measured by the number of employees increased by only 29 percent. In Korea, where development took the more common route, the relation between these two changes goes the other way around. The*

number of manufacturing firms increased by a mere 10 percent while a number of employees per enterprise increased by 176 percent.'

The comparison clearly displays the domination of Chaebols in Korea and small size enterprises in Taiwan economy[5]. The explanation of relatively slow growth of size of firms in Taiwan lies not in the presence of policies limiting but in the absence of policies encouraging their growth (Ibid:). However, Korea's fast growth of conglomerates is mainly attributed to generous credit and tax incentives given by the government.

3.2.2. Investment and Saving

In both countries, the rapid investment growth was accompanied by higher growth of domestic saving. The share of gross domestic savings in Taiwan's GNP had risen steadfastly from 15 percent on average in 1951-60 to 33 percent during 1981-90. In the late 1980s Taiwan become one of the highest savings ratio in the world. Hence, Taiwan's rapid growth was achieved with much less borrowing from abroad. Since 1970s Taiwan's saving outpaced domestic investment and the country joined the group of net creditors.

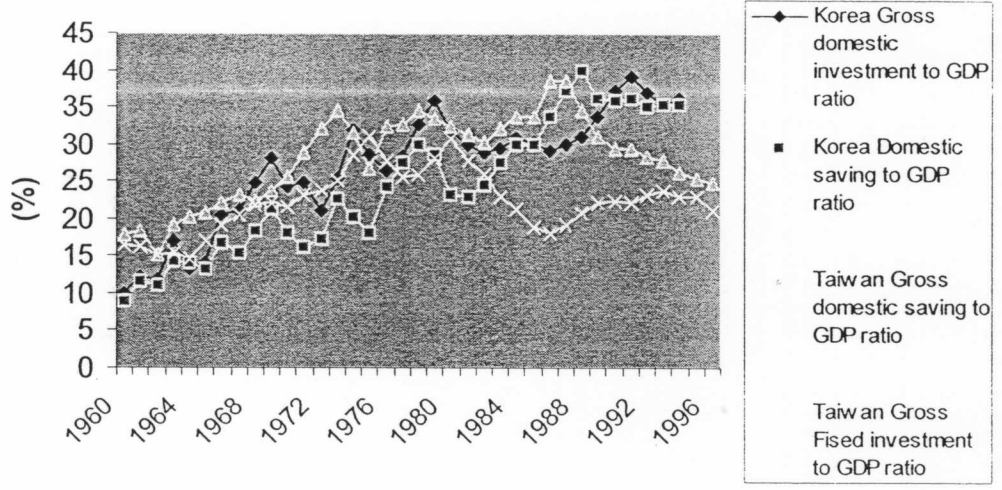
Korea has also achieved a rapid growth and high level of national saving ratio. In the early 1960s domestic savings to GNP ratio was about 11 percent. While this got doubled at the end of 1960s within a decade. The rapid saving growth in this period is usually ascribed to the 1965 interest reform. But some disagree arguing that this reform had done mostly a transfer of savings in the unofficial market to official market.

Despite the higher saving rate, Korea increased its foreign borrowing. The country remained a net borrower throughout the period, in consideration, except in the late 1980s of current account surplus. Korea's continuous foreign borrowing was matched by the remarkable domestic investment growth. Korea uplifted investment ratio even in the 1990s at which it approached 40 percent where as, Taiwan's domestic investment has started to decline since 1980s.

[5] This difference has persisted.till now.

The rapid growth of saving is considered as one explanation (factor) to the notable growth of investment in these countries. This can also be intuitively forwarded by simple observation of the chart below. Saving and investment ratios in both countries not only display similar increasing trend but also a close co-movement in most of the time. A careful look at the chart, for instance, for Korea saving and investment went hand in hand except the gap widened in the late 1970s period of HCI derive. In case of Taiwan the chart exhibits divergent only in late 1980s where the domestic investment fell sharply.

Fig.4 Investment and domestic saving trends in Korea and Taiwan



Source: Korean Economy 1945-95 KDI and National Income in Taiwan Area.

Many factors are usually cited for the impressive saving ratio in these countries. Most account view the increase in savings in Korea and Taiwan as having been the result of economic growth itself and comparatively early demographic transition (Collins and Park, 1989; Collins, 1991; World Bank 1993). Another line of argument emphasizes on the government role and that; policies were helpful in remedying coordination problem. Real interest rates were raised for depositors to levels that were either positive or only mildly negative (Taiwan in the 1950s and Korea in the 1960s). In addition, an increase in public savings made important contribution to total savings in both countries (Rodrik, 1994:18).

The World Bank published "The East Asian Miracle" (1993, 211:19) inscribes governments role in remedying market failure in promoting savings. According to this statement the high performing East Asian Economies (HAPEs), including Taiwan and Korea, took steps to alleviate the lack of deposit insurance markets and to promote stable financial institutions. They have attached great importance to maintaining saver's confidence in financial institutions. Often their policies have gone beyond prudential regulations to include protecting banks from competition at the expense of long-run efficiency. In addition these governments established government-run postal savings systems (Japanese style) to attract small savers. Besides the above measures mandatory pension schemes were introduced and conspicuous consumption and borrowing for consumption were restricted.

CHAPTER IV

EXPLAINING THE HIGHER AND RAPID GROWTH OF INVESTMENT IN KOREA AND TAIWAN

The most important concern in this paper is to explore what factors can explain the higher and rapid growth of private as well as aggregate investment in Korea and Taiwan. In context of the East Asian development orientation the following factors are considered to be major determinants: fund availability, growth of public investment, cost of capital, tax incentives and risk sharing policies, easy access to foreign exchange through export promotion and higher rate of human capital formation.

4.1. Financial Availability and Credit Allocation

4.1.1. Source of Finance

Financial availability is the main ingredient of investment decision. Developing countries have limited or total absence of capital market. Investors hardly find financial source from capital market by selling equity shares. Thus, they depend largely on borrowing for external financing. This was the real case for Korea and Taiwan at their early stage of rapid capital accumulation.

In Taiwan, during the period 1964-90 capital market provided only an average of 14.4 percent of total business sector financing (see Table-4). Financial institutions contribute about 55 percent of total domestic business sector financing. The informal system (curb market) has been very important source in Taiwan. It accounted about 24 percent financing for the period 1964-90.

Table-4 Total Business Sector Financing by Source of Financial System in Taiwan

	1964-70	1971-75	1976-80	1981-85	1986-90	1964-90
Financial institutions	57.1	67.4	57.2	52.2	54.1	54.5
Money market	-	-	4.5	10.6	6.9	7.3
Capital market	15.7	9.8	13.9	13.9	15.1	14.4
Curb market	27.2	22.8	24.4	23.3	23.9	23.8

Source: Shea (1993:233-37)

Korean corporations relied on internally generated funds (depreciation plus retained earnings) for about half of their financing at the early 1960s. However, after the interest reform of 1965 and the opening up of foreign loan guarantees, the balance shifted markedly. Internally generated funds dropped to about one-fourth and external financing increased to three-fourth of total financing through 1970s. Capital market provided very low share of financing. The equity market contribution for instance, did not exceed 15 percent even in the 1980s and bond market contribution was negligible in 1960s and 1970s (see table-5).

Table-5 Net Financing Source of Non-financial Corporations in Korea %

		External Sources		
	Internal Source	Loans	Bonds	Equity
1963-65	47.9	38.1	0.7	14
1966-69	25.3	62.2	0.3	8.5
1970-79	27.6	52.5	4.8	14.8
1980-89	38.3	32.4	13.6	15.6

Source: The East Asian Miracle 1993 p.225 and Cole and Park (1983 p.30-104)

4.1.2. Credit Allocation

In a free market system the basic instrument of allocating credit is the price mechanism in this regard the interest rate. However, this price element was under government control for the whole three or four decades of high investment period in both countries. Since bank lending rates were below market clearing rates a rationing mechanism was

inevitable. Consequently, investment decision was greatly overwhelmed by the credit rationing of government policy. Quantity of funds must have been more important than interest rate, particularly in the early stage of development and the effect would be on both total amounts of investment and sectoral distribution.

Korea: - The Korean government heavily intervened in the credit allocation. Credit guidelines were formally introduced in 1958 under Regulation Pertaining the Use of Funds in the financial sector and have been modified from time to time. There was always excess demand as a result of a low interest rate policy and financial institutions were generally unable to meet the total credit demand of the preferred sectors at the prevailing interest rates.

The financial institutions had to ration the available credit. Banks were the main instruments of the credit allocation through providing domestic loans and guaranteeing foreign loans. Banks provided 40.2 billion won loans in 1960. This increased to 1077 billion and 8052 billion by 1971 and 1978 respectively. As a new source, foreign loans arranged by the government guarantee scheme, rose dramatically from 0.6 billion won in 1960 to 1048.7 billion won in 1971 and get exceeded domestic loan by 1978 at which it reached 8623.9 billion won (Cole and Park, 1983).

During the 1950s, the primary sector and social overhead sectors and some import competing manufacturing industries received preferential treatment. As it can be seen from table-6, the manufacturing sector continues to be a dominant recipient of bank loans. It absorbed more than 40 percent in 1960s and in 1970s exceeded 55 percent of total bank loans.

Beginning in the early 1960s, the government took a more active role in guiding resources through the formulation of both multi-year development plans and annual overall resource, allocation programs. The government allocated from 50 to 70 percent of domestic credit, depending upon the classification of 'directed' or 'policy loans' to predesignated sectors, industries and uses (Ibid.1983).

Table-6 Loans from DMB and KDB by industries Korea (%)

Sector	1955	1960	1965	1970	1975	1978
Primary	30.7	34.8	21.4	14.8	10.8	9.8
Manufacturing	44.3	42.3	45.7	47.5	56.2	54.8
Social overhead	14.5	12.2	16.7	16.4	20.3	20.5
Services and others	10.5	10.7	15.9	21.3	12.7	14.8

Source: Cole and Park (1983: 178)

Nam (1995:3) provides clear evidence of the concerted credit allocation scheme during the HCI drive. The government used credit allocation through the banking system as its powerful means of supporting industries. To finance large-scale investment projects in these industries, the National Investment Fund was set up in 1974 by mobilizing public employees pension funds and a substantial share of banking funds. However as these funds proved insufficient, the banks, in all practical purpose owned by the government, were directed to make loans to strategic industries on a preferential basis. As a result during the later half of the 1970s, the share of policy loans in domestic credit for DMBs rose steadily from 40 to 50 percent. And almost 80 percent of all fixed investment in the manufacturing sector is estimated to have been directed toward the heavy and chemical industries.

In addition, the government created or upgraded many financial institutions in an objective to consolidate the allocation of financial resources to preferred sectors. Development institutions and Funds such as, KDB, Export Import Bank (KEXIM), the Korea Development Finance Corporation (KDCF) and National Investment Fund (NIF) were established to supply long-term industrial credit[6]. As a symbol of credit directing, KDB involved considerably in providing domestic loan and foreign borrowing guarantee for preferred sectors. It managed above 30 percent loans and 70 percent of guarantees of the total bank loans and guarantees provided in the late 1960s.

[6]see Cole and Park (1983) for detail discussion on this case

Korea Development Finance Corporation (KDCF) was organized to provide medium and long-term financing for private enterprises with the assistance of World Bank. The National Investment Fund was also established with especial purpose to finance investment in heavy and chemical industries. This fund was authorized to mobilize financial resource from sale of NIF bond; contributions in the form of deposits made by the DMBs and other financial institutions; and various public funds managed by the central and local governments and other public enterprises; and transfers from various government budgetary accounts. National Agricultural Cooperatives Federation (NACF) and Medium Industry Bank (MIB) were also established for providing loans the former to farmers and the later to medium and small enterprises.

Taiwan: - Taiwan experienced similar path of government intervention in the financial market. In fact, in Taiwan government owned most of the banks with the objective of directing financial resources for development. In 1981, there were 24 modern banks with 714 branches throughout the island, along with trust and investment companies, credit cooperatives, credit departments for the farmer and fishery associations, bill finance companies, security finance companies and insurance companies. Of the total number of banks operating only three were privately owned (Myers, 1990:35).

During the 1950s and early 1960s, the banks received credit allocation targets for rather broadly defined sectors, supplemented by more detailed case-by-case instruction from the planners. By the mid-1960s the banks were receiving lists of six to twelve industries to which priority attention should be given (Wade, 1990:166). As a result with up to 75 percent of loans flowing to the targeted industries and 80 percent of total bank lending goes to the private sector the list have obviously helped to guide private enterprises toward the goals of development plan (Reigg, 1978: 96).

Nevertheless, some authors argue that the Taiwan's government selective credit allocation favored public enterprises than private enterprises, large firms than small firms and manufacturing than the other sectors. Public enterprises enjoy more loans from financial institutions than its share of net value added. Shea (1993:245) estimated credit

allocation equation for Taiwan based on the above statement. His results supports the view that manufacturing sector was favored when applying loans from financial institutions, while the mining sector and the communication, transportation and storage sectors were discriminated against. Since manufacturing also has been the major exporting sector in Taiwan, this result supports the assertion that exporting industries were privileged in obtaining bank loans.

Disbursements from the government budget and access to foreign credit were the most important non-bank sources of preferential investment finance. These funds were available at considerably softer terms to public enterprises. Indeed, the four major import substituting and large lump projects of the 1970s – the integrated steel mill, the shipyard, the petrochemical complex and nuclear reactor – had been financed largely from these two sources (Westphal, 1978:11).

Taiwan's government had also created different windows of funds to promote investment. Six government-owned specialized banks; Export - Import Bank of China, Bank of Communication, Central Trust, Cooperative Bank, Farmers Bank and Land Bank of Taiwan were established. These banks were set up or designated to specialize in industrial, agricultural, real estate, medium and small business and export import financing, and special loan programs for agriculture. In addition, Special Purpose Fund, Strategic industry fund, Sino-American Fund for Economic and Social Development, Development Fund were among the credit programs arranged for redirecting resources to machinery imports, technology intensive key industries.

Government had clear criteria in selecting the winners for preferential treatment. For instance, under the strategic industry financing the criteria to select industries was linkage effect, market potential, technology intensity, value added, energy intensity and pollution. According to this selection, the government provided strategic industry firms with special medium and long-term low interest loans. The rate difference between strategic loans and prime rate was between 175 and 275 basis points. Preferential loans later were expanded to finance the purchase of automation, and domestically produced machines (Shea, 1993).

Some critics described the distribution of loans to sectors in both countries as distorted, since it did not reflect their respective contribution to GNP. This view might be true at looking the then existing shares as static rather than the dynamism of the sectors. Some other also argue, judgment of ex-post information on loan distribution tend to explain the difference in industrial characteristics such as, factor intensity, capital output ratio, investment gestation period and cash flow requirements may create difference in financing requirements. This line of argument then concludes the unbalanced loan distribution across sectors could be with regard financial requisite rather than consequences of government allocation policy. However, the credit rationing practices the governments of Korea and Taiwan involved do not support this argument in reality.

4.2. Foreign Exchange accessibility, Exports and Investment

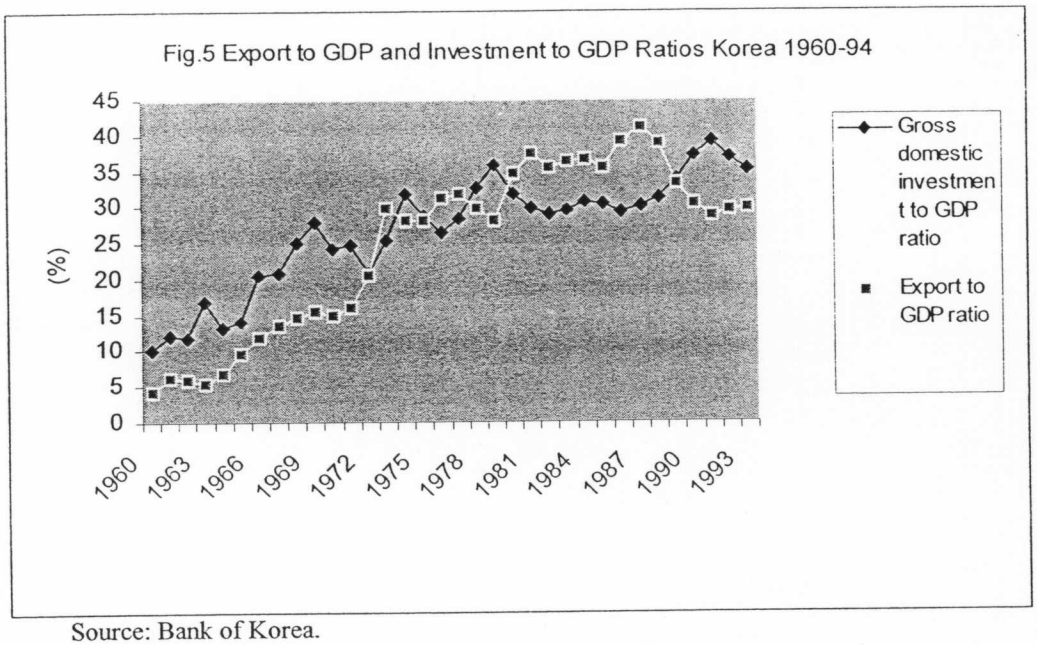
For many developing countries physical capital investment implies a larger proportion of that investment need to be imported as a machinery and equipment. Even in the absence of domestic saving-investment gap, foreign exchange is crucial to finance the imported capital. This constraint is especially substantial at the early level of development where source of foreign exchange depends mostly on exporting primary products.

In view of this argument the process of rapid investment in Taiwan and Korea was only viable with respect to the export oriented development strategy. Stiglitz (1994) states the East Asian focus on export orientation was successful in promoting economic growth at which, one possible standard analysis focuses on the export push remedying effect of shortage of foreign exchange. Bhagwati (1996) insists the major explanatory role of export promotion (EP) strategy for the enormous growth of rates of private investment in these successful East Asian countries.

The first mechanism to which export promotion pushes investment is through increasing demand for domestic produced goods, a demand side analysis. This can be justified by the trend of export contribution to GDP. Korea increased its export to GDP ratio from a

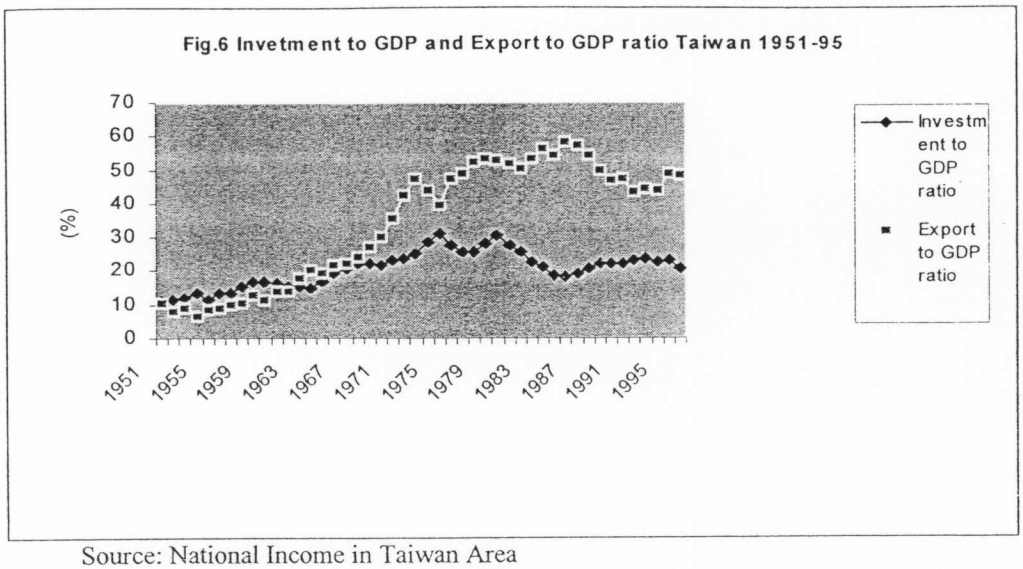
mere about 5 percent in 1960 to above 40 percent in late 1980s in an unwavering state. Taiwan had also uplifted its export to GDP ratio from about 10 percent in 1950 to more than 50 percent in late 1980s.

The second mechanism is considered to be through remedying foreign exchange shortage for imported capital goods. Due to the remarkable export performance firms in these countries didn't face foreign exchange constraint to a substantial amount. Fig-5 and fig-6 exhibit close and positive relation, with some lag in investment, between export and investment to GDP ratios in both countries.



Source: Bank of Korea.

The policy switch from ISI to EOI in the early and mid-1960s had contributed significantly to the growth of exports. Governments in both countries took policy initiatives designed to find out industries and commodity items suited for international competition and to promote such exports through a variety of incentives.



Source: National Income in Taiwan Area

In Taiwan, most of the incentives were put in place in the mid- to late-1950s, earlier than Korea. Exchange rates were unified during 1958-61 and in 1957 relatively generous export credit program was introduced. By 1960, the difference between the official exchange rate and the market price of foreign currency had become insignificant (Rodrik, 1995:5). Several export promotion schemes were introduced or strengthened to give positive discrimination in favor of export sales. Exporters were entitled to retain a larger portion of their foreign exchange and allowed to sale their foreign exchange entitlement to other firms.

Fiscal incentives such as, five year tax holiday, system of tax rebate were introduced. Concessional export credit was expanded. In addition, government encouraged exports cartels, export quality control, provision of marketing information and export prizes. (Wade, 1990:139) describes the Taiwan's initiation of Export Processing Zones (EPZ) as a most dramatic freeing of export production from protectionist constraints when few other countries had them. Firms in the EPZs have to export all other production in return for enjoying duty and tax-free imported inputs, good infrastructure facilities and simplified administrative procedures for trade and remittances.

Korea has followed a similar avenue to encourage exports. After 1958, export incentives were increased. Korea's incentive system was extremely diversified and continuously improved. Krueger (1979) provides a list of incentives for exports (see Table-7). Following this list Yusuf (1985:24) describes the incentive structure as "a comprehensive, that the advantage of exportings were almost irreversible and if enthusiasm appeared to be flagging, the government sought ways of removing and lingering impediments and raising the value of incentives." In Korea after the mid sixties interest subsidies probably constituted the single most important incentives for exports, accounting for as much as a fifth of total subsidy (Krueger, 1979:92-99).

Table-7 Types of Export Incentives and Dates of Operation (1959-75) Korea

Type of Export Promotion Scheme	Dates Applicable
Tariff exemptions on imports of raw materials and spare parts	1959-75
Tariff and tax exemptions granted to domestic suppliers of exporting firms	1965-75
Domestic indirect and direct tax exemptions	1961-72
Accelerated depreciation	1966-75
Wastage allowance subsidies	1965-75
Import entitlement linked to exports	1951-55
Registration as an importer condition on export performance	1957-75
Reduced rates on public utilities	1967-75
Dollar dominated deposits held in Bank of Korea by private traders	1950-61
Monopoly rights granted in new export markets	1967-71
Korean Trade Promotion Corporation	1965-75
Direct export subsidies	1955-56
	1961-64
Exports targets of industry	1962-75
Credit subsidy	
Export credits	1950-75
Foreign exchange loans	1950-54
	1971-75
Production loans for exporters	1959-75
Bank of Korea discount of export bills	1950-75
Import credit for exporters	1964-75
Capital loans by medium industry bank	1964-75
Offshore procurement loans	1964-75
Credits for overseas marketing activities	1965-75

Source: A. O. Krueger, The Development Role of the Foreign Sector and Aid distributed by Harvard University Press, 1979, p. 93, Table 24

One other possible source for foreign exchange is foreign direct investment. However, in both countries the contribution of FDI is not as long as it is often thought. In Taiwan, FDI as a source of capital accounted for only 3 to 10 percent of gross domestic capital formation over the 1970s. In terms of exports, about 20 to 25 percent of manufactured exports came from foreign firms over the 1970s (Wade, 1990:149).

Foreign direct investment in Korea represents even smaller portion of external inflow, amounting only 1.2 billion US dollar within 20 years, between 1962-81, (Kwack, 1990:117). Rather the most significant source of foreign exchange next to export for Korea was foreign borrowing. Before 1967 Korea's borrowing was negligible but during the Second Economic Development Plan (1967-71) it began to borrow heavily from abroad. Korea borrowed total amount of 41.669 billion US dollar during 1962-81 (Ibid.).

Most foreign loans have been secured directly by the government or its agencies. The amount of these loans were largely determined by the Korean government based on economic growth targets, export and import targets and desired level of international reserves. Unlike to many other developing countries, the foreign loan was mostly by the private sector and allocated for investment but not for consumption.

4.3. Cost of Capital, Investment Incentives and Risk Sharing

Cost of capital could be affected by several factors, market as well as policy variables. Nature and arrangement of financial market, government financial policies and tax structure are some of the most important variables. Due to underdeveloped capital market, investors in these countries (Taiwan and Korea) largely depend on debt financing. Thus, the cost of debt may be considered as a better proxy for capital cost and associated investment decision. However, since the interest rate in these countries was under severe regulation there is unsolved debate whether the official rate or curb rate is more important in affecting firms' investment behavior.

Governments in both countries deliberately lowered the interest rate on loans to reduce the cost of capital for investors. As a result the excess demand created by such control had to take the curb market as a last resort. In Korea, the difference between official and curb market rate of interest was quite high and persistent. The curb market rate was on average more than double to the general bank loan rate. In 1963 the gap was about 36.8 percentage points and in 1975 about 25.8 percentage points (see table-8). The gap between these two rates shows a declining trend but remained more than double even after 1980s liberalization. Interest rates on loans of special purposes have been even lower than those of on ordinary loans. Loans for equipment and export have, in general, been made at the lowest rates. Consequently, there was a large amount of subsidy element for the preferred sectors through such interest rate policy.

Table-8 Gap between official and curb market interest rates in Korea and Taiwan

	General Bank loan		Curb market rate		Difference b/n official and curb rate	
	Korea	Taiwan	Korea	Taiwan	Korea	Taiwan
1963	15.7	14.94	52.56	23.87	36.8	8.93
1966	26.0	14.04	58.7	23.82	32.7	9.78
1970	24.0	13.3	49.8	21.25	25.8	7.95
1975	15.5	13.48	41.3	27.26	25.8	13.78
1980	20.0	13.5	44.9	30.63	24.9	17.13
1985	10.0	8.08	24.0	24.98	14.0	16.9
1990	10.0	10.23	18.7	23.42	18.7	13.19

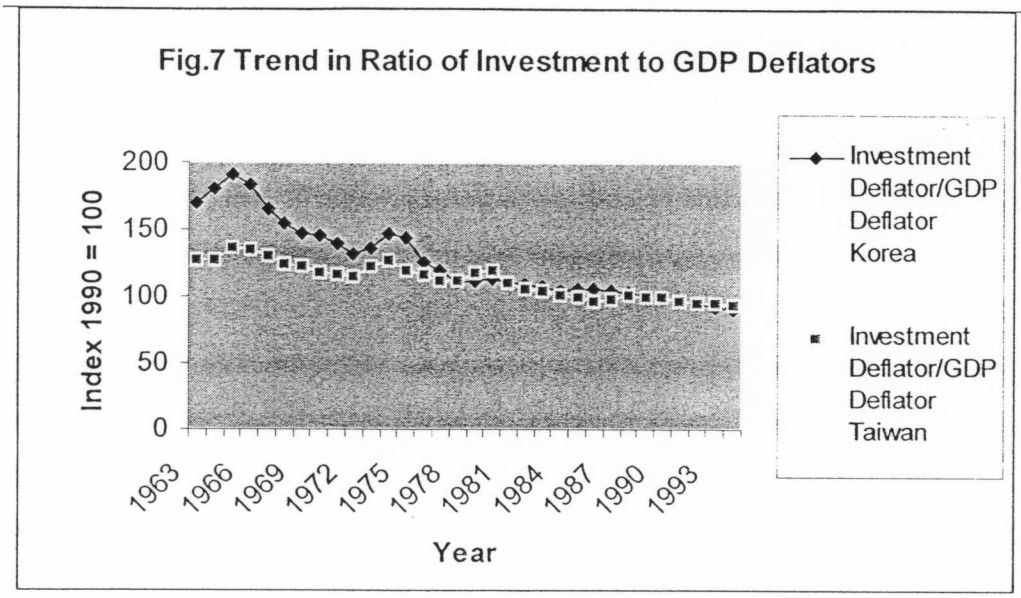
Source: BOK, National Income in Taiwan Area and other issues.

Although lesser than Korea, the difference between curb rate and official minimum rate of interest in Taiwan was substantial. Indeed, it exhibits an increasing trend. The gap between the minimum rate and curb rate got doubled since 1970s. Taiwan also offered interest subsidy by a significant amount for exporters and some other preferred sectors, even at lower than the minimum secured and unsecured rates of interest.

The movement of official interest rate and inflation can also display the incompatibility of the interest rate, as a price mechanism to direct investment decision. Korea's inflation rate was high enough to offset the official interest rate for substantial number of years. Real interest rate measured by one-year deposit rate had been negative for the periods 1962-64, 1972-81 and early 1990s. Taiwan's case is moderate, real rate of interest touched negative level in the periods 1973-74 and 1979-80. These years are known to be the outbreak of world wide oil crisis and high inflation.

Another important aspect in assessing capital cost is the trend of relative price of investment goods to output. One common measure is then to formulate the ratio of investment deflator to GDP deflator. From fig-7, below we can see the declining trend of these ratios throughout the given period in both countries. Declining investment price in contrast to output price implies an increase in profitability and attractiveness of investment, other things being constant. These countries were even fast adjusting to maintain the trend in case of some external shocks. For instance, the upward trend of investment goods following the early 1970s oil shock had short lived.

The World Bank 'East Asian Miracle' (1993:232) has clearly compared the relative deflator of investment and GDP between the so-called High Performing Asian Economies (HPAEs), including Korea and Taiwan, and other 35 developing countries. According to this comparison the HAPEs relative price of investment goods remained lower than other developing countries throughout the 1970s and 1980s. This is because the HAPEs persuaded a concerted effort to reduce cost of investing through tax, tariff and exchange rate policies. Protection of domestic market from foreign competition also helped domestic producers to entertain the markup in domestic market. Since the same volume of nominal investment bought more real capital goods in these countries, nominal return on investment would be higher and firms tend to invest more.



Source: National Income in Taiwan Area, Accounting of Rapid Economic Growth in Korea

Korea and Taiwan have also employed a wide variety of tax policies to increase investment by lowering cost of capital. Both countries used very complex tax incentives to achieve higher capital investment. The major types of fiscal incentive are tax holiday, accelerated depreciation, investment tax credit, and duty free imports of capital goods and reduced rate of business tax[7].

Korea introduced a modern corporation tax system in 1949, a generous tax holiday for industries considered important in economic development. The 1967 major tax reform replaced the tax holiday incentive with an investment tax credit system while maintaining the list of privileged sectors in general. Other major tax reforms were introduced in the early 1970s to reinforce incentives for the heavy industrialization in Korea. According to the 1974 tax reform major incentives to promote key industries were unified and rearranged under the title of 'special tax treatment for key industries in the Tax Exemption and Reduction Control Law (TERCL).' This special treatment provided three optional sets of incentives, i.e. tax holidays, investment tax credit and special depreciation to qualified firms in the selected heavy industries (Kwack, 1985:56).

[7]Tax incentives for export promotion, the important part of investment incentives, in both countries, are dealt in previous section. Thus, here we concentrate on other tax incentives.

Incentive scheme for small and medium sized firms was also important in Korea. A 30 percent special depreciation was provided for firms operating in the mining or manufacturing sectors for their investment in machinery and equipment effective from 1968. Special depreciation was raised to 50 percent in 1977; and in 1981 (TERCL) tax reform, investment reserve system were available for small and medium sized firms.

Taiwan introduced special investment incentive scheme in 1960 based on the experience of Puerto Rico in the late 1950s. These tax benefits included: - five year corporate income tax exemption or accelerated depreciation of fixed assets, preferential rates of firm's income tax ranging from 22 to 25 percent, and reduction of up to 15 percent of money paid for acquiring share certificates in the consolidated income tax in any current year (Meyers, 1990:48). This was one of the principal tools for steering private investment decisions.

Criterions were forwarded for eligible products and firms and these criterions were frequently updated in response to changing condition, eleven times between 1960 and 1982, (Wade, 1990:182). During the 1970s, the items given fiscal investment incentives have increasingly been concentrated on intermediate and capital goods, currently being imported or new export sectors while export requirement have in most cases been dropped. Moreover the products which receive tax incentives also tend to receive encouragement through import controls, concessional credit and other government promotions.

According to Meyer (1990:49) estimation, for Taiwan, total tax exemption for business investment in the period 1961-80 was roughly NT $1.5 billion. Of this amount 38.1 percent represented business tax exemption, and 37 percent income tax exemption. While the total tax relief for exports, those refunds of taxes and duties paid for imported materials came to NT $249.6 billion or 39 percent of total tax receipts from 1955 to 1980.

The incentive scheme in Korea has also resulted in large cost saving for investors. Kwack (1985) estimated the net benefit from tax incentives per one dollar invested in machinery by firms in typical industries (manufacturing) for selected years. He found that in 1963 total net benefit from tax incentives per one dollar invested reached 0.186 and after some fluctuation it shot up to 0.369 per dollar in 1976. Key industries received the heaviest support during the latter half of the 1970s and the support derived mainly from the tax holiday option in the special tax treatment. This is matched with the concerted support to boost heavy and chemical industries.

Whether the incentives have been effective in increasing investment is still unclear largely due to methodological problems. Kwack (1985) found poor results for most sectors regarding the effect of cost of capital on the desired capital stock in Korea following the Jorgenson model. Wade (1990)[8] argues that all can be said the incentives in Taiwan do make pronounced difference in user cost of capital between sectors. According to the findings, coefficient of variation (with the economy divided in to thirty-four sectors) was 0.42 in 1961, 0.61 in 1976 and 0.45 in 1984 suggesting that especially in 1970s the fiscal incentive scheme could well have exerted resources pulls between sectors.

Risk sharing was very important device in both countries in encouraging private investment. Both governments involved in lowering the uncertainty of investment implicitly or explicitly by sharing risks. East Asian Miracle (1993, 223 World Bank) describes several forms of risk sharing mechanisms practices in East Asian countries. These constitute: recession cartels in Japan, firm and bank workouts in Korea, financial repression to recapitalize firms in Malaysia, signaling priorities and policy intentions through the directed credit system in Japan, Korea and Taiwan; and credit guarantees to small and medium-size enterprises in Korea and Taiwan.

Korea is a typical case of bailingout program. In the 1980s the Korean government provided 78 distressed firms with new subsidized loans (totally about 16 percent of

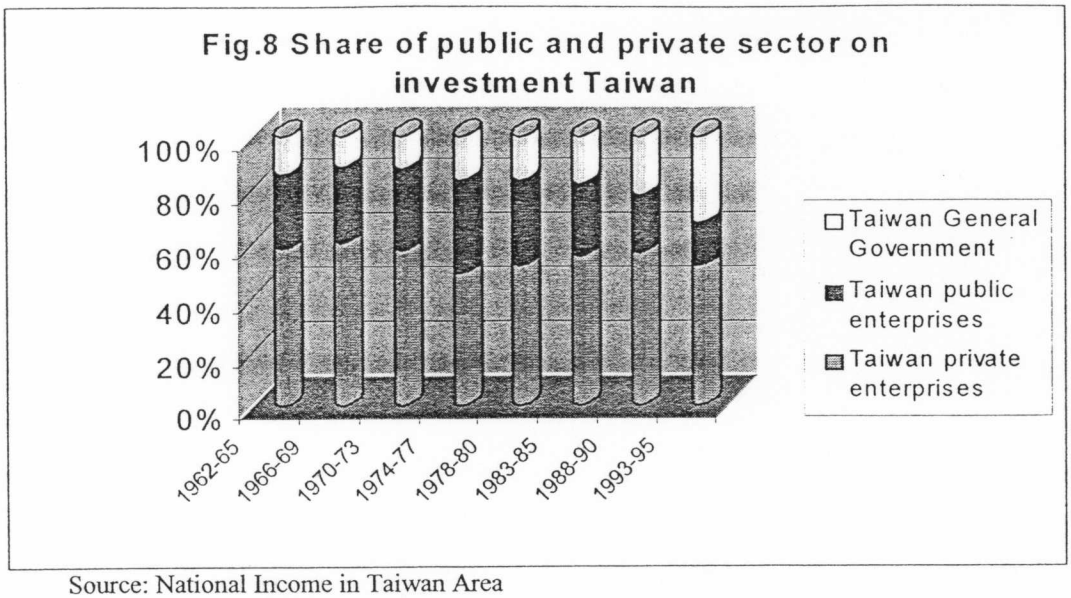
[8]Based on the findings of (Chon: 1987).

commercial bank loans) and rescheduled outstanding ones (Ibid. p.234). The growing trend of non-performing loan is a clear indicator of government intervention in such mechanism. Nam (1995:37) estimated that the share of non-performing loans in the total credit of seven nation wide commercial banks rose from 2.4 percent during 1976-80 to 10.5 percent during 1984-86. However, share of policy loans had not decreased, even since mid-1980s, as the bank credit has expanded substantially to such sectors as housing, small and medium-scale industries and agriculture.

4.4. The Relation between Public sector and Private investment

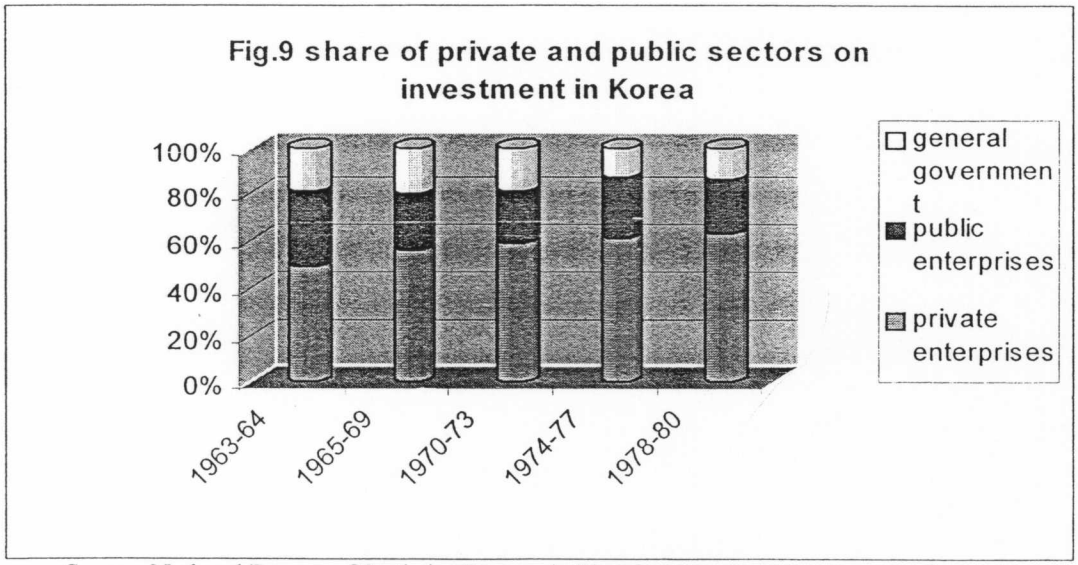
Breakdown of the aggregate investment in to public and private would help in understanding the sources of the rapid growth in capital formation and the relation among them. In both countries though in different degrees, the public and private sector played significant role. In Taiwan, share of private sector has been about half of fixed capital formation throughout the last 3 or 4 decades (see figure-8). Taiwan's private share of gross fixed capital formation rose from 47% in 1958-61 to a peak 60.3% annual average in the period 1966-69 in a steady upward trend. Whereas, in the 1970s it declined to some extent but still remained at about 50 percent.

The distinct feature of Taiwan's rapid capital accumulation is a significant contribution of public sector investment. Government heavily involved in boosting investment directly through public enterprises and general government investment that mostly refer to infrastructure investment. Share of public enterprises' investment was 38 percent in 1958-61, declined to about 28 percent in 1960s and then rose to more than 30 percent in 1970s. Since late 1980s the share declined sharply due to liberalization. The general government investment remained stable between 10 and 20 percent throughout the decades. If we sum up total public sector investment, the share is slightly less than half on average.



Source: National Income in Taiwan Area

In general the share of private investment in Korea was higher than in Taiwan. Except in the early 1960s, its share exceeded 50 percent and it exhibited a rising trend through the given time range. Total public sector investment, the sum of public enterprises and general government investment was also significant, no less than 34 percent during



Source: National Bureau of Statistics Economic Planning Board

1963-80. However, public enterprises were less important in Korea than Taiwan regarding capital formation. Public enterprises contributed 31 percent of total fixed capital formation in 1963-64. The trend declined but remained above 20 percent in late 1960s and 1970s. General government investment remained stable between 10 percent and 20 percent similar to that of Taiwan's.

The trend of share of public enterprises in the 1960s and 1970s was declining for Korea, but increasing for Taiwan. This opposite trend suggests the difference in development strategy of the countries. Korea's government induced investment, including HCI drive of 1970s, more of by encouraging private investors through subsidy and/or risk sharing schemes. Taiwan's government, on the other hand, preferred to directly invest through public enterprises in establishing key and strategic industries. Wade (1990:176) describes that from the early 1950s on ward Taiwan has had one of the biggest public enterprise sectors outside the communist block and sub-Saharan Africa.

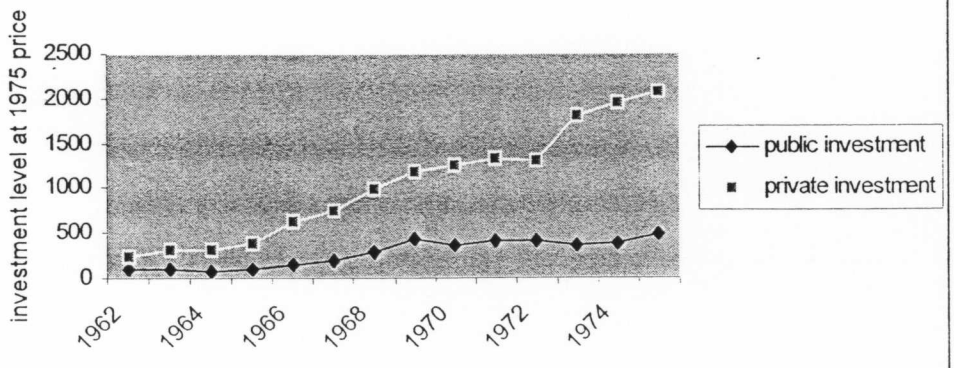
The share of public enterprises and general government investment dismisses the neoclassical argument that these countries grew because governments concentrated on infrastructure investment (fundamentals) but not on business enterprises. In both countries the data indicate high government involvement in the so-called non-infrastructure investment.

In addition, to their large share of total investment, public enterprises were the largest and leading firms. Individual public enterprises were typically among the largest firms in their sectors in Taiwan. In 1980 the six biggest industrial public enterprises had sales equal to the fifty biggest private industrial concerns. In 1981, of the ten largest industrial enterprises; seven were public enterprises; of the largest fifty, nineteen were public enterprises (Wade, 1990:178). Korea's structure was also similar, where twenty of fifty largest enterprises were in the public sector in 1972, including twelve of sixteen largest enterprises (Jones and Sakong, 1980:154).

Some analysts argue that the emphasis on public enterprises to this extent, in these countries, is neither random nor ideological, but heavily dependent on certain underlying economic characteristics. In both countries, the public enterprise sector had high forward (e.g. steel and machinery) and backward linkages. Public enterprises played significant role in capital intensive sectors and in sectors exhibiting economies of scale. Jones and Sakong (1980) assert the public enterprises sector in Korea as a whole had extremely high forward linkages, but modest background linkages to the entire non-agricultural economy. The public enterprises sector was also more than three times as capital intensive as the Korean economy almost triple the non-agricultural economy, and more than doubled that of Korean manufacturing.

Wade (1990) following the above line of argument affirms that the public enterprises, in Taiwan, were also concentrated on the commanding heights. They constituted petroleum refining, petrochemicals, steel and other basic metals, shipbuilding, heavy machinery, transport equipment, fertilizer in addition to the standard electricity, gas, water, railway and telephone utilities (i.e. infrastructure investment). They were important in capital intensive sectors where the efficient scale of production is large relative to both product markets and factor markets, and where linkages to downstream industries are high.

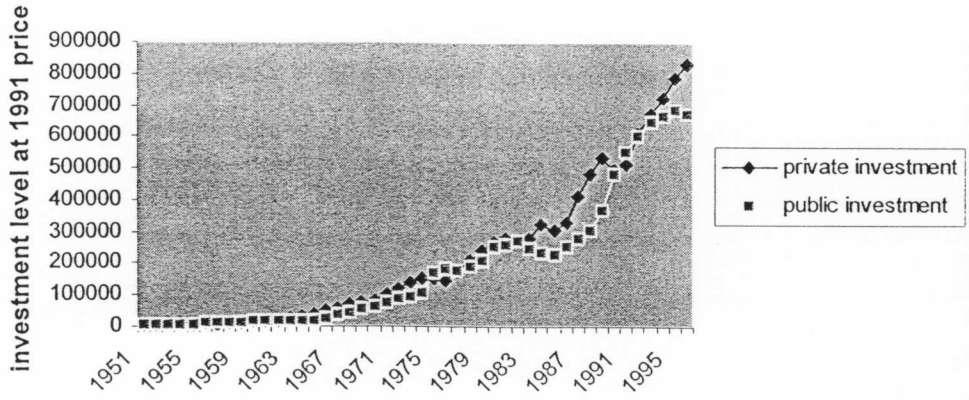
Fig.10 Trend in private and public investment levels in Korea at 1975 price (billion won)



Source: Major Economic Indicators for Korea statistical department in EPB

A generally positive association between public and private investment is evident in Korea (see fig-10). The real investment level of public and private sector moves the same direction, which suggests no apparent tendency for one sector to crowd out the other sector. The Taiwan's case is more impressive. The private enterprises investment and total public sector investment went hand in hand with strong positive association (see fig-11). It also exhibits almost 50 to 50 share of public and private sector investment throughout the period.

Fig.11 Trend in private and public investment levels in Taiwan at 1991 price (million NT)



Source: National Income in Taiwan Area

4.5. Human Capital Formation and Physical Capital Investment

Korea and Taiwan are still high performers in human capital development. The usual indicators of human capital development are much higher in these countries. Rodrik (1994) argues that the initial conditions can account for a large part of the countries economic performance since 1960. The primary school enrollment was virtually universal by 1960 where the norm for countries at their income levels stood at around 60 percent only. Korea had more than doubled the literacy rate compared to the norm, and Taiwan's literacy rate was one-and-half time as high. He found a positive and significant

effect of initial primary enrollment on economic growth and investment rates in his regression for sample countries.

As it can be observed from table-9, Taiwan and Korea are not only known for their initial achievement but also on their rapid build up of human capital that suits the subsequent demand for skilled manpower. Both countries achieved an unprecedented rate in high school and higher education enrollment. Korea increased its secondary school enrollment ratio from 27 percent in 1960 to 94 percent by 1985. Taiwan as well stretched its ratio from 30 percent to 76 percent for the same period. Higher education enrollment rate rose to 32 percent and 22 percent for Korea and Taiwan by 1985 respectively.

Table-9 Growth of Education Enrolment Ratios in Korea and Taiwan

	1960		1970		1980		1985		1990	
	Korea	Taiwan	Korea	Taiwan	Korea	Taiwan	Korea	Taiwan	Korea	Taiwan
Adult literacy	71	54	88	85	92	90	-	92		
primary	94	96	102	98	101	100	96	101	107	
Secondary	27	30	51		95		94	76	98	
Tertiary	5	3	7.9		14.1		32	22	39.2	
Vocational in ('000)	283	84.3	481	175.8		348.1	635	420.2	587	447.7

Source: World Bank and other different issues

The higher performance in education is practically associated with governments' deliberate push in both countries. Given the higher expenditure ratio to education and close coordinating of this sector by the governments, not only large quantity but also a pool of diversified skilled manpower was created. Both governments persuaded vocational education as means to supply sufficient technically skilled labor for the growing demand following rapid investment. This action was not random rather induced under consolidated manpower plan. Indeed, it reflects the pressing need for technically skilled manpower that, shoulder the rapid industrialization.

Wade (1990:190) has nicely presented in three ways the concerted efforts and transformation of educational system in Taiwan. "First, post-junior high school enrollments in vocational institutions expanded much faster than enrollments in academic institutions, raising the proportion from 40:60 in 1963 to 69:31 in 1986. At the tertiary level 55 percent students are now (i.e. 1990) in vocational colleges, 45 percent in more academically oriented universities. Second the proportion of tertiary students expanded from 24.6 percent in 1955-56 to 32.8 percent in 1985-86, while the proportion in humanities and fine arts fell from 15.8 percent to 9.1 percent in the same years. Finally the proportion of senior high colleges and university students in private institutions rose from 22 percent in 1960 to 58 percent in 1985."

This transformation and structural change of education system verify the intention of the government. The government of Taiwan introduced vocational high school in 1960 to provide the basic education necessary for the labor-intensive industries in the first phase of Taiwanese industrialization. As Taiwan started to move towards higher value added production in the 1980s, with increased demand for technical skills the government changed the ratio and increased the proportion of vocational schools in relation to the academic schools. As a result in 1980s there were seven vocational high schools to every three academic schools (Francis Green, 1997:13).

Korea is also a successful story in carrying out and providing vocational and technical education in line with the growing demand of skilled manpower. Vocational and technical education begins for about 40 percent of Korean students who successfully completed nine years of formal school at the elementary and middle school level. Non-academic high school consists of commercial (45%), technical (32%), vocational and comprehensive (20%), agricultural (2%), and Fishery and maritime (1%) schools[9] (Ministry of Education 1995).

In Korea, the private sector was also required to take some share, especially in the in-plant training system. Kim and et al. (1995:189) emphasize that the government decision

[9] Figures in parenthesis denote the share of each in total vocational enrollment in 1994

on vocational training requirements on private sector firms to expand the supply of skilled labor for HCIs. Consequently, the number of in-plant vocational trainees drastically increased and in 1976 reached an annual level of almost 100,000. Large numbers of workers continued to be trained from 1977 to 1980, averaging about 70,000 annually. The government also introduced a skill licensing system to encourage every Korean to possess at least one skill.

CHAPTER V

THE MODEL AND ESTIMATION RESULTS

5.1 The Model

The point of departure is the generalized accelerator model. The naïve accelerator model posits a certain fixed relationship between capital and output.

$$KP_t^* = \alpha Y^e_t \qquad (1)$$

Where KP_t^* = desired private capital stock

Y^e_t = expected output

α = Fixed proportion among factors (constant)

Desired capital stock (KP_t^*) is assumed to be affected by economic conditions. Introduction of time lag adjustment (due to lag in decision, building etc) in to the model gives the flexible accelerator version. Furthermore, by translating the stock to a flow concept in order to draw net investment function we obtain:

$$KP_t - KP_{t-1} = \beta_t [KP_t^* - KP_{t-1}] \qquad (2)$$

Assuming that the replacement is proportional to existing capital stock, the gross fixed capital formation of the private sector can be specified:

$$IP_t = \beta_t [KP_t^* - KP_{t-1}] + \delta KP_{t-1} \qquad (3)$$

In developing countries the gap between desired capital stock and actual investment as measured by the coefficient (β) is assumed to vary systematically with economic factors which, affect the ability of private investor to achieve the desired level capital stock. *The*

adjustment toward desired investment is mainly impeded by resource constraints in developing countries. Here is the conjuncture where market fails to coordinate and calls for government intervention.

I hypothesize that response of the private sector significantly depends on the following factors.

(i) Financial market (fund) conditions (F)

(ii) public investment (G)

(iii) foreign exchange accessibility (EX)

(iv) extent of skilled labor (SL)

The adjustment coefficient (β) is, therefore, assumed to be a function of the above four variables.

$$\beta = bo + \frac{1}{[Kp_t^* - (1-\delta)Kp_{t-1}]}(b_1F_t + b_2G_t + b_3EX_t + b_4SL_t) \qquad (4)$$

Following Coen[10] (1971) the combination of equation (3) and (4) gives:

$$Ip_t = [bo + \frac{1}{[Kp_t^* - (1-\delta)Kp_{t-1}]}(b_1F_t + b_2G_t + b_3EX_t + b_4SL_t)]\ [KP_t^* - (1-\delta)KP_{t-1}]$$

$$Ip_t = boKP_t^* - bo(1-\delta)KP_{t-1} + b_1F_t + b_2G_t + b_3EX_t + b_4SL_t \qquad (5)$$

Since desired capital is assumed to be certain proportion of expected output we substitute equation (1) in to (5) to obtain

$$IP_t = boY^e_t + b_1F_t + b_2G_t + b_3EX_t + b_4SL_t - bo(1-\delta)KP_{t-1} \qquad (6)$$

[10] Refer Coen (1971) "the effects of cash flow on the speed of Adjustment" in Tax incentives and Capital Spending for exclusive derivation of this equation

To eliminate the capital stock variable the substitution method following Blejer and Khan (1984) is used.

$$IP_t = \Delta KP_t + \delta KP_{t-1} \quad (7)$$

$$IP_t = [1-(1-\delta)L]KP_t \quad (8)$$

Where L is lag operator, $LKPt = KP_{t-1}$ and by simply inverting equation (8) we obtain

$$KP_t = \frac{Ip_t}{(1-(1-\delta)L)} \quad (9)$$

By the same process

$$KP_{t-1} = \frac{Ip_{t-1}}{(1-(1-\delta)L)} \quad (10)$$

Substituting equation (10) into equation (6) and introducing the error term gives the final equation:

$$IP_t = boY_t + b_1F_t + b_2G_t + b_3EX_t + b_4SL_t + b_5IP_{t-1} + U_t \quad (11)$$

$$\text{Where } b_5 = \frac{-bo(1-\delta)}{(1-(1-\delta)L)}$$

The basic model, following the hypothesis, to be estimated is equation (11). However, this model will be modified to incorporate relative price variables such as, real interest rate (RIN) and relative deflator of investment to GDP (PR). These variables are assumed to represent the effect of cost of capital on private investment decision. In addition, due to the time series nature of the model the inclusion of human resource variable seems inappropriate. The effect of human capital development on investment can not be

significantly felt in year by year approach. Hence, it was found to be insignificant and excluded from the estimation. The model employed for estimation is then: -

$$Ip_t = b_0Y_t + b_1F_t + b_2G_t + b_3EX_t + b_4RIN_t + b_5Ip_{t-1} + b_6PR_t + U_t \qquad (12)$$

5.2 The Data and Variables

The dependent variable is explicitly intended to make the private sector investment (IP). This is achieved in the Taiwan's case. However, for Korea due to lack of such pure private investment data, it is approximated by the non-residential business gross fixed capital formation. Korea's data includes the public enterprise's investment, though this share is much lower than the case in Taiwan.

Expected demand (Y^e) is approximated by real GDP in both countries. Real export (EX) is intended to capture both the external demand and the easing of foreign exchange constraint. For Korea due to lack of real export data in domestic currency I converted the export value in US dollar to Won by multiplying with annual average exchange rate and then deflated.

Government investment (G) by definition constitutes both public enterprises' investment and government general investment. For Taiwan I found both investments separately and summed to take total public investment. But Korea's public investment (G) is approximated by only the general government investment.

To evaluate the potential credit rationing effect of administered interest rates; a change in the quantity of domestic credit to the private sector is taken. The financial availability to the private sector is, thus represented by change in real banking system claims (credit) to the private sector (F) in both countries. To make this variable real, I deflated the nominal credit to private sector by investment deflator.

Two empirical representations of capital costs have been considered. The first is the relative price of capital goods (PR) which is based on the ratio of the investment deflator to the GDP deflator. It is hypothesized that this is a more realistic representation of the cost of capital to the firm in a more financially repressed developing economy than the neoclassical interest rate variable. This variable is constructed by simply taking the ratio of both deflators from standard sources.

The second capital cost variable is the real interest rate. Usually choice of this variable is difficult; since the official (administered) interest rates do not adequately reflect the market rate of interest and real cost incurred by the firms. Despite this limitation, the official loan rates, minimum rate of secured loan in Taiwan and general bank loan rate in Korea adjusted by inflation (PPI) for respective countries are employed.

All data used are annual, in domestic currency and expressed in real terms at 1990 and 1991 constant prices for Korea and Taiwan respectively. The regression covers the period from 1964 to 1995 i.e. more than 30 years. The main sources of the data for Taiwan are 'The National Income in Taiwan Area' and 'Taiwan Statistical Data Book' for different years. For Korea the main sources are Bank of Korea (BOK), Accounting for Rapid Economic Growth in Korea, 1963-1995 KDI and Korean Economy 1945-1995 KDI.

Unless otherwise specified, the variables employed in the regression are designated as follows:

IP: Real gross fixed capital formation by the private sector (assuming the difference between Korea and Taiwan in the context of explained above)

Y: Real GDP

G: Real government investment (total public for Taiwan but only general government investment for Korea)

EX: Real export

F: Change in real banking system claims (credit) on the private sector

PR: Ratio of investment deflator to GDP deflator

RIN: Real interest rate (minimum secured loan rate for Taiwan and general bank loan for Korea, both adjusted by inflation)

In the regression result tables variables which, start with the operator (L) represent log of the respective variables and (Δ) display differencing or change.

5.3 Investment Dynamics: An Error Correction Model

Regressions involving time series data are usually subjected to the possibility of obtaining spurious results. Such problem exhibits an extremely high R^2, high t-ratios but very low Durbin-Watson (DW). Hence, to make variables time invariant, it was customary to run regression on differenced variables. However, this practice is not with out problem. Differencing might result in a loss of information about the equilibrium relationship between the levels. While a model in differences gets round the estimation problem we face, it does so at the cost of not being able to discover the long-run relationship between the variables of interest.

Co-integration analysis allows us to avoid paying this price. Despite existence of non-stationary individual variables, the linear combination of these variables may be found to be stationary. Variables are co-integrated with one another if the residuals from the levels' regression are stationary. If variables are co-integrated then the levels regression provides robust results. Essentially, the logic behind co-integration is that econometric results are legitimate only when time series are stationary.

If the levels' regression is consistent, it is usual to proceed to estimation of the error correction model (ECM), which contains information on both the long-run and short-run relationship between the variables. The 'error correction term' is nothing other than the residual from the levels' regression. Error correction terms were used by Sargan (1964), Hendry and Anderson (1977), and Davidson et al. (1978) as a way of capturing adjustments in a dependent variable. The adjustments is then considered to depend not on

the level of some explanatory variables, but on the extent to which an explanatory variables deviated from an equilibrium relationship with the dependent variable.

Error correction models are particularly important for explaining a variety of long-run macroeconomic relationships, such as, investment function. Hence, the recent literature on co-integration provides a theoretical rationale for the empirical success of error correction models. Specifically, the levels' term captures the long-run equilibrium relationship between variables while the differenced term captures the dynamics. In our case the process by which firms move from actual to desired investment is hypothesized to follow an error correction process.

The dynamic model of investment of the error correction form gives the following equation:

$$\Delta LIp_t = b_0\Delta LY_t + b_1\Delta LF + b_2\Delta LG_t + b_3\Delta LEX_t + b_4\Delta RIN_t + b_5\Delta LPR_t + b_6\Delta LIP_{t-1} + b_7RES_{t-1} \quad (13)$$

Where $RES_{t-1} = b_7(LIp_{t-1} - b_8LY_{t-1} - b_9LF_{t-1} - b_{10}LG_{t-1} - b_{11}LEX_{t-1} - b_{12}LRIN_{t-1} - b_{13}LPR_{t-1})$[11]

Engle-Grnager Two-Step Procedure

One popular method for estimating an error correction model with co-integrating series is the Engle-Granger Two-Step procedure as advocated by Engle and Granger (1987). In the first step, the parameters of the co-integrating vector have to be estimated by running the static regression in the levels of the variables. Then, tests for co-integration has to be made at this first stage. Evidence of co-integration includes an R^2 that is close to unity at the levels stage, significant coefficients, a significantly non-zero Co-integration Regression Durbin-Watson (CRDW) statistic, and significant DF and ADF tests on the

[11] this is lagged residual from the levels' regression

residual from the levels regression. If the variables co-integrate, the coefficient estimates from this levels regression can be interpreted as the long-run multipliers.

The second step involves running regressions using stationary time series (i.e. the first differenced variables) and lagged residuals (RES_{t-1}) from the levels' regressions. In addition, lagged of all differenced variables including the dependent variable would be included in the unrestricted version. The lagged residual (RES_{t-1}) is assumed to capture the error-correction process as agents adjust for expectational errors about the equilibrium relationship. Both steps require only OLS, and the results may be shown to be consistent for all the parameters.

Prior to any estimation I tested the stationarity of each variables in the model for both countries. The common techniques for stationary test such as, Dickey-Fuller (DF) test, the Augmented Dickey-Fuller (ADF) test and the Cointegrating Regression Durbin Watson (CRDW) statistics are employed. These tests are done under the null hypothesis of existence of unit root I(1) or often known as random walk and I(2) for the first differenced variables. The result is reported below in table-10. Though the critical value of the first two tests are still debatable,[12] they provide good evidence, consistent with the CRDW test. According the result, all variables except the real interest rate variable (RIN) and change in real credit to private sector (F) are found to have unit roots (non-stationary at the level stage) for both Korea and Taiwan. This implies most variables are stationary after one differencing.

[12]and some times the DF and ADF give contradictory results in case of with only drift and with drift and time trend. Thus the CRDW might better help in decision making.

Table-10 Testing For Unit Roots: Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and Cointegrating Regression Durbin-Watson (CRDW) Tests

Taiwan	DF W/C		DF W/C & T		ADF W/C		ADFW/C & T		CRDW	
Variables	Ho: I(1)	Ho: I(2)	Ho: I(1)	Ho: I(2)	Ho: I(1)	Ho: I(2)	Ho: I(1)	Ho: I(2)	Ho: I(1)	Ho: I(2)
LIP	-1.2	-6.3	-1.4	-6.2	-1.17	-5.0	-1.6	-5.0	0.01	1.39
LY	-1.08	-4.5	-0.5	-4.6	-0.8	-4.2	-1.3	-4.2	0.01	1.48
LEX	-1.13	-6.4	-0.5	-6.4	-1.1	-3.6	-0.5	-3.7	0.01	1.48
LG	-1.0	-5.0	-1.0	-5.0	-0.8	-4.6	-1.5	-4.7	0.02	1.16
LF	-5.4	-8.6	-5.3	-8.5	-4.1	-6.0	-4.0	-5.8	1.75	2.8
LPR	-0.4	-5.5	-2.8	-5.8	-0.8	-4.9	-4.1	-5.2	0.08	1.45
RIN	-4.0	-6.6	-3.9	-6.5	-3.9	-5.9	-3.8	-5.8	1.36	2.40

*W/C refers with constant term and W/C & T refers with both constant term and time trend

Korea	DF W/C		DF W/C & T		ADFW/C		ADF W/C & T		CRDW	
Variables	Ho: I(1)	Ho: I(2)	Ho: I(1)	Ho: I(2)	Ho: I(1)	Ho: I(2)	Ho: I(1)	Ho: I(2)	Ho: I(1)	Ho: I(2)
LIP	-2.38	-4.75	-3.4	-5.03	-2.31	-4.86	-3.6	-5.48	0.02	1.78
LY	-0.29	-4.88	-2.0	-4.8	-0.27	-3.7	-2.3	-3.69	0.01	1.84
LEX	-4.3	-4.40	-3.2	-4.4	-2.4	-4.4	-2.6	-4.7	0.04	0.79
LG	-2.4	-3.48	-3.3	-3.4	-2.53	-2.98	-4.8	-3.0	0.04	1.32
LF	-2.30	-4.8	-2.8	-4.7	2.8	-3.4	-3.4	-3.4	0.69	1.59
LPR	-1.4	-4.7	-1.47	-5.2	-1.5	-5.2	-2.25	-6.0	0.05	1.44
RIN	-3.64	-6.96	-3.59	-6.8	-3.34	-5.1	-3.28	-5.0	1.13	2.47

*W/C refers with only constant term and W/C & T refers with both constant term and time trend

Critical values: DF and ADF with constant t = 2.95
DF and ADF with constant and time trend t = 3.56
CRDW test t = 0.50

LIP is log of real private investment
LY is log of real GDP
LEX is log of real export
LG is log of government investment
LF is log of change in real credit to the private sector
LPR is log of ratio of investment deflator to GDP deflator
RIN is real interest rate

5.4 Empirical Evidence for Taiwan

The cointegration statistic that have been constructed from the levels regression appear promising. The Cointegrating Regression Durbin-Watson (CRDW) test, which resulted from regressing the first difference of the residuals on a constant and evaluating the Durbin-Watson statistics, is significantly greater than zero. Both the Dickey-Fuller and Augmented Dickey-Fuller tests are sufficiently high to indicate the residuals are white noise. These results imply that the coefficients could be interpreted as long-run multiplier and existence of certain equilibrium relationship between private investment and the specified explanatory variables.

Equation 1.1 (in table-11) represents the investment model without restriction. All variables except the relative deflator are found significant with expected signs. This insignificant variable is then dropped in eq.1.2 and the result shows no important change in other variables except to some extent in the magnitude of the coefficients. All variables including the real interest rate remained significant. Further narrowing the investment model to capture only demand and government investment validates the robustness of the model.

In all cases the demand variable GDP has the largest coefficient followed by the credit availability. Export is the third important variable and since export also represents the foreign demand for domestic goods, we have clear evidence that demand got the lion's share in boosting private investment in Taiwan.

Public investment has also contributed positively and significantly. Its coefficient remained high. This variable is the sum of both general government and public enterprises' investment. Hence, we can at least disprove the crowding out argument and at most the existence of crowds in for Taiwan. Interest rate is also found to be significant in all equations.

Table -11 *Taiwan* The Cointegrating Vector for Private Investment 1964-1994
- Dependent Variable log of Private Investment (LIP)

	Eq.1	Eq.2	Eq.3
C	-2.0 (-1.6)	-0.93 (-1.05)	-0.039 (-0.04)
LY	0.63 (4.2)**	0.57 (4.0)**	0.42 (2.8)**
LEX	0.24 (2.25)**	0.20 (1.95)*	0.30 (2.7)**
LG	0.15 (2.2)**	0.18 (2.7)**	0.18 (2.4)**
LF	0.41 (1.8)*	0.40 (1.8)*	
LPR	0.60 (1.2)		
RIN	-0.004 (-1.8)*	-0.006 (-3.1)**	
R^2	0.99	0.99	0.99
CRDW	2.0	1.8	1.54
DF	-3.3	-3.5	-3.1
ADF(1)	-3.1	-3.5	-5.2
ADF(2)	-2.9	-3.3	-4.2

-numbers in parenthesis are t-ratios
*significant at the 10 percent level.
**significant at the 5 percent level.

The differenced dynamic model results are reported in table-12. The lagged residual RES(-1) from the levels' regression is included to capture the process by which agents adjust to prediction errors in the last period. Ideally it is possible to include several lags of each differnced variables. But since the data are annual and to preserve degrees of freedom only one lagged difference for all variables including the dependent variable are accounted for. The result of the unrestricted version is given in equation 2.1. Reparameterization is then made according the significance level of the results obtained.

Table-12 *Taiwan* - Results of Dynamic Equations for Private Investment - dependent variable is the difference of the logarithm of real private investment (ΔIP)

	Eq.2.1	Eq.2.2	Eq.2.3	Eq.2.4
C	-0.26 (-3.3)	-0.16 (-2.8)	-0.12 (-3.1)	-0.73 (-1.8)
ΔLY	1.92 (3.05)**	1.19 (1.9)*	1.O4 (3.87)**	0.82 (2.6)**
ΔLY(-1)	1.7 (2.34)**	0.81 (2.4)**		
ΔLEX	-0.009 (-0.05)			
ΔLEX(-1)	-0.05 (-0.31)		0.21 (2.6)**	
ΔLG	0.33 (3.5)**	0.32 (3.3)**	0.31 (3.3)**	0.25 (2.3)**
ΔLG(-1)	-0.16 (-1.9)			
LF	0.33 (2.7)**	0.34 (2.67)**	0.38 (3.01)**	0.36 (2.4)**
ΔLCP(-1)	0.21 (1.2)			
ΔLPR	-0.19 (-0.6)	-0.83 (-2.5)**	-0.89 (-2.9)**	-0.73 (-2.1)**
ΔLPR(-1)	0.65 (2.01)**			
ΔRIN	-0.002 (-1.4)	-0.005 (-3.4)**	-0.005 (-4.1)**	-0.005 (-3.6)**
ΔRIN(-1)	-0.007 (-0.55)			
ΔIP(-1)	-0.35 (-2.06)**			0.13 (1.0)
RES1(-1)	-0.72 (-3.15)**	-1.14 (-7.6)**	-1.16 (-7.87)**	-1.28 (-7.2)**
R^2	0.93	0.85	0.85	0.80
ADJ.R^2	0.84	0.78	0.78	0.72
DW	1.47	2.05	2.05	2.19

-numbers in parenthesis are t-ratios
*significant at the 5 percent level.
*significant at the 10 percent level.

The results in the dynamic equation are promising and have good diagnostic tests. The error correction term is significant and with expected negative sign in all equations. This ensures the existence of equilibrium within the specified variables. It also provides strong evidence that agents carried out adjustments for unanticipated changes. Three important changes can be observed from these results with regard to the levels' regression. First, the relative deflator of investment to GDP variable, which represents the relative change of

cost of capital, found to be significant with larger and negative expected coefficient. This may imply that it is the change of the relative deflator important in affecting investment decision rather than the level of relative deflator.

Secondly, change in export earnings is found to affect private investment at one-year lag. This may imply that in Taiwan export earnings were more important in affecting investors' expectation of future demand. While the other implication i.e. as a way to ease foreign exchange constraint was not that much significant suggesting that investors in Taiwan didn't much constrained by foreign exchange availability problem.

Thirdly, the inclusion of change of lagged GDP exhibits a significant and positive effect in the dynamic model. Thus, output growth affected investment at both current and lag. This has strong implication how important expected demand was on private investment decision making. The significance of lags in export and GDP (demand) reflects the reality in firms' decision making. The lag is a common case, because firms would first respond by raising their capacity utilization for the increase in demand. Then firms later realize to increase the capacity (i.e. investment) itself.

Credit availability has more or less similar magnitude of coefficients in both estimations. It was crucial factor in affecting investment decision positively. The results also display stronger positive contribution of Public investment on private investment. Hence, this evidence supports at least the absence of crowding out of public investment on private investment and at most crowds in.

5.5. Empirical Evidence for Korea

The first stage co-integrating levels' regressions for Korea is presented in table-13 below. The cointegration statistic that have been constructed from these levels regression appear promising. The CRDW test is significantly greater than zero. Both the Dickey-Fuller and Augmented Dickey-Fuller tests are also sufficiently high. These results imply that some equilibrium relationship exists between private investment and the specified explanatory variables and the coefficients could be interpreted as long-run multipliers.

Equation 1.1 constitutes all the relevant variables in the model and most of them are significant with expected sign. However, the government investment and real interest rate variables are less significant. After having this result, I plot the residuals and found an outlier in 1966. This year is known for the surge of savings in Korea following the 1965 reform of interest rate. Moreover, in this year foreign loan increased by more than four-fold due to government guarantee arrangement. Consequently, the inclusion of dummy variable for this year (D1966) provides impressive result and all variables become significant with expected signs. I further tried to incorporate the lagged dependent variable in the regression. Both government investment and interest rate got insignificant and unexpected sign suggesting the instability of these variables.

In all cases GDP has been found to be the most important factor in explaining the rapid private investment growth in Korea. The next significant variable is the relative deflator that represents the cost of capital. In almost all equations it exerts a large magnitude and negative coefficient implying firm's sensitivity to expected return on their investment.

The credit variable has also captured a positive and large coefficient suggesting a strong effect of credit availability on investment. The export variable is significant in all cases. This variable was considered to show the effect of foreign demand and easing of foreign exchange constraint for investors. Considering the rise in exports would create future expectations for investors, demand-side analysis of the variable, the result amplifies the

importance of demand in boosting investment in Korea. In addition, export as a source of foreign exchange is also believed to have positive effect on investors, since most capital goods need to be imported.

Table-13 ***Korea*** Co-integrating Vectors for private Investment 1964-1995

(dependent variable log of private investment (LIP))

	Eq.1.1	Eq.1.2	Eq.1.3	Eq. 1.4
C	-6.5 (-4.5)	-5.3 (-4.7)	-4.7 (-3.4)	-4.0 (-3.9)
LY	1.0 (6.8)**	0.85 (7.2)**	0.65 (3.7)**	0.57 (4.3)**
LEX	0.21 (2.8)**	0.20 (3.4)**	0.18 (2.8)**	0.18 (3.6)**
LG	0.14 (1.0)	0.25 (2.4)**	-0.24 (-1.4)	-0.07 (-0.5)
LF	0.59 (2.5)**	0.53 (2.86)**	0.62 (3.0)**	0.56 (3.6)**
LPR	-0.98 (-2.1)**	-1.1 (-3.2)**	-0.63 (-1.5)	-0.83 (-2.7)**
RIN	-0.003 (-1.3)	-0.005 (-2.76)**	0.003 (1.1)	0.004 (0.18)
D1966		0.44 (4.3)**		0.39 (4.5)
LIP(-1)			0.61 (3.1)**	0.49 (3.3)**
Adj. R^2	0.99	0.99	0.99	0.99
DW	1.52	1.52	2.2	1.7
CRDW	2.3	2.49	2.8	2.3
DF	-5.0	-4.0	-7.3	-4.5
ADF(1)	-5.0	-3.6	-6.3	-5.1
ADF(2)	-2.6	-3.1	-3.2	-3.5

- Numbers in parenthesis are t-ratios
*significant at the 10 percent level.
**significant at the 5 percent level.

Government infrastructure investment is also found to exert significant and positive effect (taking the significant result) on private investment though it exhibits some instability. One justification for the poor performance of this variable may be due to competition between public enterprises and general government investment since the former is included within the dependent variable while the latter is explanatory variable. Real interest rate is insignificant in all equations except in (eq-1.2). Indeed its magnitude

is also negligible. This result is consistent with other findings implying that in a credit rationing economy this variable has less ability to affect investment decision.

The differenced dynamic model results are reported in table-14 below. The lagged residual RES(-1) from the levels' regression and only one lagged difference for all variables including the dependent variable are accounted for the same reason cited above. The result of the unrestricted version is reported in (eq-2.1). Reparameterization is then made according the significance level of the results obtained.

In general the results are not bad. But the export and in some extent the government investment do not perform well in the dynamic equation. Reparametrization of the unrestricted equation provides almost consistent results with the levels' regression, except for export. The change in real export, in this dynamic equation context, provides poor result even at lagged level. Probably the poor performance may be associated with low data quality.

According to the dynamic model the largest coefficient is still the differenced GDP followed by relative deflator of investment goods to GDP. The change in real credit takes the next rank as it was in the levels' regression. Government investment in the later equations shows positive and consistent coefficient. The real interest rate variable is significant but with small coefficient.

All equations in this dynamic model provide strong evidence of the appropriateness of error correction framework. The lagged residual term (RES_{t-1}), is always significant and with expected negative sign suggesting equilibrium relationship between private investment and the specified explanatory variables. The large magnitude of the error correction term also indicates that agents adjust their expectations swiftly to unanticipated changes.

Table-14 *Korea* Results of Dynamic Equations for Private Investment
(Dependent variable is the difference of the logarithm of real private investment (ΔIP))

	Eq.2.1	Eq.2.2	Eq.2.3	Eq.2.4
C	-0.13 (-1.5)	-0.10 (-1.4)	-0.10 (-2.6)	-0.9 (-2.0)
ΔLY	1.69 (3.1)**	1.4 (3.4)**	1.36 (3.7)**	1.36 (3.28)**
ΔLY(-1)	1.08 (2.08)**	0.44 (1.1)		0.10 (0.35)
ΔLEX	0.07 (0.57)	0.14 (1.3)		-0.07 (0.35)
ΔLEX(-1)	-0.18 (-1.2)			
ΔLG	-0.14 (-1.0)	-0.16 (1.6)	0.29 (2.8)**	0.23 (1.8)*
ΔLG(-1)	-0.23 (-1.3)	-0.15 (1.5)		
LF	0.49 (1.9)*	0.61 (2.9)**	0.59 (3.5)**	0.49 (2.2)**
ΔLCP(-1)	0.28 (0.99)			
ΔLPR	-0.90 (-1.7)*	-0.68 (-1.7)*	-0.82 (-2.5)**	-0.97 (-2.2)**
ΔLPR(-1)	1.8 (3.4)**			
ΔRIN			-0.007 (-3.6)**	-0.006 (-2.6)**
RES(-1)	-0.80 (-4.6)**	-0.67 (-4.7)**	-0.37 (-2 5)**	-0.35 (-2.0)**
D1966		0.38 (4.7)**		
R2	0.87		0.95	0.94
ADJ.R2	0.73		0.91	0.89
DW	2.0		2.45	2.4

-All passed through the ML method for reducing serial correlation.
*significant at 10 percent level.
**significant at 5 percent level.

5.6 Summary of the Resulsts

The investment model constitutes three main components: demand, cost and quantity variables such as credit, infrastructure and foreign exchange. According the results found for both countries and both approaches of estimation (level and dynamic), the model performs well. In both countries the lagged residual term, which carries the error correction mechanism, is always significant and with expected negative sign. In general, the error correction model seems to be an appropriate means of capturing the agents' adjustment to unanticipated changes.

In both countries demand (Y) has been found the most important factor to influence private investment decision making. This is consistent in both the levels' and dynamic regression. The importance of demand is further magnified with the consideration of export (EX) as a variable that approximate foreign demand for domestic production. Moreover, this is supported not only by the obtained large magnitude of the coefficient but also by the unwavering growth of GDP and exports in these countries.[13]

All results unequivocally provide a strong evidence of the crucial role of quantity of credit (F). The coefficients are large and positive. Taking in to account the higher annual average growth of credit to private sector, quantity of credit affected the private investment quite significantly. In both countries, credit rationing was an important instrument of the governments' industrial policy.

Government investment (G) has also been found to have positive impact on private investment. For Taiwan the government investment includes both general government and public enterprises' investment. Thus, the results indicate in Taiwan not only the infrastructure investment but also non-infrastructure investment was complementing rather than competing private investment. In the Korea's case despite the variable only stands for general government investment, the results show some inconsistency. But if we consider the significant coefficients, public investment shows positive and even large

contribution. The positive coefficients fairly indicate that at least crowding out did not occur and at most the existence of crowding in for both countries.

The coefficient of the relative cost of capital goods (PR) is found to be quite high. But we need to be cautious that large coefficient may not imply large actual effect. Despite its large coefficient, the actual movement of this variable for the given period was gradual (see fig-7). Thus, the realized effect on private investment might not that much high. But one thing is evident, investors were more sensitive to changes in relative prices. In both countries this variable has shown declining trend for the given period. More or less the relative price variable was subjected to government intervention through financial and tax policies and protection of domestic market.

The relative price variable consistently outperforms the real interest rate (RIN). This is due to that the relative cost of capital goods variable takes explicit account of not only the cost but also the expected return from the incurred cost. Firms are expected to make their decision on evaluation of both factors and goods market. It is not uncommon to find small effect of interest rate since, in a repressed financial system it did not play a market-clearing role. Nonetheless, this variable better performed in Taiwan than in Korea. This is because in Taiwan real interest rate remained higher most of the time than in Korea.

To sum up private investment in Taiwan and Korea were significantly determined by expected demand i.e. the growth of the economy and change in export demand. Credit availability and public investment were crucial. Private investment was also sensitive to the relative price of investment goods. Governments in these countries, used both direct (non-price) and indirect (price) mechanism to affect private investment decision. Hence, one very important conclusion that can be made is that, these governments did not only use the direct intervention but also they manipulated the market mechanism and price incentives through their control on relative prices to promote and guide investment.

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[13] The actual effect need to be drawn not only looking the coefficient but the product of the coefficient and average growth rate of the variable in the given period.

CHAPTER VI

CONCLUSION AND LESSONS

The spectacular economic performance of East Asian countries has attracted attention of the whole world. Korea and Taiwan, as part of this category, have successfully industrialized their economy within three or four decades. These countries grew at consistent and a remarkable rate. Average growth of real GDP for 1964-1990 was 8.5 percent and 8.7 percent for Korea and Taiwan respectively.

The rapid and persistent accumulation of physical capital in both countries is one of the special phenomenons and that account a large portion of the economic performance. Investment rates as measured by the ratio of GDP are almost certainly unparalleled in elsewhere outside the East Asian Countries. Taiwan's annual average rate of gross investment was about 22.3 percent and that of Korea about 27 percent for the period 1964-1990.

Main concern of this paper is to explore what important factors can explain the notable rate of investment particularly by the private sector. Moreover, it seeks to identify in what form and extent had the governments of both countries affected these factors. The most heated debate of East Asian experience in this regard has been about the role of government. The controversy ranges from getting 'fundamentals' or 'prices' right to 'development plan' as responsible for the rapid and high investment rate. These differences have been substantiated in empirical works as a contrast between quantity variables and relative prices. It is obvious that both governments intervened in the market to promote investment in a concerted manner. The most important point then, should be to see whether these interventions were proper and resulted with intended goals.

Investors in both countries depended largely on borrowing for external financing. The contribution of capital market was almost negligible. Both governments intervened in the

market to channel financial resources to investors. They mobilized savings through innovative institutional arrangements. They rationed the available credit on priority basis to preferred sectors. And interest rate was also controlled much lower than market rates, even some times at a negative real rate of interest. Thus the credits provided was with subsidy element.

These governments subsidized the private investment in other several ways. The incentive structure was so complex, export promotion being the main component of the incentive target. Both governments employed diversified tax structure to lower the capital cost. They reduced and maintained lower relative price of capital goods to output through tariff, tax and other polices such as domestic market protection. Risk sharing was also very important scheme to encourage and guide private investors in preferred sectors, particularly in Korea.

Public sector investment had contributed significantly to the rapid capital accumulation. Particularly, in Taiwan share of public sector (sum of both public enterprises' and general government investments) were almost 50 percent of the total fixed investment. Korea's public sector investment was not less significant, but the government tended more to push private investors through subsidy and risk sharing in contrast to Taiwan. Both governments endeavored to increase the number of skilled manpower that meet investors demand, with special emphasis in vocational education.

Apart from the above discussion, the study provides empirical evidence on the determinants of private investment in Taiwan and Korea for the period 1964-1995. The private investment model employed constitutes three main components: demand, cost (price variables) and quantity variables as determinants of private investment. The common problem of spurious correlation in investment functions is addressed by testing the time series for stationarity and insuring that residuals from the econometric estimation are white noise. Two step estimation; regression at levels and dynamic model of the differnced variables is employed. The use of these two different estimation techniques

helped to confirm the validity of the model. From these estimations the following summary can be forwarded:

(i) In both countries the private investment has been largely affected by expected demand. The economic growth itself positively contributed in boosting private investment. This effect has been realized not only at current but also at lagged. In this regard governments' intervention was important through prospering domestic economy.

(ii) The importance of expected demand, as a determinant for investment, is further magnified by the finding that exports exert positive and significant effect on investment in both countries. Hence, it is evident that these countries' export oriented strategy has contributed to the high and rapid rate of private investment.

(iii) The findings unequivocally provide a strong evidence of the crucial role of quantity of credit on private investment. In both countries credit rationing was an important instrument of the governments' industrial policy. Hence, both governments lifted up investment by raising availability of fund through saving promotion and other policies. They guided investment by directing credit to preferred sectors. Essentially, the credit allocation embodied subsidy element since it was also provided at lower rate of interest than market rate.

(iv) Despite the classical argument of crowding out effect of public investment on private investment, this variable (for Taiwan it is sum of both public enterprises' and general government investment) captures positive effect in both countries. This implies that public sector investment has reduced cost for private firms and/or increased demand to private firms' output and/or provided necessary inputs at lower cost i.e. complimentary relation. The positive coefficient fairly indicate that at least crowding out did not occurred and at most existence of crowding in.

(v) The relative price of capital goods to output found to be significant and negative with large coefficient, implying that the lower this ratio the more firms tend to invest and vice versa. According to the findings, investors were highly sensitive to movement (changes) of this ratio. The relative price of capital good outperforms the real interest rate. This is because it explicitly takes in to account not only the cost to invest but also the expected return from the incurred cost.

The cost of capital relative to the price of output has declined significantly throughout the sample period except to few fluctuations during certain external shocks. This was due to combination of lower tax liability (including tax exemptions to import some of the capital goods), and domestic market protection from foreign competition. This implies that both governments promote and guided private investment, not only through direct (non-price) mechanisms but also by wisely manipulating market forces and price incentives through their ability to control the relative prices.

To sum up, Korea and Taiwan able to raise their investment and grew at exceptional rates. The private sector performed well toward this objective. Governments facilitated, promoted and guided the private investment in concerted endeavor. They mobilized, subsidized, shared risk and protected the private sector to pave the road to industrialization. Hence, it is inappropriate to deny the contribution of both market forces and public policies. Rather a synergetic connection between the private sector and public system with government setting rules and influencing decision-making of the private sector was responsible for the rapid investment and the success of the economy as a whole.

Other developing countries can learn a lot from this 'contest-based' investment coordination and government supports. However, it is not easy to replicate the experience due to new developments in the international market, in addition to the commonly known resource impediments. Probably one and major constraint, nowadays, for developing countries is the WTO arrangement in the name of 'free' competition. According to this

arrangement the developing countries are not allowed to subsidize and protect their private sector due to the safeguard and antidumping rules. They can not use the available technology at lower cost under the intellectual property rights rule, etc.

However, one thing is clear. In developing countries financial markets are imperfect, economic and social infrastructures are so poor, international competition is quite difficult for the underdeveloped domestic private sector, domestic demand is constrained by low per capita income. In general, in developing countries the road toward rapid and high private sector investment is unpaved due to several impediments. Improving investment climate or secured property rights alone, as claimed by neoclassicist, can't solve the coordination problem. Hence, investment in developing countries can not be left for the market alone.

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