GOVERNMENT POLICY IN HUMAN CAPITAL ACCUMULATION AND TECHNOLOGY TRANSFER: THE CASE OF KOREA

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THESIS

Submitted to
KDI School of International Policy and Management
In partial fulfillment of the requirements
for the degree of

MASTERS OF GROWTH AND DEVELOPMENT STUDIES

Department of Growth and Development Studies

1999

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ABSTRACT

GOVERNMENT POLICY IN HUMAN CAPITAL ACCUMULATION AND TECHNOLOGY TRANSFER: THE CASE OF KOREA

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Korea has achieved remarkable economic growth in the last three- to-four decades. Its economy transformed from poor agrarian level to world industrial nation within a short period. Many scholars have different views in explaining how this miraculous development occurred. However, there are some stylized facts that all agree with out difference. These facts include the government policies that put prime importance on the development of human capital, outward-looking growth strategy and the acquisition of foreign technologies through trade and the strong institutions adopted by government; each of which reinforce each other. In the early 1960s, even before the economic take off, Korea had a well-educated labor force. This increased the success in export promotion development strategy and conversely trade increased the demand for human capital, thereby increasing the return from its investment.

This study attempted to explore the government policies that contributed to rapid success in expansion of human capital and technology transfer. And the relation between per capita income growth, availability of threshold human capital, and outward-looking growth strategy. The result for empirical estimation made using time series data for period 1963 to 1993, shows that they have positive and strong relation. The same estimation made for seven high performing East Asian economies show also the same association. This all depicts that early investment in people is more profitable than any other investment in elsewhere.

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ACKNOWLEDGEMENTS

I am highly indebted to my advisor professor Ju-Ho Lee for his constructive comments starting from the preparation to submission of final draft. I also wish to express my appreciation to professor Sang Woo Nam, head of the department of Growth and Development Studies, who enrich me for developing clear understanding of Koran economic development and for his unreserved support for my thesis preparation.

I would like to express my thanks to the Daewoo and Keagnam Enterprises for covering my education and living expenses in Korea besides providing notebook computer to facilitate my work. I would also like to give my thanks to Professor Bobae Park(MOE), Professor Kyung-He Sung, Mrs. Kim Eun Ju (KEDI), and to KDI School and KDI librarians who cooperated in providing required materials.

I also express my indebtedness for my mother Tsedal Giru, to my sister Abainesh Atumo, to my daughter Lemlem Tadesse and to my son Lidetu Tadesse who endured for the one and half year of my absence in their lives.

Finally my thanks goes to all my Korean and Ethiopian friends, who supported me materially and morally.

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Chapter One

Review Summary

Korea was one of the poorest countries in the world immediately after the Korean War. Even in 1960, after the damage inflicted during the war has been repaired, Korea's per capita income was still only US $80; at the time, which lagged behind that of many of African countries[1]. From 1963, however, after adoption of outward-oriented development strategy, Korea entered a period of sustained high economic growth path. As a result of which it developed a level of newly industrializing economies by 1970s. The Korean economy reached self-sustaining growth by mid 1980s. In the 1995, the nation GNP per capita exceeded US $10,000, while many countries that were at equal level had no significant change and still remained poor.

This extraordinary economic development attracted the attention of both developing and even developed countries. It was the question of all what was the secret to this "miraculous" growth. Identifying the factors behind the Korea's fast growth is a task of principal interest to both policy makers and academic researchers.

Many economists and scholars have different views as how this "miracle" occurred. The debate between neo-classical and revisionists views are main parts of controversies. The adherent of neoclassical view stress that the success of Korea attributed to reliance on market forces, minimization of price distortions, orientation towards international trade and absence of other discretionary policies, and focus on investment on human capital. In contrast, the revisionist view followers argue that intensive market intervention of government using expanded incentive and industrial targeting policy, commitment in accumulation of human capital, and other pragmatic government policies have been contributed for rapid success rather than free market

[1]. Including Gahanna and Kenya had higher than Korea, not to mention Latin American countries

mechanism[2].

The revisionist view appears to be gaining theoretical support. The government had friendly relation with market forces in the 1960s, played more of indicative role, and in the1970s government was played strong role in rationing resource to strategic industries promotion, since the 1980s more liberal role was adopted. In all these periods the government intervention was consistent with promotion of investment and saving, export, and with expansion of industrial manpower.

The rapid growing Korean economy used many of the policy instruments as other developing countries, but had great success. Thus it is important to explore which policies were contributed to this rapid growth. It is partly result of government policy that put heavy weight on human capital investment, outward-oriented growth strategy, and acquisition of superior foreign knowledge through linking its economy to international market.

In Korean case, it is universal fact that the prime importance on education by government and society from the very beginning in combination with other appropriate economic policies has played a key role. Lacking other natural resources, Korea had utilized abundant well-educated human resources for its continuous economic growth. Educational development has taken place early and more rapidly than other sectors of the economy[3]. As the result, Korea achieved universal primary education in the late 1960s and secondary in the mid-1980s. Thus Korea education has been able to meet not only high level of social demand for education, but also manpower need of rapidly growing industrial sector. This has been made possible through government's consistent upgrading the sector based on prevailing demand for labor, budgetary commitment, adoption of responsible institutions for policy reform, and attracting private sector to participate in provision of educational service using different incentives.

The Korean government played detrimental role in acquisition and diffusion of best foreign technologies to maintain sustained long-term economic growth. Although the private sector has played the dominant part in acquisition, the government facilitated by easing the financial, human, and establishing institutions responsible for

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(Kim, 1998)

[2].Yoo,jungho, 1997.Neoclassical Vs Revisionist view of Korean Economic Growth Development discussion paper no.588.Harvared Institute of international development.

technology acquisition, adoption, and diffusion mainly at early stage of development when private sector is not strong enough to participate.

We should note that the high level of physical and human capital formation may be a necessary condition for sustained rapid growth of output but it is not sufficient condition. Rather utilizing human and physical capital in the activities that yield high returns on the prior investment is important to growth as accumulation of productive assets. Accumulation human capital as other productive assets is necessary condition for economic development however utilizing in productive way is equally important as accumulation. Korea's policy measures were successful in coordinating these two conditions in way that has high return. i.e., rapid growth in labor demand relative to supply, particularly for skilled labor in industries made labor to be employed in areas where he/she trained that there skills are most productively utilized.

These all were successful in case of Korea because of adoption and implementation of appropriate economic policy that generated positive interaction between human capital, physical capital, and knowledge. Thus long run economic growth is possible only when the human capital and economic growth support each other. Thus, the rapid economic progress and human capital accumulation of Republic of Korea is a result of the government's policy measure which focus on early commitment to basic education, outward-looking growth strategy, and acquisition of foreign technology. This hypothesis has thee interrelated basic components.

First, early government commitment in compulsory primary education and later broad based secondary education made every labor force in the nation to have certain set of knowledge and belief. It improved communication and thereby increased productivity. Also, from dynamic context, it provided young population with basic education at low wage for early labor intensive industry.

Second, Outward-looking growth strategy: traditional concern for education alone does not guarantee accumulation of high skilled labor essential for long run growth. It is promotion of export that raised the demand for educated labor and increased the return from education. This in turn was successful because of growth in income that enhanced spending on education both for government and family. That is, change in demand and supply of education due to change in income. In other word,

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[3].Sung-Jcon Paik,1998. Education finance in Korea. KEDI

export promotion increased the return from education investment and conversely education increased export gain.

Third, acquisition of the best practice advanced foreign technology: the sustained and fast progress of Korea would not been effective without continued efforts to adopt and master best practice technologies which undoubtedly needs high skilled human capital to acquire, adopt, and diffuse either for existing one or for innovation. Besides this, conducting R&D inherently requires capable skilled researchers. Hence, subsequent adoption and implementation of appropriate government policy created strong interaction improving productivity and thereby whole social welfare.

In short, accumulation of human capital could be accelerated with international trade, which expands and diversifies benefit from its investment. Participation in the international trade force to improve or invent new technologies in order to withstand the fierce competition in the world market in order to survive. That again dependent on accumulation effective human capital (potential scientists and engineers) who are capable of conducting effective R&D.

On the bases of this concept this paper tries to analyze the government policy and strategies that lead to great success in both human capital accumulation and technology acquisition within short period of time. The paper has six main chapters. First chapter deals with the summaries of the paper. The second tries to explore theoretical background on human capital accumulation and economic development. The third part is the central part of the thesis where some important policy measures were explained. The experiences of all Asian economies explored, how they were able to accumulate so fast. The fourth part deal with contribution of outward looking growth strategy in accumulation of human capital and technological progress. This part takes the export success as engine for rapid accumulation absorbing all skilled persons and raising the return from investment in human capital. The fifth part tries to find out empirical evidences using econometric methods. The last part devoted for policy lessons that we can draw from Korea as well as other East Asian economies for other less developed countries like Ethiopia.

Chapter Two

Literature Review on Human Capital Accumulation And Economic Development

2.1 Overview of Growth Theories

Why we are so rich and they are so poor? How is it possible to have certain level of economic growth for low-income countries and how developing countries sustain their economic development in the long run? What determine long term growth? What kind of policy-mix appropriates to enhance economic progress? These are every time questions those economic planners ask themselves in order to adopt and implement economic policies. They have no one consolidated answer, since all economies are different in number of factors.

The World consists of rich economies in one side and extremely poor economies on the other side, which even fail to feed their population. Some economies are growing rapidly, where others are not growing at all – many country have remained seemingly in desperate growth path for relatively long period time. The causes for sustained progress or for prolonged stagnation correlated to various economic, social, and political factors; including many that affected by government policies[3]. These observation have led the current generation of growth theorists to formulate model that explain what influences per capita income growth. Neoclassical and endogenous or 'new' growth theories are the major components of them.

Neoclassical growth theory, as developed by Solow (1956) and his followers, focus on physical capital accumulation and emphasis in technological progress as ultimate driving force behind sustained economic growth. In this model, the per capita income of economies would tend to converge to the same level over time, as lower income nations grew faster. Their presumption was that the additional investment in

[3] Jones, 1997. Introduction to Economic Growth

capital stock for economies with an initial low capital-labor ratio would have the high marginal return of capital. Then if constant fraction of the income generated by a new piece of equipment is saved, the gross investment in new capital goods may exceed the amount need to offset depreciation and to equip new members of labor force. Overtime capital per worker will rise, which will generate a decline in the marginal product of capital. But if the marginal product continue to fall, the saving generated by the income accruing to the new capital also fall, and eventually be only sufficient to replace worn-out machinery, and equip new workers. At this point the economy enter to stationary state with unchanging standard of living; additional investment vanish over time.

This view flourished in the 1950s and '60s and many early economists used as base for development policy recommendation. At the period belief was that through large injection of physical capital into production process of poor nations and slow population expansion would poverty reasonably be eradicated. The rapid growth of some countries like Japan in the post II World War period was put hopeful prognostication at the time. Their belief was low income countries converge (catch up) developed countries. It seems to fit to East Asian and Pacific countries, but for regions like Sub Saharan Africa it has no relevance where have experienced the worst over all growth performance. The existing fact shows, countries already attained high income and output, are embarked on high growth path, and tend to grow faster. The income gap widening amongst poor and rich nations rather shrinking. The model fail to explain the causal factors influence per capita income growth. As a result there has been calls for modification of its restrictive assumptions since the model introduction[4].

Since late 1980s and early 1990s the view on economic growth was changed. Neoclassical restrictive assumption like perfect competition, constant return to capital, constant labor force growth, the same level of saving, exogenous technological progress assigns small role to other factors. The recent new growth theory by Romer (1986) and Lucas (1988) has focused on the role of human capital from the outset as the main source of increasing returns and divergence in the growth rates between developed and developing countries. The model has been refined and extended further

[4]. Fore instance, Solow(1959) himself introduced a model that allowed for the embodiment effect between investment and technological progress. Arrow (1962), suggested potential of learning by doing as way of accounting for economic growth.

by Romer (1990), Rebelo (1991), and stocky (1991). Dynamic spillover effects of export expansion by Grossman and Helpman (19991) which emphasizes that, when investment takes place under increasing return to scale, the marginal product of capital need not decline over time. Hence, the incentive to accumulate capital may persist for successive periods, sustaining a steady state of growth.

Recent study by Mankiw, Romer, and Weil (MRW, 1992) within framework of neoclassical model found significant portion of growth not explained when proxy for human capital not incorporate (the 'residual alone account for more than 50%). When the Solow model augmented with human capital, saving and population growth, it explained more than 80 percent. That is, the residual significantly falls. As MRW demonstrated in their paper, higher saving and lower population growth lead to a higher level of income and hence to higher level of human capital. Again higher level of human capital accumulation also will lead to higher income. This indicates that high income and high human capital are complementary to each other. And it believes that availability of stock of people as real motive force for economic progress. In this theory of what increases productivity is not an exogenous factors, but 'endogenous' one – related to behavior of people responsible for the accumulation of productive factors and knowledge.

The economists had long assumed that the main component of county's productive wealth is physical wealth. But according to World Bank (1996) assessment for 192 countries, physical capital on average accounts for only 16 percent of total wealth. More importantly, natural capital accounts for 20 percent. And the remaining 64 percent account for human capital, which is dominant share and much higher than any capital share. This result is the same to Jorgenson (1994), estimate of American economy. The dominance of human capital is particularly high in high-income countries. But in low-income nations, still more than half of their wealth from natural resource. Beside this the model suggest, simple accumulation of capital (either human or physical or both) is not the whole story of what promotes high level of economic development (World Bank, 1993). Accumulation of human capital may be necessary for high rates of economic growth, but it is surly not sufficient either, or more of variation in the income may be explained on the other factors; spending on R&D, better macroeconomic policies, international trade, equitable income distribution, stable political environment strong institutions for policy designing are fundamentals required for change in income.

The human capital model shows how education allows learning-by-doing. Educated people use capital more effectively, that it becomes more productive. They also more likely to innovate – to devise new way of production. Moreover, they spread the benefits to their coworkers, who learn from them and also become more productive. Thus, rising the level of education cause a rise in the efficiency of all factors of production. This means that learning by doing increase potential level of out put without the need for increase any additional inputs and increase in investment. Thus through enforcing each other it increase productivity. In endogenous, the ability to use technology, the ability to develop it, the skill to complement technology is all formed in and shaped by interactions within production process.

The spillover benefit from education has important relationship between growth and physical capital. Past growth theories assume that accumulation of capital is subjected to diminishing marginal return – that is, as more capital accumulated, overtime the efficiency decline and growth rate slow. But many countries that have accumulated high level of capital rather have achieved high and sustained growth rate. The human capital model help to explain this by showing how decreasing marginal return to capital are offset to some extent by increased efficiency from education.

2.2 Education and Development

Education is major ingredient for economic and social development. *Investment in people more profitable than any investment elsewhere.* It improves standard of living through sustained growth. Education enables to use people in more productive ways. It is principal asset of the poor. Those who are denied access to education service today also remain denied access to national wealth in the future.

Investment in the education lead to accumulation of human capital, which is key for sustained economic growth and to enhance national wellbeing. Education, especially basic education (primary and lower secondary) also contributes to poverty reduction by increasing the productivity of the poor labors. By reducing fertility and improving health, and equipping people to participate actively in their economic and political activities. In addition education contributes to strengthening of the institution of civic society, to national capacity building, and good governance, all of which are critical elements in effective implementation of sound economic and social policy.

Education contributes to economic growth, but itself it will not generate growth. The strongest growth comes about when investment in both human and physical capital takes place in accordance with economies demand for specific required skills.

Economic growth is explained partly by stock of labor and physical capital. A large improvement of growth steams from improvement in quality of labor force, including increased education and better health, together with technological progress (Dension 1967, WB 1991). As new theories of economic growth suggest, faster technological change occurs when workers are highly educated. Thus, accumulation of human capital with required skills, facilitates the development of new technologies and it is self sustain growth (Romer 1986; Lucas 1988; Azariadis and Drazen 1990; Barro 1991). Education contributes to economic growth through the increased individual productivity brought about by accumulation of skills and attitudes and accumulation of knowledge. A rate of return for education is very high in low and middle-income economies (Psacharopoulos 1994).

As shown on the table bellow, in economies less than universal basic education, rates of return greater for primary education, followed by secondary and tertiary education. Interestingly, economies with universal primary education that have undergone rapid growth tend to show high rates of return to secondary than to primary education (Jain, 1991; Schultz 1993).

Table 1: The rate of return to investment in education by region and level of Schooling

Countries	Social return			Private return		
	Primary	Secondary	Tertia	Prima.	Secon.	Tert.
Sub-Saharan Africa	24.3	18.2	11.2	41.3	26.6	27.8
Asia	19.9	13.3	11.7	39	18.9	19.9
Europe, Middle East & North Africa	15	11.2	10.6	17.4	15.9	21.7
Latin Americas and Carbine	17.9	12.8	12.3	26.2	16.8	19.7
OECD countries	n,a	10.2	8.7	n.a	12.4	12.3

Source: Psacharopoulos 1994

In all countries, the rate of return to investment to all levels of education exceeds the long-run opportunity cost of capital (usually returns to capital estimated at 8-10

percent in real terms) making education an excellent investment (WB 1995).

Recent studies confirm the importance of education, and especially primary education for growth. Cross-country studies suggest the possibility of a threshold level of human capital accumulation beyond which country's growth may accelerate (Azarias and Drazen 1990; Lau, Jamison, and Louat 1991). Primary education is the single largest contributor to growth in both the cross-countries and cross regional comparisons and within country analysis carried out to explain East Asian Miracle of development. According to World Bank (1993), primary education was the largest single contributor to economic growth rate of HPAEs. Investment in physical capital was second school enrollment and population growth. As it demonstrate the main difference between East Asian and Sub-Saharan Africa is variation in primary school enrollment rates

The East Asian high performing countries invested in both primary and secondary education in an effort to enhance heavily the quality of labor. This effort was complemented on the demand side by a pattern of growth that made the productive use of labor and by complementary investment in physical capital. Substantial investment in education benefits not on the consumer of the service but also others because of its neighborhood effect.

2.3 Human capital[4] and Technology

There is no doubt that sustained long term per capita income growth depend on technological progress as emphasized in Solow growth model. However, this does not mean technological progress falls on society like manna from heaven. It is human being, through their conscious actions, determine the rate of technological progress, and such action should be part of explanatory theory and not simply black-boxed (Jones, Ray 1998). The availability of effective stock of human capital with adequate capabilities to conduct R&D, to invent new products, to absorb foreign technology; that they are inseparable and important inputs for development. In other words, the creation and utilization of of technology requires other inputs - human capital that play crucial role.

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[4] 4 . This paper education regarded as the main component of human capital. So that they are used

Technological change is the major agent of economic growth. Development and adoption of new technology are primarily means by which scientific and technological advances are adopted not only to meet human and social needs and expand new opportunities, but also to sustain and improve international competitiveness and economic growth. In industrialized countries many studies have shown that more than 50 percent of long-term economic growth stems from technological change which improve productivity or lead to new products, processes, or industries (Kim, 1991). Industrial development is the main means for acquiring new technology. The government policy that fosters science and technology play central role in the speed of acquisition. The profitability of new technology determines its progress. Profitability depends on societal demand for given technology. In this sense, science and technology policy be effective when drown from societal demand and if engage in production of goods for international market.

What comprises competitiveness? According to Porter (1990), the factors comprise for competitiveness includes technological change, which is important source of structural change in an economy. The second factor is human capital that enhances to utilize people creativity, technological skills, and entrepreneurial ship. The third element that builds up human capability is "knowledge". According to Porter, a more accurate prospective for differences between nations' is not luck of a resource endowment, or difference in the rate of growth of capital and labor. But *it is the growth and accumulation of useful knowledge, transformation of knowledge into final output via technological innovation,* upon which the performance of the world economy depends.

As World Bank report (1998) argued:

> *" Knowledge is like light, weightless and intangible, it can easily travel the world, enlightening the lives of people everywhere. However, low-income countries denied access to it. Poor countries – and poor people – different from rich ones not only because they have less capital but because they have less knowledge. Knowledge often costly to create for them and that is why much of it created in the industrial countries. But developing countries can acquire knowledge overseas as well as create their own at home This is the only way to bring sustained growth For insistence,*

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synonymously

great success of Korea in acquiring and using the best practice of the world is major source for her success.

The great deal of research at national level has attempted to understand the contribution of factors to variation in the rates of economic growth. Over all studies have found that capital investment growth accounts for less than half of the measured increase in output. The balance attributed mainly to improvement in the quality of labor, from education, heath, training and experience, all are put heavy emphasis on human capital accumulation (Mackay 1993).

As all evidences cited above clearly portray, technology – appropriate knowledge is essential for production of goods and services and as well to use resources in the more efficient way and hence to have sustained growth. However, knowledge is not traded in the perfect market, its tacit that requires specific education and training, its investment is risk full that its costly to acquire mainly for private individuals. Moreover, firms' invest in labor training and R&D has positive externality in the production that spread to other producers that not all benefits from investment accrue to them alone. This may result in under investment if totally left for market. This lead to obtain less than socially optimum level out put, which is undesirable.

2.4 Why Government intervention in Human capital Accumulation and Technology Transfer?

In endogenous growth model, country that accumulates more physical and human capital, undertake more R&D, may continue to grow and even may have accelerated economic growth rate overtime compared to nations put impotent focus. Indeed the success conditioned by type of education of labor force, government policy, and other external variables. Appropriate education is means to acquire any form of technology. Human capital and technology are inseparable. The government can play pivotal role in coordinating both factors. Although profit oriented private efforts has been contributed the dominant share of the progress in these fields, the importance of appropriate government policy in undeniable (Helpman and Grossman 1993).

Endogenous growth models thus suggest government policies can affect the rate of accumulation of both physical and human capital as well as the level of R&D. Such policies are extremely important in boosting the long run growth for an economy by removing the obstacles of the progress. Market is less-than-perfect, mainly in the less developed countries where prices are less responsive. Hence, purely market based development strategy not adequate especially in conducting basic research and development, in providing relevant skilled workers, and education and training. Besides this, investment in R&D for innovative activities is risky for private investor since it difficult for them to foresee its success. Thus they invest lower than socially optimum level. This in turn expected to reduce future growth of nation. Here intervention of government be essential to coordinate the market failure.

Ronsen (1990), poterba (1995), and Stiglitz (1988) explain that market failure and distributive consideration justify government intervention in the education market. Society wide externality associated with education of each individuals will not appropriated if parents ignore the externality associated with education in deciding how much to spend on there children's education, education will fall bellow socially efficient level. On the other hand, the existence of disadvantaged (minor) groups, who are usually recipient of the service hurt if left for market.[5]

As numerous studies indicate, earning is higher when individuals have higher human capital, as measured by their education and health status. We know that investment in education contribute significantly to economic growth; that means the benefit for whole society is higher than individual return. Indeed, if the private returns on the human capital investment lower than social return, individuals are likely to make lower than socially optimum level. This justifies the government intervention for two reasons. First, lack information mainly for disadvantaged groups and failure of capital market. Second, educational investment has positive externalities, which imply that families that invest in education are not the sole beneficiaries (Psacharopoulos, 1986). The existence of externalities has more immediate implications for what type and level of schooling the government should subsidize and for what group. There are several sources of externalities. An educated person may increase not only the house holds income but also the income of other

[5] . The Level of spending on education depends critically on the parents' altruism. If they put low value on improvements of their children's' future earning potential, then they under invest in their children. And government intervention might be justified on the ground that it protect children from

households, because his/her idea and innovation has direct spillover to others. Besides this education has social returns not directly compensated monetarily. Many possessive spillover effect come from literacy acquired at lower level schooling, while returns form university level fully captured by the higher income university graduates. This indicates where the government role more important.

2.5 Is the East Asian Success Solely Belongs to Market forces?

The rapid growth of High Performing East Asian economies (HPEAs) astonished the entire world mainly since 1960s. The HPEAs, Japan, the four tigers (Korea, Taiwan, Singapore and Hong Kong) and three followers: Malaysia, Indonesia, and Thailand have been achieved unprecedented economic growth within less than half a century. While even those western countries it took more than centuries to attain the same level of per capita income growth. Why they had fast and sustained economic growth? There are different presumptions categorized in to "market oriented views" by World Bank adherents and "revisionists view" by who argue the success as result of government policy effort. The first five leading economies grew 5~6% since the Second World war on average doubling there per capita income less than every twelve years. The next followers come to join the leading North East Asian economies. This spectacular performance astonished many scholars how it occurred.

According to the report of World Bank 1993, the part of factors responsible for the 'miracle' were *'a market-friendly' strategy* and the crux of the government policies. The market friendly approach includes policy choices related to "economic fundamentals" as well as selective interventions and performance of national institutions (see the figure bellow). To these the World Bank adds two forms of competition: market-based competition, both in export and domestic markets, and the contest-based competition, where firms compete for information, credit and other performances according to clear and well-defined rules that have no favorites.

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wrong decisions by their parents(Poterba 1995)

Table 3: The Policy framework behind the East Asia's economic miracle

Policy Choices	Competitive discipline
Fundamentals	
- Stable macroeconomic	
- High human capital accumulation	
- Effective and secure financial system	market-based competition
- Limited price distortion	- Export competition
- Openness to foreign technology	- Domestic competition
- Agricultural development policies	
Selective interventions	
- Export push	
- Interest rate control	
- Direct credit	
- Selective promotion	**Contest-based competition**
	- Export credit
	-Investment coordination
Institutions	- Information exchange
- Technocratic institutions	
- High-quality civil service	
- Monitoring	

Source: World Bank (1993:88, fig. 2.1)

Together with the policy choice and competitive discipline imposed lead to accumulation, effective allocation of capital investment and utilization of human resource, and productivity growth. The outcomes are desirable ones; rapid and sustained growth and equal income distribution (World Bank 1993: 88). They sum up that it is neo-liberal policy of minimal intervention or the so-called '*market-friendly*' approach that led to great success of all HPEAs. It tries to argue that countries should first maintain fundamentals then others. However, some scholars not satisfied with these views. The intervention of government is deeper than the World Bank admits.

According to Kwon (1993), the World Bank report over relied on free market

mechanism to promote development in the third world. Based on the East Asian experience over half century the selective intervention can effectively promote economic development. Government in the East Asian economies not limited to supportive role, but have central role, except for Hong Kong. He argues that, although development strategies require "healthy dose" market mechanism, government intervention can complement the market by creating an environment that is conducive to economic development. The appropriate intervention of government is well acknowledged since Keynes. The East Asian success history fit none of the classical paradigm. The market is inadequate to provide some goods and services. Specially, in less developed countries where poor information and knowledge, lack of resources to spend on basic infrastructures for private sectors, among others calls government. However, potentially high transaction costs associated with government actions (i.e., acquiring, processing, and transmitting the information need to formulate and implement public policies), distortions arising from large scale rent-seeking may lead to government failure (Deepak Lal,1985).

According to Kwon, neoclassicists tend to attribute all economic failure to government failure and all economic success to free market success, regardless of the government involvement in the development process. Yet, the theoretical development as well as the empirical evidences put in doubt the validity of the neoclassical doctrine. On the theoretical front, economies of scale, externalities, incomplete markets with imperfect information, strategic interactions, principal agent problems, and the transaction cost are involved as important elements in dealing with development issues (W.Brain Arthur, 1988). However, the most powerful fact against neoclassical doctrine comes from historical evidence of East Asian, where the government has played crucial role elevating the standard of living of all.

As clearly evidences portray, the East Asian government and market have not been usually mutually exclusive but have worked together in promoting economic growth. For instance, in Japan, since Meiji period, where government privatized all factories to merchants and high government officials in the 1885, large capitalist (zaibatsu) worked as hand in hand with government for long period. Capitalist's growth fostered by government policy, and they remained loyal and cooperative with the government. The same is true in Korea, where government and big business (Cheabol) worked together. In Taiwan and the approach is almost similar. The government participation in acquisition, assimilation, and diffusion of western

technology, provision of social overhead capitals, subsidizing key industries and train technicians and sent them to private factories to help running modern equipment contributed for fast success.

Stiglitz (1996) argued the integrated approach that government and other institutions may be crucial if the economies and economic actors to deal with uncertainties in any form of investment and technological change. The neoclassical policy have no tool to smooth, we have no as such perfect information.

It is difficult to consider the World Bank view as stylized fact. For instance, after publication of the " The East Asian Miracle" in 1993, four years later some of these economies entered to big trouble, indicating that some thing has been wrong earlier period mainly related with corruption of government officials that partly put in question the world bank view. There are certain facts that no one can deny; stable macroeconomic, selective openness (especially openness for foreign technology), appropriate industrial policy are essentials to be focused.

To sum up, the economic analysis has no trouble in explaining why they are so rich and we are so poor. Why few countries have experienced very long period of persistent growth in income per person, while others creeping for number of decades. According to Backer (1993), the answer lies in the "*expansion of scientific and technical knowledge*" that raises the productivity of labor and other inputs in production. The systematic application of scientific knowledge to production of goods which in turn depend on the education, technical schooling, on-job-training as growth of knowledge has become embodied in people – in scientists, scholars, technicians, managers, and others contribute to output.

Hence, it is clear that all countries, which have managed persistent growth in income, have also had large increase in the education and training of their labor force. In all these economies, first elementary and secondary schools become universal, then higher education spread rapidly. The outstanding economic performance of Japan, Taiwan, Korea and other Asian economies clearly illustrate the importance of human capital as primary source of economic development. Lacking natural resources, the Asian tigers grew rapidly by relying in well educated, hard-working, conscientious labor force.

Given these facts, broad-based basic education at early stage is major instrument for economic and social development. Government policy put prior emphasis for universal primary education attainment, and later for secondary and

tertiary education is most successful for sustained economic growth as Asian experience shows. However, success in education performance alone does not guarantee for sustained economic growth. We need '*package of healthy economic policies*' that mainly focus on international trade, foreign technology acquisition, stable political environment, responsible institutions, continuous spending on R&D, equitable income distribution, stable political environment and others.

Chapter Three

Korean Government Policy in Human Capital Accumulation

3.1 Background of Korea's Development

Korea is well known for its rapid economic growth, as well as for its rapid education expansion. Korea achieved the fastest economic growth since the mid of 1960s to mid of 1990s. The average annual growth rate of GNP during this period reached 8.4 percent, which belongs to the highest rate in the world. Primary and secondary education was universalized late 1960s and mid-1980s respectively. The higher education enrollment achieved 54.6 percent as of 1995.

How were they able to manage such unprecedented achievement given number of subtle situations they had at early stage? Korea is country deprived of rich natural resources. Known mineral deposits in Korean peninsula went to North Korea in the partition of 1945 (McGinn 1980). The population density one of the highest in the world, with 70 percent of the landmass covered by mountain endowed with relatively little arable land. Thirty-five years occupation under Japanese left little in the way of industrial development in the south, and few trained people. Meanwhile, the Korean War – during 1950-1953 destroyed almost all the physical infrastructure. The threat of another invasion was real in the minds of leaders and citizens, which force to spend on large military building. At the end of Korean War, the economy was stagnant. They had many problems associated with underdevelopment, such as poverty, high birth rate, high unemployment, low saving, large trade deficit, and food shortage all were critical problems at the period. It's from this background that Koreas was begin its movement towards industrialization. However, since early 1960s Korea entered into new line of history; i.e., from the world poorest nation to the world richest nation. What contributed for this success?

Among other factors the early development of human resource contributed for Korea's rapid growth. Although Korea poor in natural resource, but rich in culture and education. Korean people inherently have insatiable demand for further learning; widespread enthusiasm for education was partly major factor for their success. This asserted by UNESCO: "The remarkable and rapid economic growth that has occurred in the Korea over the last decade has been based to a large degree on human resources; and education has assisted the production of literate and industrious people". Perhaps, early adoption and provision of broad based basic education greatly contributed to this extraordinary performance. Many scholars have positive presumption that the superior enrollment of education sector has contributed to the rapid growth through providing appropriate labor force with basic education. One reason for Japan, Taiwan, and Korea rapid industrialization is that they have invested heavily in education. Fore instance, one year after end of Korean War, 17 percent of its total population already enrolled in school (Amsden, 1989, pp.217). This achievement was quite high given the economic situation of the period.

The Korean government was found appropriate development strategy that fits its local conditions. Export promotion strategy was chosen as the only way to bring certain changes. Since the adoption of First five-year Economic Development Plan in 1962, the economy had sustained high per capita income growth except for Second oil shock period and political unrest of 1980 and for financial crisis in 1997. However, this success is not simple gift, but it's partly the result of availability of threshold level of human capital, which increased the profitability of investment.

The Korean human capital expansion so rapid compared to any other country in the world. The are several economic and cultural factors contributed for this expansion. Although it is difficult to measure, the Confucian cultures, which upheld by general public, racial homogeneity possessed and ceaseless effort by government and society. Some of the notable values, which have contributed to or favorably, affected rapid and sustained economic growth in Korea. The Korean enthusiasm for education, parents willingness to sacrifice for children education, strong national filling, and saving for future perhaps have made additional contribution for fast success.[6] The evidence for this is that when Korea's enrollment ratio for primary and

[6] Considering the Confucian culture as determining contributor for rapid economic growth challenged by many scholars. They argue that the Confucian culture exists in China before 2.5 thousand years before, while the rapid growth occurred five decade ago.

secondary school compared with countries with the same GDP level, Korea performance surpass all (see the table 2b in appendix).

However, this does not mean countries with multiple nations and nationalities or lack Confucian culture no room for growth. The more important fact is policy of government that considers short and long-term return from its investment. Regardless of such factors, the emphasis that society and government place for human capital accumulation and related policies determine it.

Koreas education has some unique features cited as exemplary; immense share of private educational cost, large class size, high student teacher ratio, special education for gifted students, and privileged teachers social position. Large class and student teacher ratio was prevalent in early mid 1960s. In primary school nearly 70 students in class. Not only in primary school but also in middle schools, in academic and vocational high schools the number was on average above 50 students (see fig. 1 in the appendix). This has some policy implication that where the government resource should focus. At early stage its seems appropriate to increase number of students in class providing adequate teaching materials than simple expansion of school buildings.

Privileged social position of teachers also enabled to attract large number of qualified teachers to the sector. Although the legal status of teachers in Korea is the same to that of the central government officials, they are highly respected by society. Teachers have life time occupation from the beginning of their carrier until retirement at the age of sixty-five. This has some contribution to attract qualified persons in order to provide standard education for all school age students.

Also as many scholars point out, Korean cohesive culture was reinforced by numerous foreign invasions, which requires solidarity and unified efforts to survive as nation and society. In addition, social classes nearly disappeared, as a result of Japanese colonial rule and land reform that every body starts from scratch and strives to achieve better social position. Also initial socio-economic conditions, mainly, the threat from North Korea, which created social uncertainty, and sense of vulnerability reinforced their strength. The political leaderships' commitment to the economic development since early 1960's, which served as the main driving force to formalize and to implement successive development plans.

3.2 Strategies on Human Capital Investment

Accumulation of productive assets is the foundation of economic growth. However, the return depends on the selection of areas with higher return and investment priorities. Korean government accumulated both physical and human capital more rapidly and consistently than other developing economies. Perhaps this rapid success partly accounts for the selection of areas of investment where higher social return obtained and where market perform inadequately. Its speed of human capital accumulation surpasses even other East Asian economies. Indeed, this rapid accumulation accounts for their superior performance. Korean government performed well in selecting and implementing fundamental economic policies. Every government spend on education, but *Korean as well as East Asian spend money more wisely, emphasizing universal primary and, later, secondary education.*

3.2.1 Early commitment to compulsory education

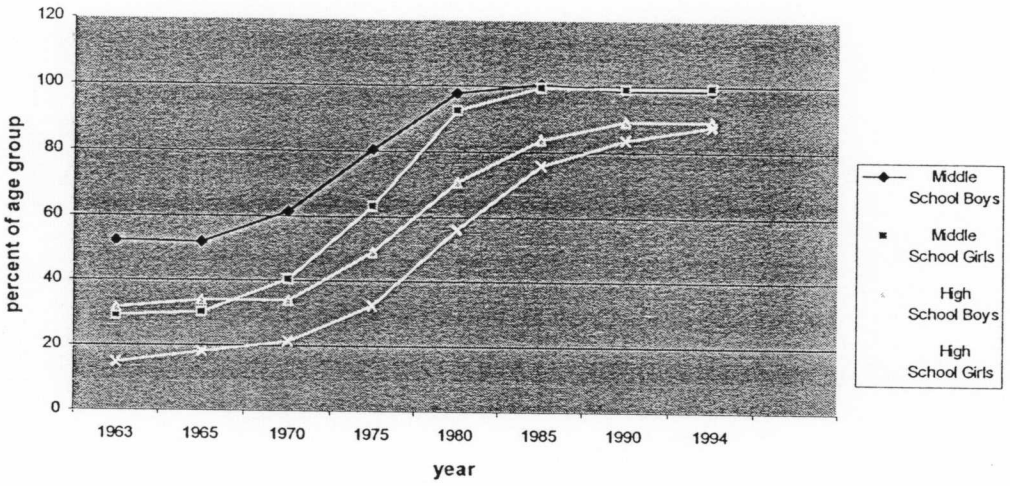
Basic education typically encompasses at least primary education and other lower secondary education as well. A complete basic education's normally provided free of fees, since it is essential for acquisition of knowledge, skills and attitudes needed by society. The importance of compulsory primary education, for all school age groups of the nation is well proved to be highly important and base for economic development especially when externalities taken in account. To obtain the maximum gain for society as whole, the top public priority is acquisition of basic competencies by all students. The government role in financing and ensuring access for all eligible children is indispensable.

Public investment on basic education in early stage of development is both equitable and efficient in the sense that it is efficient because public resources are concentrated in cost-efficient manner where returns to investment are highest and cover all citizen with low cost per student compared to higher education. It is equitable also, because it ensures no qualified student denied access to education because of inability to pay. At the time in case of basic education, the gap between private and social return is higher for higher education than for basic education. Thus

the advantage in higher education take individuals willing to pay for it by sharing costs. Its contribution in poverty reduction and in fertility rate is undeniable. The earning difference between labor is well explained by difference in human capital. The equal educational opportunity for girls has also crucial importance.

The progress in reducing disparity between the educational opportunity for boys and girls has been successful in case of Korea. As the economy grow further, the disparity in enrollment totally removed. As shown in the figure bellow, boys and girls enrollment has become equal both in middle and high school level. In the early period there was significant gap in both levels. In the mid -1980s and 1990s the enrollment gap in middle and high school removed respectively. This had economic and social importance. Women share the benefit from economic growth equally with men and perhaps contributed for limiting population growth raising the cost of child raring children for women's.

Fig. 1:The Enrollment of boys and Girls in Middle and High schools



Source: Education in Korea(MOE), 1997~1998

Early commitment to broad-based basic education is distinctive investment strategy of Korea, which in turn contributed to its progress. Korean government and society was placed prime importance for basic education from very beginning, prior to its high growth. In 1954, the government established the six-year plan for accomplishing compulsory primary education (Six Year Primary Education For All! was the slogan at the time). In order to finance compulsory primary education, the government introduced the 'Education Tax' as a special purpose tax and enacted the ' National Grant Law' for financing compulsory education and to make up shortage in

national treasury in 1958(Paik 1998). Through these policy measures, Korea achieved universal primary education in mid-1960s, closing the gap between girls and boys enrollment in primary and secondary schools. This has social benefit that better educated mothers raise the better-educated children, complementing public investment in basic education. The rapid increase in educational attainment of women contributed to early decline in the fertility, which in turn resulted in a less rapidly growing school-age population, made more resources available for both primary and secondary schools. This type of investment strategy, which put prime emphasis for primary education, has great importance. It increases adaptable workers who can readily acquire new skills, increase the communication and flow of ideas between labor force. This in turn increase productivity.

In case of Korea, there is close secular relation between expansion of education and economic development. In 1950s, Korea was one of the poorest nation in the world after sever Korean War. Many scholars had bleak prediction on its future progress based on the gloomy situation of the period. However, due to heavy emphasis, on the basic education and appropriate policy, brought it to first line of development. The early availability of threshold level human capital eased the luck of required labor in take-off period. In the later period, the economic growth supported the human capital expansion and conversely, the human capital expansion facilitated the economic growth.

Unreserved effort by government and society rose the human capital stock. According national statistical office, in Korea the average years of education over five years of age expanded rapidly from 5 to 10.4 in between 1965 and 1994. In the same period the per capita income grew many folds, reaching nearly to $10000 - Perhaps this shows the positive relation of growth in years of schooling of population and improvement in standard of living. Indeed this argument holds true only the economy able to accommodate labor with required skill.

Table 3: Korea's Social Indicators (1965 - 1994)

	1965	1970	1975	19780	1985	1990	1994
GNP per capita (U.S $)	105	248	591	1605	2047	6518	8483
Average years of Education	5.0	5.7	6.6	7.6	8.6	9.5	10.4
Student Population (%)	22.1	25.4	26.5	27.7	27.6	24.5	23.6
Life Expectancy	55.2	57.6	60.6	66	69	70	73
Population Growth (%)	2.7	2.2	1.7	1.6	1.2	1 1	0.9
Literacy rate	72.1	89.4	*	*	*	*	*

* so insignificant illiteracy rate

Source: Byung-Nak Sung, 1996. The Rise of Korean Economy

The Asian type policy approach has some implication for countries, which are not yet achieved compulsory primary education and secondary education. The early investment in primary education proved to be effective from both social and economic prospective. In Korea the early success in basic education made possible all people to share common set of knowledge and belief and provided a critical basis for national development and improved communication among people. In the dynamic context of the economy, universal primary education provided the basis for rapid economic growth by staffing a large number of young people with at least low wage level.

3.2.2 *Shift of Investment Priority to Secondary and Higher Education*

After accomplishing universal primary education, the government shifted its investment emphasis to secondary and vocational education in the late 1960s and 1970s. In the 1980s, higher education got heavy emphasis. As the social demand for secondary education increased due to universal attendance in the primary education and demand for skilled man power increased since the national economic structure shifted to more skill intensive Heavy and Chemical Industry. The government invested a lot to meet the needs of skilled man for industrial sectors both investing in facilities and trainers (Woo, 1995). This condition was the same for expansion of high education.

The same pattern of shifting investment priority was found in the other advanced Asian economies, such as, Japan, Singapore, and Taiwan. These economies also once achieving the universal coverage of primary education and minimum threshold per capita income, these economies shifted their emphasis to senior secondary education and eventually to higher education (Mingate, 1991). This sequential expansion pushed one the other.

According to the World Bank 1993, there are three most important factors enabled for phenomenal accumulation of human capital: rapid economic growth, early demographic transition, and equitable income distribution. Each of these increased the resource available for education. Rapid economic growth is the main factor that accounts for Korea's extraordinary expansion of human capital. Korea enjoyed high and sustained income growth for the last three - to - four decades in which its per capita income grew from $80 in 1960 to nearly US $10000 in 1995. This rapid growth increased the resource available for educational investment. It created job opportunity for both man and women, increased real wage, increased rate of return in on the labor force skills; thereby increasing the demand for education (King, Anderson, and Wang 1993). Again the raising real wage that are product of rapid growth could have a dampening effect on the educational opportunities; if the relative wages of education service providers increase. Thus rapid growth operates both on the supply side of market for education service, by increasing the potential suppliers. In the same it influence the demand side by raising effective demand to consume the service.

Education sector is the major beneficiary of demographic transition. One important outcome of deceleration of the rate of population growth is decline in the rate of growth of school age population. This increases the spending per child either in the public resource or families resource. But when the school age population growth accelerate, rise in expenditure just needed to keep enrollment rate constant; with declining or slow growing school age population, however, similar increase in expenditure can go for more schooling or for better quality. That means, countries with accelerating population growth have to increase spending simply to maintain the last period enrollment (WB, 1993).

Equitable income distribution has great contribution in fostering educational opportunity for all. The more equal income distribution of the economy's, the higher the primary school enrollment tends to be. It is stylized fact that those with higher years of schooling, and better access to education opportunity will have better income

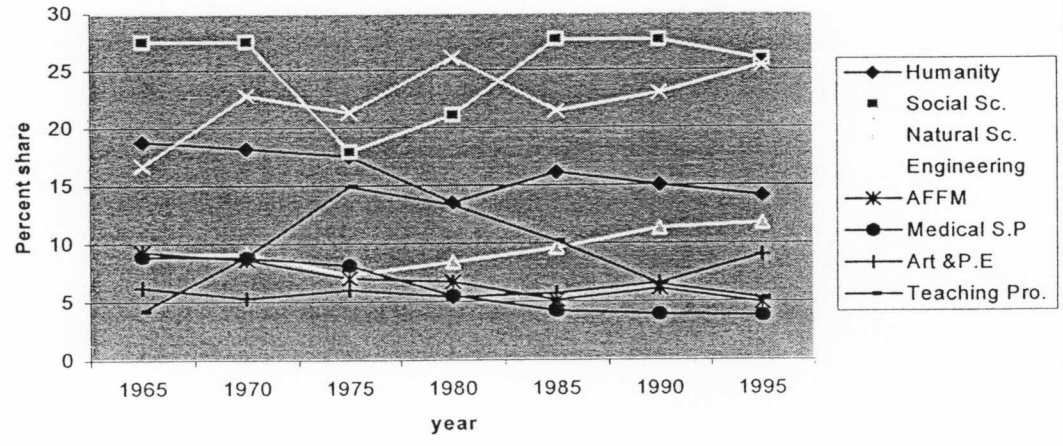
in the future. Conversely, today's equal access to education opportunity has great tendency to at least minimize future the income gap between citizen. Hence, rapidly accumulation of human capital in Korea is partly explained by this factor.

In many instances, not only lack of awareness, but also sever resource constrain and inequitable income distribution, hinder poor households from investing in their children even when rate of return is high, which calls for government action. Such a problem is less likely to happen in Korea, because of relatively more equitable income distribution. Besides this, government has been well aware in solving such problem.

3.2.3 Strategies in Higher Education Investment

Higher education also has got massive importance since 1970s. The government policy highly reasonable for each steps in policy adoption. In 1950s and early 1960s, massive efforts for literacy campaign and with implementation of compulsory education, since mid-1960s vocational education at secondary school level were expanded in order to meet the rapidly increasing demand for skilled labor. Since 1970s, the importance of technicians was recognized due to growing sophistication and complexity of modern manufacturing sector.

Fig. 2: Composition of ratio of College and University Students(Unit:persons,%)



AFFM: Agriculture, forestry, fishery and marine

Source: MOE, Statistical yearbook of Education, 1965~1995.

It is from this aim that government let the expansion of tertiary education abolishing

restrictive university entrance examination in 1974.

As clearly the figure above illustrates, social science has been got the highest share of students in college and university. This is perhaps more of indication of social demand competing to have highest position and this requires certain level of higher education in social science. Hence, families opt for it. Conversely, the government put more attention for providing skilled manpower for industries. From this point of view technical education (engineering) for the last three decades on average has got more than 20 percent. Humanity has got the third largest share, natural science and teaching profession has got nearly the same share. The remaining three areas also have the same proportion. Here the indication is large or small demand is based on industrial and social demand for the field.

Education in higher level, besides socializing young people, it gives credentials to graduates, legitimizes knowledge, enable to get rewards in any society. University or college graduate students in Korea, if not in all in some elite institutions highly concerned with certain responsibilities in their society because they are university students (McGIN.1975). High school graduates are expected to think and act in ways that are different from those of their junior. The university graduates has a different set of role expectations. This expectation pushes the degree-holder into a certain pattern of behavior and feel responsibility.

Government used the school curriculum as measure tool to cultivate youths to perfect their characters, foster independence, to develop better citizenship who lave each other and as well their nation, strictly feel responsibility of their society, cooperative and hardworking. Fostering nationalism even in primary and secondary school level is one of the goals of the curriculum to develop future generation with strong lave of his nation. Moral education is common in both lower and higher school levels. According to Amsden (1989), what distinguishes the curriculum of Korean schools from countries whose attempts at development have failed is not emphasis on science and technology. The major difference seems to be that Korea education places a heavy stress on moral education and discipline. This is universal fact that no one can deny. They retained their culture and norms from influence of any other foreign culture-using curriculum as major tool. In the high schools, military exercise instructed as compulsory education to enable youths strong both physically and mentally (Huh Kyung-chul, 1998).

3.3 Strategies in Education Finance

The rapid expansion of education requires adequate financial and physical resource to meet the growing demand. The public resource alone not sufficient to comply with. The Korean government adopted suitable policy measures to tackle the problem. They used shared financing scheme where public and private sector shares the burden. The public resource mainly allocated to primary and secondary education, leaving lion share financing of partly secondary and higher education for private sector. The government put emphasis on basic education since 1950s. Contrary to some other developing countries, which invest considerable, share in secondary and higher education.

Table 4: composition of Educational Expenditures of sample Developing Countries Compared to Korea

Countries		1965	1970	1975	1980	1985	1990	1992
Korea	Primary	66 4	64 3	62 5	48 9	46 7	44 3	42 2
	Secondary	22 2	23 1	25 5	33.2	36 7	34 1	39.4
	High	11.2	8 3	7.3	8 7	10 9	7 4	6 9
Hong Kong	Primary	57 4	54 9	48 7	33 7	31 4	26 3	
	Secondary	25	21 2	26 3	35 7	37 9	39 3	
	High	12 0	19 2	20 6	24 6	25 1	30 0	
Thailand	Primary	67 2	54 0	64 5	55 1	58.4	56	53 9
	Secondary	16 7	19 5	16.6	28 3	21 1	21 6	21.2
	High	9 3	13 8	11 3	13 3	13 2	14 6	16 3
Ethiopia	Primary	41 7	55 4	47 9	42 0	52 8	53 9	53 6
	Secondary	28 4	35 6	50 7	29.8	27 6	28 1	27 7
	High	16 9	--	--	9.0	13 3	12 1	10 5
India	Primary	23 3	22 4	40 0	36.9	44 6	38 1	38
	Secondary	42 1	42 5	26 6	24 2	30 3	25 5	27
	High	23 1	24 6	12 1	13 5	18 7	14 9	14 7

Source: UNESCO yearbook, 1973,1986,1994

The best strategy that the Korean government did is that heavy reliance on private sector for preprimary, secondary, and higher education. Private sector participated in providing both educational service and financing. But the primary

education treated as collective good for all eligible age groups. It has been mainly publicly funded and insignificant share comes from households. The government encouraged private sector in the upper level to overcome budge constraints.

This heavy reliance on the private funding in the secondary and higher education has important policy implication for utilizing limited amount of available government budget. In this way there is considerable room for raising efficiency and conserving resources for alternative use. As shown on the table above, in many developing countries, a considerable amount of educational expenditures on secondary and higher education is funded by families. By introducing private sector to play the main role in the provision of education service at secondary and higher education a large resource could be saved. The Korea's rapid expansion in the educational sector could be the strong evidence for success of such strategy.

Private funding policy, however, raise the serious question about access to high level education for underprivileged sections of the society, it may be the cost of a private sector oriented strategy. However, the Korean government minimized this shortcoming by designing different policy measures like allowing student loan and scholarship regardless of their family income, all potential students free access to public funding. This enable to overcome the market failure in higher education (sse the appendix).

Since 1950s private sector has made substantial contribution to school education by complementing the meager public resource devoted to education. Today in Korea private provision of education is most conspicuous in kindergarten, secondary and higher education sector.

Table 5: Percent of Students enroll in private schools by level of Education

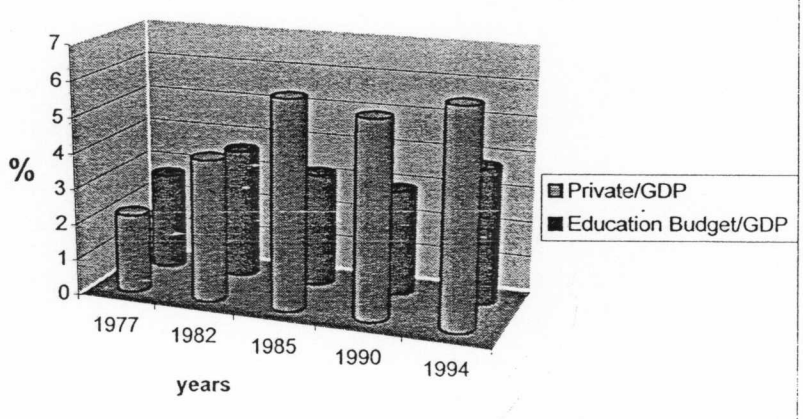
School level	1970	1980	1990	1995
Preprimary	99.6	96.5	69.3	77.8
Primary	1.1	1.3	1.4	1.6
Middle School	48.6	38.8	28.6	26
High School	54.7	59.4	61.7	60.0
University	75.5	71.4	75.5	75.1

Source Ministry of Education Statistical Year Book

As the shown on the table above, the private sector accounts more than 50 percent for both middle and tertiary education. In general, the private sector participation beyond primary school level is higher in Korea. Preprimary school education mostly initiated by religious, social and private organizations. The government participate in coordinating by enacting different acts to promote its enrollment (MOE, 1998).

The government policy measures vary in each step for human capital accumulation depending on the needs of society and industrial demand. In 1950s, during President Rhee regime allowed the education sector to expand freely. In contrast, the president Park was more concerned about quality of education and systematically attempts to manage and control the entire educational system such that the education supply is well balanced to overall manpower demand (Lee, 1996). In mid 1960s, when over supplied college graduates found unemployed, the policy direction shifted to tight control enacting 'decree of college enrollment quota'. In 1969, government introduced mandatory college entrance test to screen out the unqualified candidates for college education. In the same period government abolished middle school entrance exam, making middle school open access for all.

Fig. 3: Rising share of Private educational expenditure



Source: Kong and Baik (1994)

However, as indicated on the figure above, the entry barrier to college and university education resulted in huge social problem such as family spending outlay

on tutoring increase heavily for high school entry computation. Families in Korea spend huge sum of resource to cultivate their children from early stage for future college entrance exam. The government realizing this problem announced " high school equalizing policy" in 1973, with intention to make high school education accessible for all meeting minimum requirement.

Although Korea's educational system expressive achievement, it's criticized by many scholars for its over all deficiency in creating students with creative mind and for parents high out-of-school expense that misdirected for college entry competition. However, the Korean education has world exemplary position for producing assiduous industrial labor force.

What then is the driving force behind the massive privatization of education in Korea? How has been government able to mobilize the private sector? How did the private sector respond to government regulation and incentives? Investment in education or on education service provision is similar to any other investment on capital good. However, appropriate government policy highly important to coordinate these all.

3.4 Government Policy for private Schools

The government of Korea played mixed role in private school. On one hand, the government has tried to foster private initiatives in providing education service. This was done using various tax incentives, subsidies, and loans. On the other hand the government tightly held the rein of private sector. The government has administered a set of norms and standards regarding tuition fees, curriculum, faculty recruitment, facilities and student selection and so forth.

In early 1960s, the government had hold lenient position towards the private schools. As a result, the number of schools expanded especially at the middle school level. The main incentive at the time was tax breaks for the properties owned and run by school corporations along with the right to raise funds and donation from parents. However, some, if not all, of founders of private school abused the system and made profit by engaging financial wrong doing (Gwang 1998). As a result, the public skepticism began to rise. To protect undesired adverse trend, Private School Act (PSA) was promulgating in 1963. The PSA requires that private schools should serve

the public as non-profit institution.

Financial Assistance for Private Schools: Private schools generate revenue from student tuition, donation, and form other ancillary source. But the revenue may not cover the cost of service provision that may force them to quit the sector. Until late 1960s, little financial assistance was provided to private schools by the government.

In 1970s, due to the conspicuous expansion resulted from both abolition of middle school entrance exam, and universalization of primary school middle school had pressure. As a result, government began to subsidize private schools. Private middle schools began to receive government subsidies in 1971, and private high schools, followed in 1979 (Gwang - Jo Kim, 1998). The government policy designed to reduce unneeded competition for college and university entrance examination called 'schools equalization policy in 1974' expanded the financial aid to private schools. Under this program, students were randomly assigned to different schools regardless of their choice to equalize the quality of education between schools (Lee and Woo 1996). In general physical incentives the Korean government provided for private sector were:

- ***Direct subsidizes for secondary school*** – subsidies varies in the level of schools and covers the difference between operating budget and revenue of the school
- ***Grant to Higher Education*** - in order to stimulate innovation and upgrading in teaching and R&D. The grant is earmarked to the improvement of facilities, equipment's and library. The size of grant determined by the performance of individual institutions.
- ***Tax incentives*** – All taxes that directly related to operation of private schools are waived. Some of these are corporate tax, value added tax, Property tax, and numerous other international and local taxes. Businesses and assets owned by schools are subjected to very lower rate.
- ***Government Loans*** – in1990s, government loans financed by public funds made available to private schools at a very small scale. Besides, students enrolled in private schools are also entitled to students loan programs subsidized by the government.

The government role has been powerful enough to expedite in process of private sector participation. The advocating of private sector is reasonable for certain reasons. It enables to generate additional resource. By relying on the private education, Korea has been able to accommodate the growing demand for education without dramatic expansion in public expenditure. Privatization increased access to various educational opportunities. It 's also equitable that every body has access to basic education and qualified children not denied access to basic opportunity. Private schools also with their autonomous status can contribute to diversifying the system where by parents and students could have more options to choose from. Moreover, the private sector tends to be more responsive to local communities and consumer of their services. This stimulates the competition within the entire education system. The Coexistence of private public sector would allow more flexibility in the expanding education resource.

In short, the private sector has played a pivotal role in pushing the Korean education platform to higher level by reducing the financial burden on government. Thus it has made a critical contribution equalizing access an all levels. Unless, it would have been impossible for the government to provide broad based basic education for age groups regardless of their family income if the government had taken the burden of establishing more pubic high schools it would have been impossible.

3.5 Government Role in Establishing Institutions for Educational Planning

According to Lin and Nwgent (1991), an institution is defined as a set of humanly devised behavioral rules that govern and shape the interaction of human beings in part by helping them to form expectations of what other people will do. Institutions are rules governing behavioral relations among individuals. The most basic function is to economize the resource. That is, to allow one or more of agents to improve their well fair without making the others worse off, or to allow them to obtain the higher level of utility within their constraints.

The importance of institutional mechanism responsible for distinctive sector economic planning is most important for economic development. In Korea, well-

developed national institutions and intermediary organizations in the educational planning and implementing have played crucial role. The education and training should meet social and industrial demand for manpower. The main goal of any educational system is developing human beings creativity, adaptability to changes in their environment. Knowledge obtained should be consistent with knowledge required in the work place or appropriate to solve the existing problems. The Korean government was established responsible institutions for human resource planing from the very beginning. The major institutions involved in educational planning are Economic Planning Board (EPB), Korea Development Institute (KDI), Korea Educational Development Institute (KEDI), Korea Institute of Science and Technology (KIST), and Korea Advanced Institute of Science and Technology (KAIST), and others. Each of these agents are inter linked in formulating essential components; such as long-term planning, testing and monitoring the strategies to ensure the success of education management in Korea. KDI and KEDI are *policy research institutes* established the emphasis in overseeing long-term issues often overlooked by government bureaucracies whose expertise is predominantly involved in solving immediate and short term problems(Byong-suk Kwak 1998).

As some of the economists and political scientists argue that the East Asian miracle is due to high quality and authoritarian nature of the regions institutions. From early stage of development they have been instituted high powerful technocrats which are shield from political pressure, device and implement well-established interventions. Leaders in East Asia have tend be either authoritarian or paternalistic, they have also willing to grant a voice and a genuine authority to a technocratic elite and key leaders of private sector. The leaders in East Asia well realized the importance of well-trained technocrats for development.

EPB was established in 1961 to support early stage economic planning. It has several responsibilities like planning function, preparing government budget, collecting and evaluating the national census, and other statistics. Besides these responsibility and jurisdiction over inflow of the foreign capital and technology were vested in the EPB as well. In sum, it formulate the economic policy programs, it coordinate and evaluate economic policies implemented by individual ministries. It formulate consistent economic policies based on research and technology assistance

EPB's role well respected by other important decision-makers. Korea Development Institute (KDI), the government funded economic think tank,

established in 1971, and manned the social scientists trained abroad and foreign trained Ph.D. level recruited primarily from the United State. With considerable independence in operation, KDI has been the integral apparatus that provide research and technical assistance to the EPB in formulating medium and long-term economic policies, in particular each of the five year national economic development plans (yoon 1998).

Korea Educational Development Institute (KEDI): Korea Educational Development institutes was established in 1972 to carry out educational research to Ministry of Education. KEDI carries out an independent and autonomous operation with funding from government. It is committed to produce mid and long term range educational plans (MOE 1988). KEDI undertake comprehensive and systematic research and development activities on educational goals, content and methodology assisting the government in determining its educational policy. And long term development strategies, producing TV and radio programs and improve there effectiveness of teaching and learning programs, publishing and disseminating findings of educational research, and promote international exchange of innovative experiences in education. Since its inception, KEDI played a major role in national research and development, in training, and policy designing, mainly its firm researches provided foundations for formation of educational policies.

KIST was instituted as primary measure to supplement export promotion policy by president Park Chung-Hee in 1966 with the help of USAID. KIST began by doing contract research for local firms and helping them evaluates and adopts imported technology. The government established the Ministry of Science and Technology (MOST) in 1967 as official government ministry to control the KIST. KIST recruited a number of high-qualified scientists from abroad (Taekwon Kim, 1994). On the other hand, KIST provided a very positive impact, which was to send out the important signal that scientists and engineers will be honored by the government. This signal provided incentives for students to become more interested in science and engineering.

KAIST is research-oriented graduate and undergraduate institution, with the mission of producing high quality scientists and engineers for the development of science and technology. The top and gifted students well cultivated in higher science and technology schools like in the Kwangju Institute of Science and Technology, In Seoul National University, and in the Pohang Institute of Technology before joining

this institute and pick the top smart students for further education. KAIST has produced the large number of people with Ph.D., MS and BS degree with highly trained and technological talents. Over half of them award Ph.D. in there twenties. Ministry of Science controls KAIST and Technology authorized for more flexibility and independence.

These and other all related institutes are committed to cultivate gifted youth form very beginning for creative work. Students are encouraged to carry out their independent creative work with out any interference (MOE 1998).These all institutions worked together during every economic planning periods. Since 1961, EPB was processing long range of economic planning within the overall economic development strategy. MOE, MOST, and OLA are responsible to respond to long term plans indicated by EPB in executing their shorter term plans and providing directions to educational and training establishments. For this KDI and KEDI provide pragmatic, research based assistance to EPB in formulating medium and long term educational plan in line with frame work of national development policies. EPB has been gained considerable autonomous power and prestige, for it's formulating successful development plan. It is the only ministry in the government to be led by the deputy Prime minister, who has also held the chairman position of the economic ministries council. In general EPB have enjoyed its considerable power that economic policies and programs approved by 'Economic Ministry Councils' were rarely overlooked by the state council. There are ample empirical and theoretical evidences for contribution of education for Korea's progress.

3.6 Existing evidences for contribution of Education for Korean growth

Adopting human capital theory, the joint research between KDI and Harvard University in 1980 estimated contribution of education to economic growth (McGinn 1975). Education's contribution to growth was calculated by multiplying the annual average growth rate of the education quality index by the share of labor earnings in the total value added of Korea. The growth contributions attributable to increase in fixed capital formation and employment were also estimated (see the table bellows). It shows the annual growth rates of these inputs and their estimated contribution to the economic growth.

Table 6: Growth Rates of Factor Inputs and Their Contribute to Economic

	1960-1974	1960-1966	1966-1970	1970-1974
Growth of Input and out put (annual Percent)				
GNP	9.07	7.25	10.8	10
Capital	7.19	3.73	10.43	9.27
Labor	3.55	2.11	6.26	3.06
Education	1.18	1.72	0.82	0.73
Percentage contribution of factor s in input growth rate				
Capital	2.88	1.5	4.17	3.71
Labor	2.13	1.27	3.76	1.84
Education	0.71	1.03	0.49	0.44
Others	3.35	3.45	2.36	4.14
Contribution of factor inputs to output Growth rate				
Capital	31.8	17.5	38.7	36.6
Labor	23.5	17.5	34.9	18.1
Education	7.8	14.2	4.5	4.3
Others	36.9	47.6	21.9	40.9

Source: Computed from BOK, National income in Korea. 1975, pp.268-269

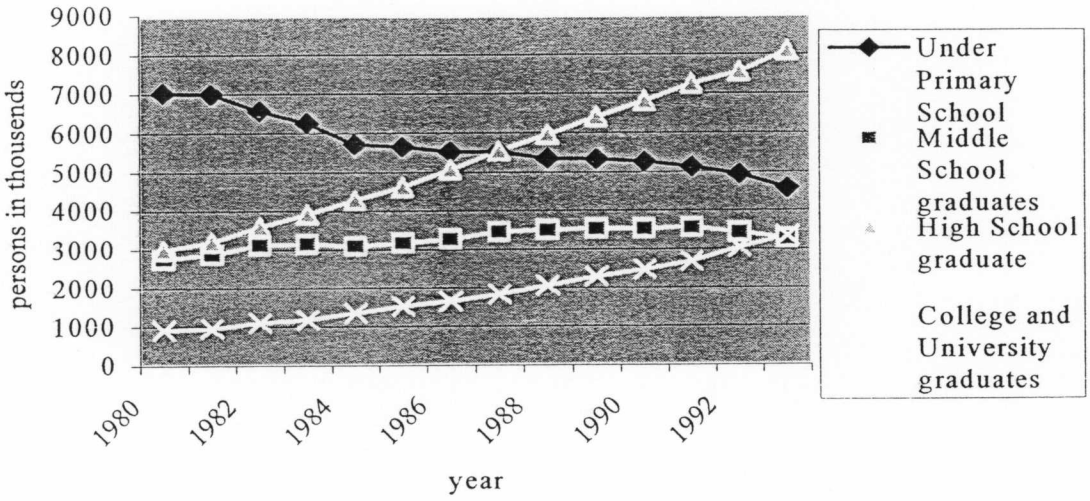
During the period 1960-1974, GNP grew by an average rate of 9.07 percent per annum, while fixed capital, employment, and the quality of labor due to education increased by 7.19 percent, 3.55 percent, and 1.18 percent respectively. The increase in capital growth by 7.19 percent was estimated to have contributed 2.88 percentage points, or 31.8 percent to the GNP growth rate. And increase in labor 2.13 percentage points, or 23.5 percent; and 0.71 percentage points, or 7.8 percent to GNP growth rate was explained by quality improvement of labor due to education. The estimated contribution of education to output growth in Korea for period 1960-1966 was higher than the later periods.[7] The high residuals indicated under "others" perhaps not be free from contribution of education.

In the literal sense the educational attainment of working population have indication for contribution of education. The higher the stock of educated workers in modern manufacturing sector, the higher productivity will be. The evidence on employed persons educational attainment is very strong. The share of elementary school and less elementary constitutes the largest share in 1960s and early '70s. This situation changed with the change in industrial sector growth. High school graduates constitute the largest share in the later period and also college and university

[7] East Asian Studies Harvard University, 1980, Education and Economic growth in Korea.

graduates grew considerably. This has direct relation with income growth (see the estimation results).

Fig. 4 :Employed persons by Educational Attainment



Source: Yearly Book of Educational Statistics (KEDI)

As young Alwyn (1994), explains human capital accumulation has been quite rapid in Korea as well as in other NICs. As shown in the tables below in Korea the proportion of working population with secondary education and grew from 26.5 percent in 1966 to 75 percent in 1991. This improved educational attainment of work force contributes to about 1 percentage point to annual GNP growth.

Table 7: Educational attainment of working population (%)

	Hong Kong		Singapore		South Korea		Taiwan	
	1966	1991	1966	1991	1966	1991	1966	1991
None	19.2	5.6	55.1	-	31.1	6.4	17.0	4.5
Primary	53.6	22.9	28.2	33.7	42.4	18.5	57.2	28.0
Secondary	27.2	71.4	15.8	66.3	26.5	75.0	25.8	67.6

Source: extracted from Young Alwyn (1995) . Asia Growth Experience

Contribution of education for economic growth is already well proved. Any country's significant development achievement is more or less tied with educational improvement. Even the world development history has a close relation with educational level of the citizens. But the causality may run both ways. From Korea's experience it seems safe to say that education was one of the driving forces of economic take-off in the 1960s.

3.7 East Asian Strategies in Human Capital Accumulation

East Asian has achieved an amazingly wide margin the faster-growth in the world in the recent years. The real per capita GNP growth especially in four economies for the last 3-4 decade surpasses all other economies in the world (Snodgrass 1996). How do they were able to do much well than other? Their success largely accounts for activists' industrial policy and institutions copied from Japan. Industrial policy success was also made feasible because of the early development of absorptive capacity in each economy through appropriate educational policy.

This success could be explained partly by unique features of these economies as well. According to Francis Green (1996), the role of the state mainly, in four tigers have five distinctive features: the existence of an emergency situation in the society during the early stage industrialization; an out-ward orientation of the economy; absence of the rural land owning class; an ability to reskill the society during the process of industrial upgrading; and finally the ability to adopt rapidly to changes in the international economy. Within the context of external threat to their political sovereignty the state promoted heavy industries, not as end, but as means of sustaining legitimacy of the state and its political independence. Besides these, commitment of the ruling elite to develop their economies in the specific direction contributed in these nations.

In all rapidly growing East Asian Economies, the growth and transformation of systems of education and training during the past three decades has been drastic. As stylized fact, enrollments are at higher at higher levels of per capita income, but the HPEAs enrollment rates tend to be higher than predicted for their level of income

(World Bank 1993). At primary level this was most obvious in 1965, when Korea, Singapore, and Hong Kong already achieved universal primary education enrollment, well ahead of other developing countries. And even Indonesia with its vast population had a primary enrollment more above 70 percent in the same period. By 1980s, their superior education system was evident at the secondary level.

As we can clearly observe from the table bellow, all high performing Asian stars had superior achievement even in the 1950s in primary school. The all Asian locomotives and backbone, Japan, already achieved universal primary school enrollment and secondary education in 1970s. Except for Indonesia, Malaysia, and Thailand; all others attained universal primary education in the early 1970s. Interestingly, if we compare the average regional achievement, the Sub-Saharan Africa performance is only 46 percent where HPAEs average is 96 percent. In the secondary school also the performance gap is much higher.

Table 8: Primary, secondary, and tertiary enrollment of East Asian Economies 1950 ~ 1970

Regions	Primary			Secondary			Tertiary School Enrollment per 100,000 population		
	1950	1960	1970	1950	1960	1970	1950	1960	1970
Japan	100	102	100	69	79	90	289	761	1656
South Korea	83	96	104	16	29	41	179	409	627
Taiwan	79	102	106	11	29	53	89	330	1450
Singapore	80	111	105	8	33	45	181	629	650
Thailand	84	84	81	6	13	16	111	192	196
Malaysia	72	93	91	5	16	33	5	117	166
Indonesia	46	60	69	3	6	12	8	113	187
Avg.	79	92	97	18	29	42	218	454	834
HPAEs Sub-Sa . Africa			46	5. 9					

Source: UNESCO, progress of education in Asia Region. Statistical Supplement (Bangkok, 1972)

This have rough indication that early universal primary and secondary education achievement necessary condition for any form of economic growth. The rapid success could be the result of bundle of economic policies, which support each other. However, the availability of educated persons who coordinate all required policies is substantial importance than any possessions. It is equally important for low-income economies with number of social and economic bottlenecks. As clearly the econometric estimation carried at chapter five shows that the fast per capita income growth of HPAES and early universalization of primary and secondary education has positive relation.

In all East Asian economies, increasing share of industrial output to GNP is consistent with high human capital accumulation. Rodrick Dani (1997), on his study on "total factor productively controversies" indicated that output per capita worker has higher in Korea than in others. However, all have significant share of out put per worker, which resulted from improved labor productivity through high educational attainment of working labor force.

Table 9: Sources of Growth in East Asia Region

	Output per worker	Contribution of		
		Physical capital	Education	Factor productivity
Indonesia	3.4	2.1	0.5	0.8
Korea	5.7	3.3	0.8	1.5
Malaysia	3.8	2.3	0.5	0.9
Philippines	1.2	1.2	0.5	0.4
Thailand	5.0	2.7	0.4	1.8
Singapore	5.4	3.4	0.4	1.5
Taiwan	5.8	3.1	0.6	2.0

Source : extracted from Radric, Dani (1997) Working paper NO. 5914

On the other hand, extraordinary performance is partly a result of rapid growth in income, early demography transition, and more equitable income distribution. Each of which increases the resource available for education in each of the economies. The

government policies that rise income level of the citizen have influence on the expansion of education. Besides this, the low population growth paid for success. Deceleration of school age growth in national level enabled the public expenditure to rise per student.

Table 10: Size and Growth of school age population

Economies/Region	School – age (0 –14) Population as % of Total population		Growth rate of primary school age (6-11) population percentage	
	1965	1989	1965–75	80 – 85
Hong Kong	40	22	-1.1	0.3
Korea, Rep. Of	43	26	0.7	-0. 3
Malaysia	46	37	1.9	0.2
Singapore	44	24	-1.2	2.2
Thailand	46	34	2.9	- 0.1
Average	**43.8**	**28.6**	**0.64**	**-0.42**
Other selected economies				
Bangladesh	43	44	3.3	2.9
Brazil	44	35	2.0	1.7
Colombia	47	35	2.3	0.9
Kenya	47	51	3.8	4.7
Nigeria	46	48	3.8	3.4
Pakistan	46	45	2.9	1.8
Average	**45.3**	**43**	**3.16**	**2..56**

Source: World Bank 1993, pp. 193

During 1980s, the growth rate population age 6 –11 years was very low in East Asia. So low absolute number of school children in Korea, Singapore, and Thailand but is phenomenally high in Sub-Saharan Africa. As a result, they were able to provide broad based basic education for all of eligible age group.

As indicated above, in East Asia High Performing Economies on average the school age population (0 –14) fall from 0.42 to –0.42 in between 1965 to 1985, while in selected low-income countries above hardly fall from 3.16 in 1965 to 2.56 in 1985. So, when the school age growing rapidly, as in Kenya and Pakistan or in any developing country, the rising expenditures are needed just to keep the enrollment rate

constant. However, with decelerating school age population growth, similar increase expenditure can go for more schooling or better quality. This means countries with increasing growth rate of school age population has to increase the educational budget simply to maintain last year enrollment. Hence, demographic transition had contributed for Asian rapid accumulation of human capital.

Amusingly, regardless of their rapid expansion in education opportunity, the public expenditure of education not so much higher in East Asia than else where. As it is illustrated on the table above, in 1960, the public expenditure on average 2.5 in East Asia, while 2.4 in the same period in SSA. In 1989 also the same is true in between EA and SSA.

Table 11: Public expenditure on Education as % of GNP

Countries	Hong Kong	Korea	Singapore	Malaysia	Thailand	Average	SSA
1960	–	2.0	2 8	2 9	2 3	2 5	2 4
1989	2.8	3.6	3 4	5 6	3 2	3 7	4 1
1985 allocation of educational	69 3	83	64.6	74 9	81 3		
allocated for basic education	ED EX/GNP 2 8	3 0	5.0	7 9	3 2		

Source: World Bank, 1993

The allocation of public expenditure in between basic and higher education is the major policy factor for their extraordinary performance. The share public expenditure allocated to basic education has been consistently higher than elsewhere. Even Indonesia with the large rural population was able to pull all school age population through priority setting on public expenditure and attained 92 percent primary school enrollment in 1980s (WB 1993).

By giving priority to expanding primary and secondary bases of education pyramid, the East Asian government stimulated the demand for higher education, relying to a large extent on private sector to fill unsatisfied demand. This strategy of investment is more equitable and efficient. Priority on higher education expenditure benefit high-income families.

However, it is important to note that sustained long-term economic growth depend on producing skilled young generation capable of undertaking effective R&D activities. In case of East Asian also they didn't left totally higher education to free

market. Fore instance, Korea developed number of public institutions to cultivate youths in science and technology skill from their secondary school level to doctoral degree. Limited funding of post-secondary education focused on the technical skills, and some HPEAs imported educational services in large scale, particularly in vocational and technologically sophisticated disciplines (Snodgrass 1996). Government mainly carried this out

To sum up, the public investment on education was not larger in in East Asia than elsewhere. The main difference lies in priority of investment. The early emphasis on compulsory basic education has substantial pay off for whole society. The excess demand for secondary and tertiary education was largely met by private sector. In general pragmatic policy adoption and implementation based on economies need led to this great success.

Chapter Four

The Interaction between Outward-looking Growth Strategy, Human Capital Accumulation, and Technology Transfer

4.1 Is Expansion of Human capital all?

It is clear that Korea has been successful in strategy to achieve rapid accumulation human capital. But the high level of human capital formation may be a necessary condition but not sufficient condition for sustained and rapid growth of output. The Philippines, the Republic of former Soviet Union, and Sri Lanka are the prominent examples of economies that have had a high school enrollment rates but low rates of growth of percept income and wages (World Bank, 1993). The main difference in between Korea and such countries perhaps emerges from utilizing human in the activities that yield high returns on the prior investment in education and training, which is equally important for growth as accumulation of productive assets. Here two conditions must be fulfilled for a growing supply of educated labor to be utilized in high-return activities. First, there must be rapid growth of labor demand relative to supply, in particular demand for skilled labor. Second, the return from education investment at least should be equal to other alternative investment. This in turn depends on labor market performance – it must be efficient flexible, responsive to change in labor demand, and workers should be employed in a job their skills are more productively utilized. Here the responsible government agent participation is highly important to adjust coordination failure. If these conditions are not fulfilled, there is risk that the rapid expansion of education and training may result in labor market problem that erode the benefit of human capital accumulation and have serious adverse impact on the growth of out put and wage.

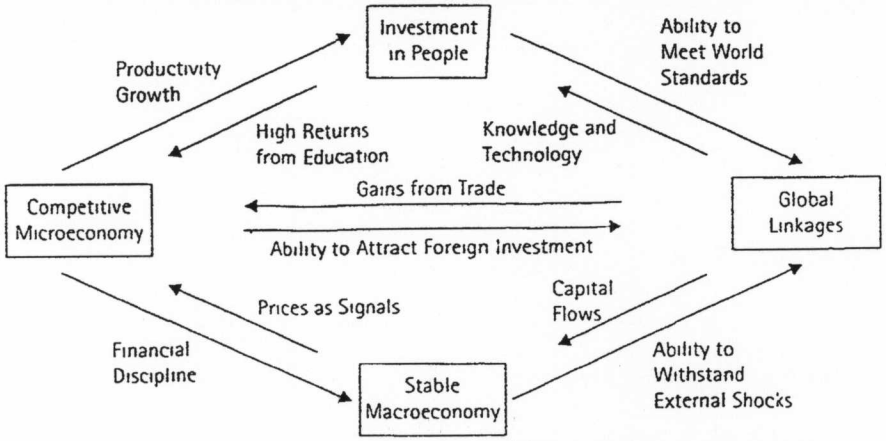
Korea has been successful in achieving these goals, its economy effectively

absorbed high expansion of human capital for the last three-to four decades. Korea, until 1997 financial crisis had unemployment rate less than three percent that could partly indicates the absorption of effective labor force in productive economic activities. This impressive accumulation of high skilled labor force and absorption partly attributed to outward-looking growth strategy, its rapid raise in per capita income, and in the process acquisition of foreign technologies through merging domestic economy to world. They have created effective interaction in between in which one supports the progress of the other.

It has been believed that outward-oriented growth strategy has positive impact on the growth through a number of channels other than through improved resource allocation - more in line with once comparative advantage. Among the most frequently cited channels are: the ability to exploit scale economies in production, easier access to better technologies, increase efforts towards labor training and research and development, to meet the greater competition at home and abroad, and better chance to have general policy environment especially conducive to growth. That means, outward-oriented economies benefit from number of dynamic externalities generated by opening the domestic market to foreign competition, bedsides the strategic gains from trade expansion itself.

As shown in the figure bellow, the interaction between export oriented growth and government policies that focus on investment on people, healthy macroeconomic situation increase the return from both human and physical capital investment. This is one of the strategic benefits from outward-oriented growth. Stable macroeconomic condition is equally important for attracting foreign capital. Thus, it is this interaction lead to sustained success.

Figure 5: The complex interaction of firms and government policies in economic development



Source: Malecki Edwad J., 1997. Technology and Economic Development.pp 274

4.2 Government policy and Outward-looking Growth strategy

With the launching of the First Five-Year Development Plan in 1962, Korea directly switched to so called outward-looking growth or export oriented industrialization and growth strategy. The growth rate soared immediately in 1963 and prolonged period of high growth and rapid industrialization ensured. Under this strategy, most other policy objectives were aligned to the basic goal of export promotion. And in order to achieve this goal the government undertake a package of policy reforms, one after the other, regarding exchange rate, currency, budget, and tax systems[8].

Trade regime was not neutral. Protection of domestic market was high in industries without strong export prospect, and it was low in industries with international competitiveness. Also government introduced a complex system of incentives, all designed for export promotion. The system of export financing played a critical role in supporting export industries until mid 1980s (Kim and Shin, 1995). The government deliberately established responsible institutions for this purpose. Bank of Korea, engaged in automatic rediscounting, which supplies credit through commercial banks to exporting firms who receive letter of credit. The central bank's discount loan also extended to free shipment of export and as well as for imports of row materials and immediate goods for export use.

As it established much human resource development planning institutions in education sector, the government established the Korea Trade Promotion Cooperation (KOTRA) mainly to explore foreign markets. To assist exporters in effectively filling foreign orders, the government also subsidized projects to improve the wrapping and design of product, the expansion of facilities for export goods, the opening of foreign language training centers, and traveling expenses covered by government for delegation to overseas exposition and trade show.

The government also initiated close consultation with the exporting firms and industries to evaluate performance through " monthly export promotion and

[8] The Won was devalued from130 to 255W per U.S dollar in 1964, inaugurating a sliding-peg system continued adjustment (from multiple to unified). Price stabilization and tax reform were carried out to control inflation and raise the ratio of tax revenue.

expansion meeting" chaired by president. These and many policy measures were taken to support the plan. These and some other policy measures played important role for the success.

One of the important factors contributed for the success was Korea's deliberate concentration on industries where capital requirement was relatively low. Korea had consciously relied on the early period on exporting some of the labor-intensive products such as clothing and wings, which had favorable and rising international demand. All these strategies and programs turned out to be highly successful. Export share of GNP rose sharply, while the basis of industry and exports diversified into light manufacturing industry in clothing, footwear, and electronics (Woo, 1998). Korea's economic transformation is highly impressive. The per capita income on average from 1962 to 1995 grew 22.8 percent. In the same period the share of primary sector to GDP fall from 44 percent to 6.6, while share of manufacturing rose from 12.4 to 26.9 in between 1962 and 1995 respectively. This rapid unprecedented growth perhaps the result of success in export promotion strategy. As it is illustrated in the table bellow, the export share of GNP grew from 2 percent to nearly 28 percent in the same period. Interestingly more than 90 percent of exportable items are manufacturing goods. It is from these facts the Korean miraculous economic growth emerges.

Table 12: Major indicators of Korea Economic Growth

	1962	1979	1995
Mid year population (in million)	26.5	37.5	44.9
Per capita GNP (U.S.$)	938	2697	8015
GDP by industry origin (% share of current price)			
Primary industry	44	20.3	6.9
Manufacturing	12.4	27.5	26.9
Social overhead and construction	9.5	16.8	23.7
Other services	34.1	35.4	42.5
Financing investment (%ratio to GNP in current prices)			
Gross domestic saving	3.3	27.1	36.2
Foreign saving	10.7	8.5	1 9
Export and Import (in current prices)			
Commodity export, f o.b U.S$ billion	0.1	15.1	125 1
Ratio to GNP (%)	2 0	22.9	27.7
Share of manufacturing exports (%)	27.0	90.1	96.1

Source: Kim and Hong, 1997.Acccounting rapid growth in Korea, 1962-1995 Pp. 5

The Korea's success is not free gain, but it is the result of availability of threshold level of human capital. As I have tried to explain in the earlier chapters, at the beginning of 1960s, at early export promotion period, Korea had certain level of human capital and primary education was nearly universalized. As a result through out this phase of development, the economic plan was not staked from any shortage of required manpower for the economic level of the period. Thanks to government effort devoted to adult literacy and early concern provided for basic education, a great reservoir of modestly educated semi-skilled worker were available to meet the demand basically for manual industries during this phase. In addition, Korea had small but suitable number of innovative enterprise, government officials, and various professionals and clerical personnel were available.

According to Radrik (1994) comparative studies on Korea and Taiwan growth, most explanation of Korea and Taiwan's growth early 1960s place heavy emphasis on export promotion. Profitability of export during 1960s is too insignificant to account for phenomenal export boom. Moreover, exports were too insignificant to effect on aggregate economic performance. A more plausible, story focuses on the investment boom that took place in both countries. In the early 1960s both countries had an extremely well educated labor force relative to their physical capital stock, rendering the latent return to capital quit high. Here Rodrik argue that the existence of certain stock of well-educated labor had contributed to rapid take off. The government policy subsidizing and coordinating investment decision, which increase private return from investment and devoting public resource to investment in infrastructure and human capital has undeniable importance for economic take off.

Bhagwati (1996), argue that export promotion has direct and indirect strategic benefits. It increases private earning in that in that increases in imports of new-vintage capital equipment whose social marginal product exceeds the international price, and yield surplus. The social marginal product of imported equipment would be greater with a literate labor force. And the return would be even higher for labor force with secondary and above. This argument precisely indicates that the benefits from export promotion growth strategy will be higher with availability of literate labor force consistent with the initial condition in Korea.

Hence in the initial period, the availability of modestly educated labor force raised the return for export and export again raised the return for educated labor.

However, due fires competition in the world market the demand for skilled labor change frequently. The government closely follows the bottlenecks and quickly responds adopting the appropriate policy measures. The policies were different from time to time based on the real problems.

Since the initiation of Second Five Year Development Plan (1967-1972), due to continued industrialization, the skills demand start to rise rapidly since the major policy targets gradually shifted on to more skill intensive industries – such as chemicals, machinery and steel. Corresponding efforts in manpower development followed, aimed at expanding the capacity and improving the quality of vocational education and training (VET) both within and outside the formal education system.

4.3 Trade and expansion of Vocational Education and Training (VET)

The role of VET is regarded as pivotal for Koreas industrialization through exports based strategy. It is considered by policy makers as key for reducing the pressure on the universities to enroll the greater numbers, and meeting a shortage of skilled and semi-skilled workers. The mismatch in educated persons and the workplace demand specific skill was the main focus of policy makers. In the late 1960s and 1970s, Korea stepped up to develop skilled and technician workers outside the formal education system. The government efforts in this line started with legislation of the " Vocational Training Law" in 1967. Later, government constantly expanded vocational training facilities by drawing domestic as well as loans and aids from foreign countries and international organizations. In 1968, the government established the Central Vocational Training Center with the aids from ILO and UNDP so as to cultivate vocational training teachers (trainees of train). In 1971, the government made a contract for technical cooperation with German government and opened the "Korean-German Vocational Training Center" in Pusan. In 1973, the government founded the Chunsan Training center with the aids from U.S. government and setup the center in Chunchon and in Taejon with the loan from Asian Development bank (Woo, 1998). These and all other training centers established with international cooperation and foreign loan were equipped with usually excellent training facilities to meet the demand. Foreign and local skilled teachers in the area

were employed to train workers in the demanded field.

The government full effort on VET is to promote and secure engineers and skilled workers for the heavy and chemical industrialization (HCI) program and to provide skilled manpower especially for manufacturing export sector which was growing at accelerated rate in 1970s. To support this goals, training centers, technical high schools, and engineering colleges highly expanded in quality and quantity. Specifically, the government imposed the vocational training requirements on the private firms to expand the supply of skilled labor for the HCI. As a result, the number of in-plant trainees increased in 1970s (see fig.5). To encourage the trainees the government introduced *skill-licensing* system, that induce every Korean workers to posses at least one skill license. In addition for each field of engineering the government actively recruited outstanding Korean scientist's abroad and established a modern laboratory where research on the improvement of production technology was conducted in collaboration with industry researchers and university professors. Industrial parks were built to conduct broad-based industrial research.

Features Korea VET: As in most countries, private firms and public training centers and education in institutions deliver VET. Ministry of Education and Labor oversees it. Koreas industrial manpower is educated and trained under diverse vocational and education systems. The vocational/technical education system in Korea consists of vocational education and vocational training systems. The authority of running the first one given for MOE while the latter led by MOL as shown on the table below.

Table 9: Korea's Vocational Training System

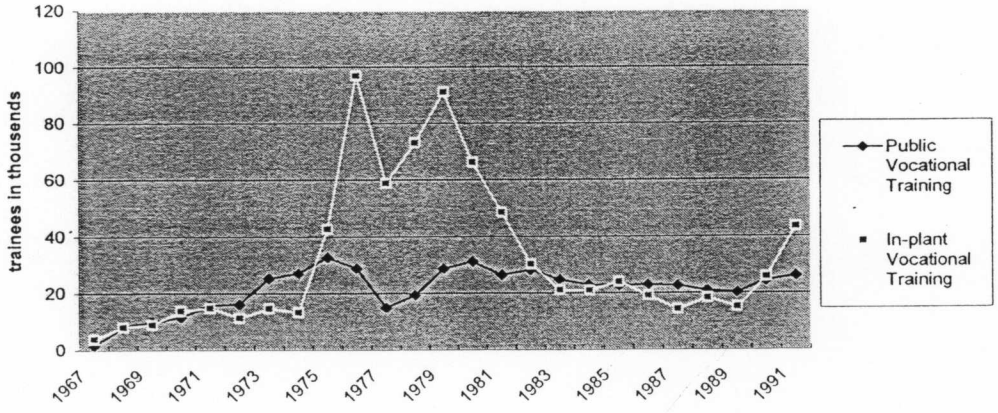
	Vocational Education	**Vocational Training**
Implementing	**Vocational High schools**	**Public vocational institutes**
Institutions	Junior technical colleges Open collages	In-plant vocational institutes Authorized vocational institutes
Ministries	**MOE**	**MOL**
Duration	2 to 3 years	1 to 3 months
Curriculum	Major field and knowledge and skill related to major 70% theory 30 per cent practice	Knowledge and skill related Directly to major 30 per cent theory 70 per cent practice

Source: Ministry of Labor (1995), Vocational training in Korea

Vocational Education: Middle school graduates after six years in elementary and three years in lower secondary school (that means, students who successfully completed nine years of formal school education) steamed into academic or vocational tracks depending up on their performance. In the high school students have choice either to join general academic high schools or vocational high schools. Vocational high schools subdivided into agricultural, technical, commercial, fishery and marine, and home economics. There are also vocational high schools called ' *comprehensive* high schools', which provide both vocational and general academic education within the school system (Ihm, 1998). Besides, a number of general high schools offer vocational classes for students who decide not to enter college but want to get jobs after high school graduation. In the colleges and university level, mostly, student who not succeeded in university and college entrance exams apply for vocational education.

In-plant Training: Since1960s has experimented with various measures to increase in-plant training. Large firms were advised strongly to provide in-plant training, and they were forced to pat training levy if they did not met the government regulations. The policy brought significant increase in number of trainees (see figure bellow).

Fig. 6: Public and in-plant vocational Training



Source: KEDI - UNESCO ACEID (1998)

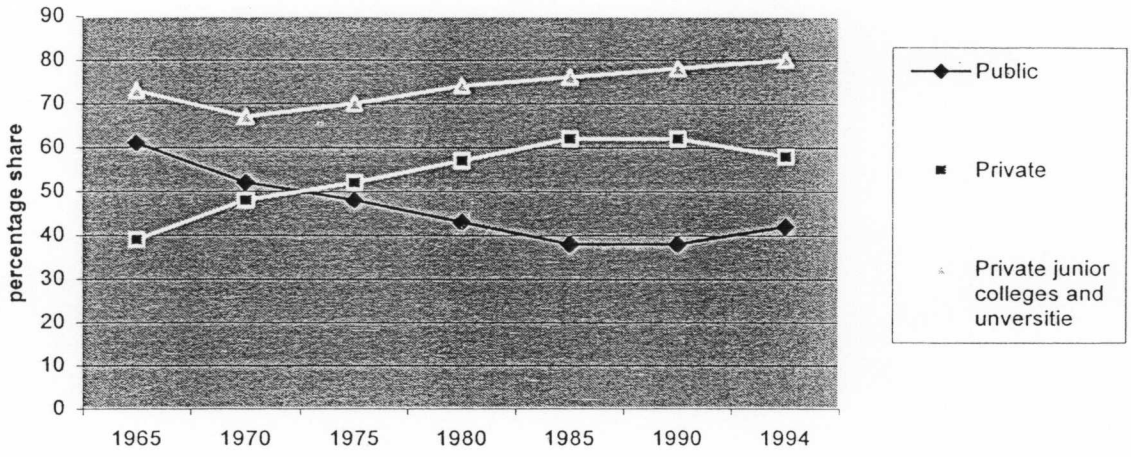
This mandate initially applied to firms with at least 500 employees, but the coverage was expanded to firms larger than 150 employee. However, the private

sectors were reluctant to conduct their own training centers. When they were desperate for skilled workers, they simply unfairly scouted for those workers in the other companies. To cope with such problems, the special measure low for vocational training enacted in 1974. Under this law, private enterprises above 200 employee were obliged to train at least 15 percent of their workers every year and if they are fail to do so, they could be fined up to $6000 (Kim, 1998). In every sector the Korean government policy designed to solve existing problems. Pragmatic and flexible policies measures are special features in Korea.

In the 1980s, training labor in firm specific skills has understood that it has limitations, especially in labor mobility. As a result the emphasis changed from single skill training to multi-skill training. Among public training institutes, there are quasi-higher education institutes operated by MOL. These colleges train multi skilled craft men and masters in area. The public vocational training include Central Government Local Government, Korea Manpower Agency, Korea Employment promotion Agency for Disabled, Korea Chamber of Commerce. In-Plant Vocational Training includes sole program and joint program. Besides these, there are accelerated vocational training programs. These include: special corporation, social welfare corporation, and non-profit corporation. In these diversified policy measures the government was able to meet the growing demand in industrial sector for skilled technicians.

In regard to financing VET, the shared financing is common in this sector as it is in academic education. Interestingly, at the early stage of development, when industries were in embryonic stage the government provided industrial labor from formal educational system. The government limited itself in providing teachers skilled in training and running certain highly important training centers. The private share of enrollment kept high for all three decades (see the table bellow). This has clear policy indication for less developed countries. In the embryonic stage of development government has took responsibility; but in the later stage private sector become more dominant.

Fig. 7: Share of private enrollment in vocational high schools and junior colleges



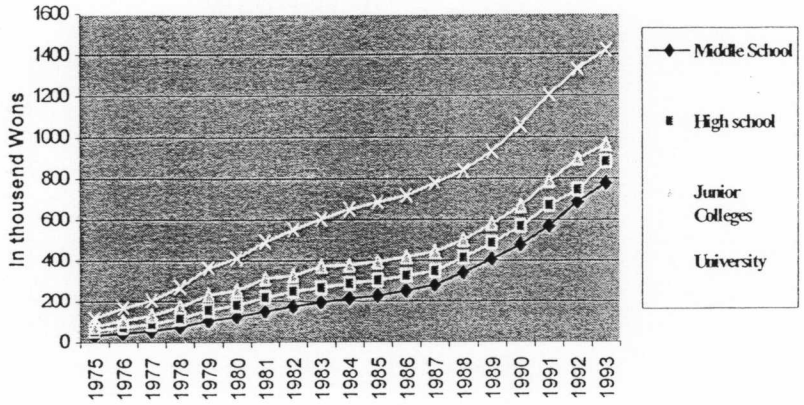
Source: Gwang-Jo Kim, 1998. Privet Sectors Role in Education. KEDI

As we can see from the graphs above, private sector was the dominant provider in junior colleges and universities and its share started to ascending since 1970s.In the vocational schools public share was higher at embryonic stage of industrialization. But latter private sector has got dominant share while public share was falling.

4.4 Increase in Wage as Stimulant for Human Capital Investment

The demand for skilled labor is more importantthan supply of it; basically the demand for labor drive from demand to produce goods and services. The rapid expansion of skilled labor is attributed to increased demand in industrial sector. This increased wage level stimulating more youths and families to invest in further education. According to Amsden (1989), "... early low wage level and later fast wage increase contributed to the dynamism of Korean and Japan growth. Workers in these countries paid higher wages not because of shortage of particular skills, but in order to induce them to exercise there intelligence and make important technology work". In demand side rapid GNP increase and rapid accumulation of capital basis for rapid wage increase.

Fig. 8: Wage level by Educational Attainment



Source: Major statistical Indicators of Korean Economy (1994)

The successful interaction between human capital, trade and technology raised the per capita income significantly since 1963. Besides, the promotion of skill intensive chemical industry, further raised the demand. The manufacturing export share grew unexpectedly which in turn accelerated the acquisition and mastery of international best-practice technologies in highly imperfect international technology markets. High and rising level of human capital ensured the acquisition and adoption of sophisticated imported technologies effectively. Thus, export orientation and high human capital formed high vicious circle. Export raised the demand for educated persons and educated persons raised the return from export. This rose the demand for industrial labor further.

The standard deviation between wage levels in the same period is much higher for university graduate employee than any other graduates. Indicating that the level of deviation in between mean wage in different levels, which attracted may families to invest in education. The skewness of the wage for middle school graduates surpasses all the others. The implication of this is that, compared to wage paid to middle school graduate in 1975 and in 1993 highly different due rapid raise in wage. The difference in mean wage is much wider. For instance, the mean wage in thousands of Won for period 1975 to 1993 for elementary, middle, high school, and colleges and universities is 272, 338, 421, and 673 respectively. Thus induce people to strive to be in the upper ladder.

4.5 Trade and Acquisition of Foreign Technology

4.5.1 Access to World best Practices Though Trade

In the earlier discussions I have tried to illustrate the government policy issues in rapid accumulation of human capital. However, the government policy alone does not explain the whole history of Korea's high skilled labor force accumulation. It is rather the result of appropriate policy that raised the return from skill investment. The development strategy that links national economy with international economy raised the demand for skilled labor raising the gains. It enabled to access to international best technology. Thus, access to international market and rapid accumulation of human capital formation supplement each other. It is doubtful that Korea could have made as productive use of foreign technology and imported capital without highly skilled domestic engineers and workers. Conversely, without foreign best-practice acquisition, it is very unlikely that total factor productivity would have been large. According to Katz (1987), intensive efforts by highly skilled managers and technicians in in-ward looking strategy without linking to international market do not generate high return.

The rapid export growth has often generated positive interaction between human capital, physical capital, and knowledge. Korea has been able to acquire foreign technology with low cost, easily adopted and diffused. This coordinated approach that led for rapid success. Fast growth on technological capability related with the profitability of investment in new technology. According to many studies, firms invest in new technologies when they expect sufficient returns from their investment. In fact, large proportion of scientific research conducted in the OECD countries financed by private individuals. For instance, in U.S alone more than 12,000 industrial research labs are searching actively for profit innovations, and in Japan more than 80 per cent of all R&D, including much research as well as for development is financed by private sector (Helpman and GrosssMan, 1993). The

same is true in case of Korea after 1980s. The largest share of spending on R&D come from pockets of individual business group looking for profit. The government policy played the supportive role in easing financial and human capital, and information problems.

Without technological change, sustained growth is impossible and unthinkable because it is known to be the major determinant of a nation's economic development. Many studies have shown that more than 50 percent of long term economic growth stems from technological development which improves the productivity or innovation of new products (Dension, 1967, Grossman, 1991). Therefor, the question is how science and technology, which appears to be the key ingredient of development is advanced and effectively used in for advancement of less developed countries.

The Koreas rapid growth may be attributed to many economic, social, technological factors. The most important may be the rapid technological change stemming from accumulation of technological capabilities over time. It grow through expanding science and technology education in supply side, which in turn enable to assimilate, use, adopt and diffuse.

4.5.2 Technology Acquisition, Adoption, and Diffusion

Technology is not as simple commodity bought and sold in the perfect market. Its market is highly imperfect. Even it is in the market, it is tacit that the original innovators only know well but for those buy it, it is not as simple as theories explain. It requires new investment to understand well its structure. Besides this the technology owners and technology seekers have conflicting ends. Technology owners always try to maintain their ownership and are doubtful not to be robed by others. Hence they don't want to reveal its secret. Conversely, developing countries want to access to at less cost and to sustained use. Korea has been able to break through these all complicated problems within short period of time. The success may be emerged from early accumulation of adaptable labor force, entrepreneurial ability, government early adoption of technology acquisition supporting institution, rent less efforts by private firms either formally or informally on the bases of profit seeking together have contributed to it.

Success in technology development requires access to foreign technology

(Dahlman and Sercovich, 1984). After obtaining foreign technology, a conscious effort is needed to assimilate, adopt, and make effective use of it through changing in the way it fit to local condition. The participation in technology intensive goods exports facilitate technological development by permitting economies of scale and accumulation of experiences, including access to additional foreign technology from foreign collaborates.

Acquiring Foreign Technology: technology transferred from abroad through such formal or direct channels or informal or indirect channels. Formal channels include Foreign Direct Investment (FDI) by multinational companies and Patent or know-how licensing are the major mode. In the former mode, foreign firms possess ownership of subsidiaries and management control; in the later case, foreign firms utilize market opportunity through arms-length contracts for technology. The informal channels are: technological consulting, imitation, technical assistance from foreign buyer (OEM), importation of capital goods, study abroad, personal relations, etc., are grouped as informal transfer.

The Industrial Policy Contribution to Technological transfer: Korean government also played the decisive role in this field as it did for others. The government in aim of sustaining economic development and industrial growth deliberately promoted of big business as an engine for technological learning. An ambitious outward-looking growth strategy forced firms to expedite learning, and promotion of HCI which requires high skilled engineers to handle its operation and maintenance or improvement directly or indirectly forced to learn technology through leaning by doing. Korean 'Chaebols'[9] had several important contribution in technological learning–through rapid accumulation of technological capabilities. This is because of their financial adequacy, they were able to draw the best human resources from formal educational institutions as they can offer higher wages. They developed organizational and technological resource to identify negotiates the transfer of technological know-how for foreign countries. They obtain new business license and preferential finance from government, investing in organized in-house training, and transfer of experience gained in one field to other and collaboration with foreign Original Equipment Manufacturer (OEM) buyers for international marketing of their products.

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[9] Chaebols can be defined as a big business group or financial clique consisting of varied corporate enterprises engaged in diversified business areas and typically owned and managed by one or two interrelated family groups

Sources of Technology Transfer: At early 1960s, Korea had only small old technologies of import substitution period, which is inadequate for economic take-off. Korea lacks technological capability at the outset of economic growth – that forced to relay on technological imports.

Table 10: Foreign Technology transfer to Korea (US$ million)

Source	1962-66	67-71	72-76	77-81	82-86	87-89
FDI	4 4	218 6	879 4	720.6	1766 5	3433.2
Foreign Licensing	0.8	16 3	96.5	451.4	1184.9	2130.3
Technology Consult	0	16.8	18.5	54.7	332.3	679
Capital Goods Imports	316	2541	8841	27978	44705	52155
Total	321.2	2792.7	9835.4	29204.7	47988 7	58397.5
Average	80.3	698.175	2458.85	7301.175	11997.18	14599.3

Source: Linsu Kim, 1991. Technology Policy and industrialization: Korea's Experience PP.443

Until the late 1950s, foreign investment was not allowed partly due to apprehension towards Japanese colonial period. The legal base provided in 1960 through the enactment of the "Foreign Capital Inducement Act" which provide number incentives like tax preferences, equal treatments with domestic firms, guarantee of profit remittances, and withdrawal of principals when needed (Won-Young Lee,). Its effect was so insignificant that its share was only 4.4 million or 1.4 per cent for period 1962-1966. This was partly related to political instability of the period. However, this liberal policy towards FDI not last for longer than 1965, when Korea normalize the relation with Japan anticipating a potential surge of Japanese investment the government introduced various measures to regulate the quality of foreign capital.

When technology is not critical element and matured technologies easily acquired by other means like in reverse engineering Korean government policy biased to importation of turn key plants and foreign capital goods as way of acquiring the world best technology (lee 1995). As the data above indicate, for the period 1962-to-1989, the total share of capital goods importation accounts for 92 percent that all the remaining account only for 8 per cent alone. This consistent with Westphal presumption that Korea acquired more technologies from advanced countries through importation of capital goods than through other means.

Regarding the source of foreign technology transfer to Korea, Japan constitutes the dominant share in all imports of technology. In terms of capital cost of imported goods from 1962 to 1981, more than 50 percent of come from Japan. U.S. is the next largest contributor which constitute for 22 percent and all the remaining countries 27 percent (Linsu Kim,1994). As these figures illustrate, technology transfer has direct relation with trade relation. U.S and Japan are the two largest trade partners of Korea export receivers. On the other hand, in all HPAEs, the Japanese technology transfer has been the dominant one.

Among HPAEs relatively Hong Kong and Singapore are more open to international trade, however, all were open in case of acquiring foreign technology. Japan, Korea to lesser degree Taiwan, China relied heavily on licensing, imports of machinery, and reverse engineering during their rapid growth periods. Hong Kong, Singapore and south Asia HPAEs, welcomed Foreign Direct Investment (FDI) that come bundled with technical, managerial, and some times with labor force skill (World Bank, 1993).

Technological Adoption and Diffusion: The effective diffusion of adopted technology is important part of technology to benefit economy from it. But if it limited to imported firms, it give monopoly power to that firm which limit the gain obtained from competitive situation. In Korea, many firms engaged in production of the same good which enabled them to be highly competitive in price and quality in domestic as well as in the world market.

Korea has many specialized technology diffusion agents such as capital goods producers, engineering consulting firms, and Government Research and Development Institutes (GRIs), with which government promote diffusion of technology with in the economy. The government established GRIs in 1966 as diffusion agent for whole economy. In addition, government deliberately fostered both government and corporate owned R&D centers though different policy measures. It considered R&D as the major tool for sustained growth. To this end, the government expands science and engineering education in university level to support the goal (see fig.3).

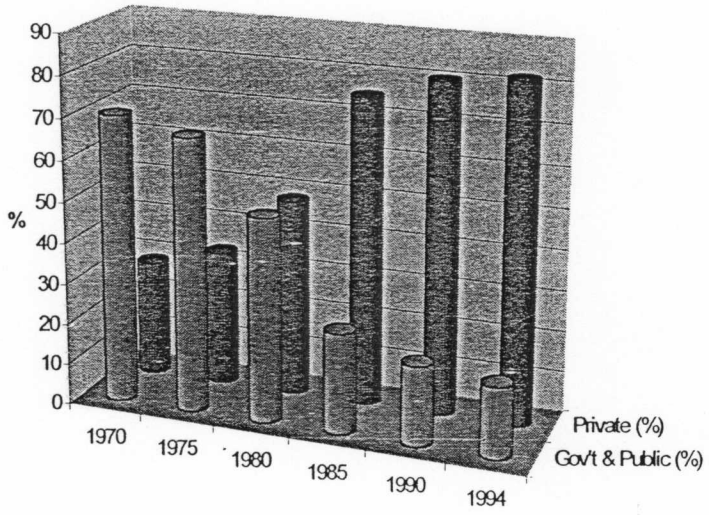
4.5.3 Research and Development (R&D)

Tacitness of technology requires government and firms to put certain efforts to acquire, assimilate, and improve the technology even taken from existing world shelf.

Korean government and firms made meaningful effort. Although the means of acquiring vary with the size of Korean firms have made significant effort in acquiring and assimilating foreign technology mainly through imitative engineering because relevant technology was readily available in a machine embodied form and learning by doing.

In the first two decades after economic take-off, due sever shortage in resource, little effort put to domestic research. Korea used its comparative advantage in labor intensive light industries. In 1966 government established Korea Institute for Science and Technology (KIST), as integrated technological center to support industrial technology learning. Government gave due attention to this institution allocating the largest share of R&D budget. Interestingly, in the 1960s and 1970s the lion share of R&D expenditure covered by the government. But since 1980, the situation reversed as indicated on the figure bellow. In other words government did take initiatives in endogenous R&D efforts in the early years.

Figure 9: Public and Private investment Share in VET

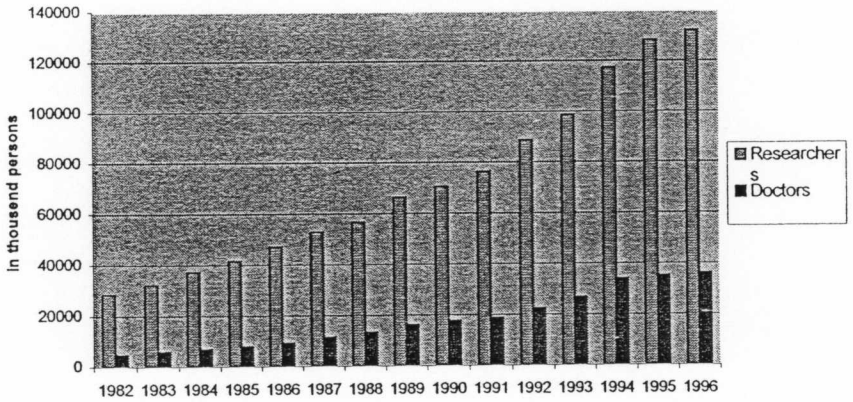


Source: Major Statistics of Korean Economy

Impressively, the number of researchers grew 2,135 in 1965 to 98,764 in 1993. Big jumps take place between 1980 and 1993. In this period the Korean economy changed from light labor intensive to highly sophisticated skill intensive production system which require continued R&D. This perhaps could be the reason for extraordinary growth in number of researchers.

The government policy, which increased competition in technology market, increased the corporate R&D centers significantly. Its number grew from 1 in 1970 to 1,690 in 1993. Their task was imitative reverse engineering rather than research for development. The government offered various tax incentives and preferential financing ways to reduce the risk in R&D investment. The government gave heavy weight and expanded engineering education to raise the absorptive capacity. The number of doctoral and bellow doctoral researchers engaged in R&D grew drastically (see the graphs bellow).

Figure 10: Researchers with doctoral and bellow doctoral level



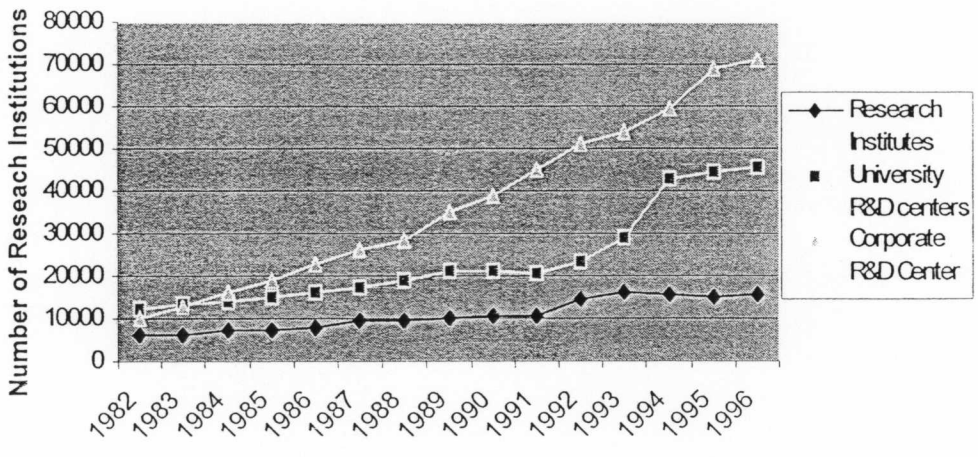
Source: Major Statistics of Korean Economy

Besides large number of domestic 4-year science and engineering, 2-year junior colleges, KAIST the government favored overseas education and training. A high proportion of senior government personnel, business people, and academics were exposed to foreign training mainly in U.S under various economic assistance program (Manson et., 1980).

Technology acquisition strategy varies with the type of technology and firm size. Industries like shipbuilding and machinery relied on formal transfer of foreign licensing and hiring constancy; large batch and mass production system such as electronics and automobile developed technical assistance program; industries like chemicals, cement and paper establish on the turn key bases by western firms. Small and medium size firms travel large distance to master through reverse engineering (Kim and Seong, 1995).

In 1970s, the Korean government policy biased towards cultivating big firms resulted in macroeconomic imbalances. Besides, political unrest and second world oil price shock forced Korea to undertake Comprehensive Stabilization policy measures. The policy aimed to make Korea economy more liberal and market oriented. Due this policy FDI flow increased, small and medium size firms got access to financial and other resources. In this period, raising technological level of the economy has got special attention. Numbers of basic research institutions were established.

Fig. 11: Sectoral Performance In R&D



Source: Major Statistical Indicators of Korean Economy

The government has played pivotal role in expediting basic and applied research in two ways: directly participating in R&D investment and indirectly using incentive packages such as preferential finance and tax concessions. In addition to this, the government expanded science and technology infrastructure. Government established several GRIs as spin-offs from KIST; each designed to develop in-depth capability of high industrial priority. In shipbuilding, Marine resource, electronics, telecommunications, energy, and chemicals (Linsu Kim, 1991).

In any case endogenous R&D is indispensable because technological capability is enhanced only through effective learning. Technical capability cannot be transferred through either borrowing or import This is because the tacitness of complex technology requires the intensive R&D efforts from technology users for the effective adoption and assimilation of technologies. This in turn requires the government coordinate role for successful transfer.

4.5.4 The Government Strategy in Repatriating Korean elite living abroad

Besides improving the performance of university R&D centers using different incentives, the government was also successful in attracting a large pool of Korean scientists and engineers studying and working abroad. Koreans studying in American universities ranks fifth after china, Japan, Taiwan, and India in 1980s (Mi Daehak,). During early years student do not return back after they have completed their academic and professional training in abroad. The government took systematic measures to repatriate Korean scientists and engineers' abroad. For this end, government established KIST as the first GRIs in 1966. The state directly participated in pursuing the repatriation of experienced scientists and engineers with highly attractive compensation package to hire and empower them. The government led repatriation program was a quite successful and returned large number highly experienced scientist. Also this strategy persuaded private corporate sectors to recruit high caliber Korean scientist and engineers from abroad paying attractive compensation with considerable independence. As a result, the number of corporate owned R&D center flourished from 54 in 1980 to 1690 in 1993 (Kim and Seong, 1995). The program called "Brain Pool" designed in 1991 to pull high level foreign as well as Korean engineers to Korea.

4.5.5 Chaebol's Effort in Attracting Foreign Technology

The Korea government played undeniable role in coordinating all the economic activities in every field of economy. However, that alone does not explain the full story of success. It is more of profit seeking private sector effort that contributed for the larger part. In the 1960s, the Korean export dominated in labor intensive products like food, textiles, footwear and wearing apparel, wood products, leather, clay and stone, etc., But since mid 1980s, it transformed into high skill intensive, world superior technology exports like electronics, chemical, automobiles, ships, semi-conductor. This rapid technological transformation is largely attributed to continued efforts and strategies of private large business groups.

The Korean Chaebols had impressive strategies in attracting foreign technology. They diversified their source of technology; setup outposts in advanced countries such as U.S, Japan, and other countries to get state-of-art technology by monitoring changes and for acquiring advanced semi conductor and computer technology. They developed ties with multinational corporations (MNCs), which provide important input in developing high technologies. They also entered into extensive licensing programs. Also chaebols took steps to merge, acquire and engage in strategic alliance with foreign top firms such as IBM, Xerox, Toshiba, and Microsoft (Linsu Kim, 1995). Chaebols looked for Russia, as attractive alternative source for new technologies, mainly after economic problem occurred in it and extracted many new technologies directly buying and also hiring Russian scientists and engineers.

In addition, they keep closer ties with local GRIs and invested aggressively in developing in-house R&D activities in order to absorb, assimilate, and adopt imported technologies form their outposts. Also they setup number of innovation centers since 1980s. Hence, the largest four chaebols of Korea (Samsung, Daewoo, Hyundi, and LG) contributed the lion's share of nation technology transfer as well in industrial R&D spending.

Hence, they have taken part from reverse engineering to cross boarder cooperation with high technology firms to expedite technological acquisition. When technology was relatively simple they opted for reverse engineering, when technology tasks become more sophisticated, tuned to strategic alliance, cooperation with MNCs, and so on. By this strategy they have been able to attract the world first class technologies.

Chapter Five

Empirical Findings and their Analysis

In the early part we have seen government policy measures contributed for rapid success in human capital accumulation and technology transfer in different economic growth levels. The theoretical analysis presumption based on that early unversalizetion of primary and secondary education combined with appropriate economic policy has given initial stimulus for per capita income growth. However, the initial success does not guarantee for sustained long run per capita income growth unless continued effort devote to produce high skilled labor with innovative and/or adoptive capacity. In other words, long term-sustained growth depends on availability of sufficient number of qualified scientists and engineers who can conduct innovative R&D activities. The empirical analysis bellow based on proving these concept.

5.1 Methodology and Limitations

In this part empirical test will be employed to prove the theoretical presumption explained above. The analysis use country specific time-series data on human capital stocks on selected proxy variables for period 1963 to 1995. The data sources vary with the requirement. However, the major source is 'Major Statistics of Korean Economy' published by the Korea statistical association. The model in all cases uses simple growth accounting equation with human capital. The analysis is base on the theory of endogenous growth where human capital variable considered as engine for long term growth.

The Model

The model based on endogenous growth theory. Indeed, this work not goes all the empirical details. We consider two growth models. One which is based on

standard Robert Solow model with two inputs, capital and labor, which are paid their marginal products and the other adds human capital to accumulation to Solow Model. In the first model it assumes Cobb-Douglas production function at time t is given by:

$$Yt = At\, K_t^{\alpha}\, L_t^{1-\alpha}\ ,\ 0 < \alpha < 1 \qquad (1)$$

Where Y is out put, K capital, L labor, and A the level of technology. In this model L grows exogenously at rate of n and that a constant fraction of output s is invested. Through derivation of evaluation of output per capita the steady state income per capita is:

$$\ln\frac{Yt}{Lt} = \ln A_t + \frac{\alpha}{1-\alpha}\ln st - \frac{\alpha}{1-\alpha}\ln nt + \delta t \qquad (2)$$

where δ is the rate of depreciation. This equation states that, the steady state per capita income related positively to rates of saving and negatively related to population growth. Because the model assumes factors are paid according to their marginal products. This model has no assumption about increasing return to factor input and has no explanatory power for long term growth. When the second model expand to include stock of human capital proxies, H (represented by PED, SED, PSE, JVC, PRD):

$$\ln\frac{Yt}{Lt} = \ln At + \frac{\alpha}{1-\alpha}\ln st - \frac{\alpha}{1-\alpha}\ln nt + \delta t + \frac{\beta}{1-\alpha}H_t \qquad (3)$$

In the above equation the real per capita income growth positively correlated with higher saving, human capital, and negatively related with population growth (n). However, there are another factors that can influence income level in both cases. i.e, technological level. If we include 'A_t' which reflects technology level and other stochastic variables as $\ln A_t = a + \varepsilon_t$; Where ε_t a random variable independent of saving, human capital and population growth. Therefor equation (2) and (3) take stochastic forms

$$\ln\frac{Yt}{Lt} = a + \frac{\alpha}{1-\alpha}\ln st - \frac{\alpha}{1-\alpha}\ln nt + \delta t + \varepsilon_t \qquad (4)$$

$$\ln\frac{Yt}{Lt} = a + \frac{\alpha}{1-\alpha}\ln s_t - \frac{\alpha}{1-\alpha}\ln n_t + \frac{\beta}{1-\alpha}H_t + \varepsilon_t \qquad (5)$$

When trade variable introduced to equation five

$$\ln\frac{Yt}{Lt} = a + \frac{\alpha}{1-\alpha}\ln s_t - \frac{\alpha}{1-\alpha}\ln n_t + \frac{\beta}{1-\alpha}H_t + \ln\frac{X}{GNP} + \varepsilon_t \qquad (6)$$

where X/GNP - is share of export to GNP

This analysis not extend to prove the detail analysis on the theory of neoclassical growth or the theory of convergence; but its main focus based exploring the relation between per capita income growth and human capital variables. And what if trade variables introduced with human capital? Equation (5) and (6) use as base for estimation.

The analysis has three main parts. The first part examines the correlation between early unvesalization of primary and lower secondary education using enrollment ratio as proxy variable. In the second part trade related variables are included to examine the relation between per capita income growth, persons engaged in R &D, spending on it, and with other related variables. The third part deals with seven high performing Asian economies using the same method as in the first part.

Limitation of the Methodology

Finding adequate and required data is the major problem in research work. Using educational attainment of working population could be more appropriate to measure education stock than using enrollment ratio as proxy of educational variable has several limitations. First, current enrollment ratio measures the flow of schooling; the accumulation of these flows creates the future stocks of human capital. Because educational process takes many years to join labor force that lag between flows and

stocks is long and does not exactly human capital stock. Also enrollment ratios usually available for gross enrollment not for net enrollment that includes students not in the age group. Human capital in broad sense includes investment in health and in job training and others related investments but this not considered in this work. Besides this limitation, due to continued growth in the last four decades in every sectors of economy's of Korea, most of the economic variables have upward trend (move together). As a result, when one variable effect overlap the other it provide unexpected results. Hence, multicollinearity and spurious results, unexpected signs and low t-ratio prevail.

5.2 Estimation Results

The results for regression using Ordinary Least Squares (OLS) estimation method on log of real per capita GNP reported on the table 14 and 15. Looking at the estimation results for both Korea and Asia the estimate coefficients have expected signs in most cases and high significance. The degree of fitness is high. Interestingly, the coefficient of human capital stock proxy is significant at five percent significance level in all cases.

Table 14: Out put of the regression using Ordinary Least Square Estimation

Dependent variable log of real per capita GNP ($\ln\frac{Yt}{Lt}$); 30 observations are used for Estimation from 1963 to 1993

Symbols	Variables	Eq.1	Eq.2	Eq.3	Eq.4
C	Constant	-7.116 (-6.9193)***	-6.6876 (-4.8152)***	-4.8096 (-17.3812)***	-.10866 (-.093)
lnI	Log of real invt.	1.1811 (20.6042)***	1.1132 (15.0708)**	1.0578 (16.7719)	.53724 (3.4409)***
PED	Enrollment ratio Of Sec.edu.	.02599 (3.0103)***	.032989 (2.6319)		
SED	Enrollment ratio of secondary edu.	.005968 (2.2278)**	0.014411 (3.2782)**		
lnL	Log employed labor force Age 15-64		-1.4929 (-.82421)	-1.4128 (-.7666)	0.53724 (.32483)
lnX/GNP	Log of real export to GNP		.34871 (2.5942)*	.31296 (2.3312)	.41570 (2.2358)**
PSE	Enrollment of lower secondary Edu.			.066598 (4.0043)***	
lnmx/X	Log of skill intensive export Share to X				.019924 (.12467)
lnPRD	Log personnel's engaged in R&D				.21300 (2.3158)**
lnJVC	Log of junior vocational enrollment				-.40707 (-2.2164)*
lnRW	Log of real wage growth				.65838 (5.2209)***
Adj.R^2	Adjusted R2	.994	.98	.99	.99
DW		1.5060	1.5519	1.3770	2.0226

*** Statistically significant at 0.01 level
** Statistically significant at 0.05 level
* Statistically sigt. at 0.100 level
( ) Statistically insignificant

Part One

As explained in the early section, superior performances in basic (primary and lower secondary) education and export promotion expected to have positive interaction. To investigate whether this presumption hold true or false alternative specifications were employed to test the hypothesis above.

$$\ln\frac{Yt}{Lt} = a + \beta_1 lnI_t + \beta_2 PED_t + \beta_3 SED_t + \mu t \qquad (1b)$$

Where $\ln\frac{Yt}{Lt}$, log of real per capita income growth; lnI log of real investment, PED and SED, are primary education and secondary education enrollment respectively(see equation 1 in table). In this equation all the educational proxies are positively related with investment and per capita income. When trade variable introduced for equation 1, the result grew stronger and significant.

$$\text{Ln}\frac{Yt}{Lt} = \text{a} + \beta_1 lnIt + \beta_2 PED_t + \beta_3 SED_t + \beta_4 lnL_t + \beta_5 ln\ \frac{X}{GNP}_t + \mu t \qquad (2b)$$

Where lnL is log of labor force growth and $\ln\frac{X}{GNP}$ is log of export share of GNP. The relative improvement in coefficients of both primary and secondary education is perhaps indicating that education has more interactive power with trade than without. Both have strong t-ratio and DW statistics.

$$\ln\frac{Yt}{Lt} = a + \beta_1 lnI_t + \beta_2 PSE_t + \beta_3 lnL_t + \beta_4 ln\ \frac{X}{GNP}t + \mu t \qquad (3b)$$

Equation three introduces lower secondary school enrollment (PSE) as proxy for educational variable and the coefficients become more stronger. In the above three equations we have consistent results that per capita income growth and educational variables and trade positively correlated. In the other words, per capita income growth

dependent on peoples productive ability (human capability) and profitability of investment which realized when there is economic relation with international trade. This will be seen in the next part.

Part two

It is clear that the export growth raised the productivity growth helping the country to adopt and master international best practice technique. This in turn requires skilled persons and continued spending in R&D activities to have sustained economic growth. Even to adopt and use already existing skills in the market, labor quality is highly important.

$$\ln\frac{Yt}{Lt} = a + \beta_1 lnI_t + \beta_2 lnL + \beta_3 ln\frac{X}{GNP}_t + \beta_4 ln\frac{mx}{X}t + \beta_5 lnPRDt + \beta_6 lnJVCt + \beta_7 lnRWt + \mu t \qquad (4b)$$

In this equation further new per capita income related new variables are introduced; namely lnPRD, persons engaged in R&D activities; lnmx/X, log of high skill intensive product share of export; lnJVC, enrollment in vocational junior college; lnRW, growth in real wage for whole employee. In this equation, as in the earlier case, the aim is to see the relation ship between skilled manpower, trade and per capita income growth. Trade has much stronger coefficient in this case than any one in the earlier case. The availability of R&D personals is positively correlated with long term per capita income growth. This result clearly shows quality of labor for continued growth.

Any alternative investment decision based on the expected return from given investment. The rapid expansion of stock of human capital within three decades has some thing to do with wage level that workers earn. It has positive and strong relation; which perhaps illustrate return from given investment as important factor for economic growth. Junior vocational education and skill intensive export share to total export has got unexpected result due to multicollinearity problem. These variables highly correlated with investment variables and have unexpected result.

Part three

In all high performing economies education has got prime importance. Japan, the Asian locomotive, was achieved compulsory primary education in 1950s before its high growth. This perhaps had taken as model in all other late developed countries of East Asia. Except for Indonesia, Thailand, and Malaysia the remaining four tigers namely Korea, Taiwan, Singapore, and Hong Kong achieved in the late 1960s. Is this early success has any relation with per capita income growth? To see this OLS estimation used for seven countries taking their averaged per capita income, enrollment ratio for primary and secondary school for period 1960 to 980. This period has chosen as early development period on the presumption that in this period their exports were dominated by primary products which require basic education of labor(see the result table bellow). The specification of the model similar to above cases.

$$\ln\frac{Yt}{Lt} = a+\beta_1 \ln\frac{I}{GNP}t + \beta_2 PEDt + \beta_3 SEDt + \beta_4 lnPGt + \mu t \qquad (5b)$$

Table 15: Asian case : Ordinary List Square Estimation Dependent variable log of real per capita income growth ($\ln\frac{Yt}{Lt}$) and 30 observations are used for estimation 1 to 30

		Eqn.5	Eqn.6
C	Constant	2.0510 (1.0484)	1.8280 (.95590)
lnI/GNP	Log Real investment over GNP	. 85319 (1.6813)**	. 92950 (. 92950)**
PED	Primary school enrollment	0.01470 (2.6585)**	
SED	Secondary school enrollment	0.022447 (2.4412)**	
PSE	Lower secondary school enrolment		.033645 (3.6542)**
lnPG	Population growth rate	-.45685 (-.78389)	-. 40821 (-.71218)
Adjusted R^2 DW		.40273 1.7475	. 41416 1.8102

*** Statistically significant at 0.01 level * Statistically significant at 0.100 level

** Statistically significant at 0.05 level ( ) statistically insignificant

As shown on the table above education proxy variables and per capita income has positive and strong relations. Interestingly the coefficient of primary school is relatively stronger than secondary school. Which perhaps indicate the higher externality arise from early success. The coefficient for secondary school enrollment is a little bit lower when regressed together with primary education. For separate regression. Equation eight also has the same result as all in the above cases. The only simple difference is investment over GNP ratio coefficient is stronger with lower secondary school.

Population growth has negative relation with per capita income growth for selected period. This has important implication that the more increase in number of people the less progress in per capita income. This is stylized fact that all less developed countries with exploding population growth have partly contributed for

their stagnant or insignificant or declining per capita income.

All the above regression results have consistent outputs. In all cases per capita income growth and early unvesalization of primary and secondary school has positive relation. In the other side the continued and long-term growth is dependent on the accumulation of skilled citizens. This is stimulated when there is gain from investment made on human capital, which in turn dependent on how the country has link with international trade.

Chapter Six

Policy Lessons

Human capital development plays the central role in economic development if not all. The neoclassical growth theory believes that the large injection of physical capital into production process has no strong ground to explain the long run sustained economic growth. As the experiences of some countries in the past portray, endowment of natural resources does not necessarily lead to sustained growth. Conversely, spectacular growth of East Asian economies without adequate natural resource but human capita reveals the importance of human capital for development. In case of Korea and other East Asian economies, as the study prevail, per capita income growth, educational proxy variables, and export have positive and strong relation. This result is not different from the earlier works by other scholars.

In fact all the developed countries are not only rich in physical capital but also rich in high skilled creative mind. On the other hand, poor countries are poor in both human and physical capital. They lack the knowledge that enables them to use even their existing resources in an efficient way. The gap is widening over time. In what ways do the less developed countries have to overcome this critical problem? What do experience of Korean, as well as other East Asian economies manifest? As all evidences clearly show, all these economies have given great importance to the education of the younger generations from the early stage of their development. They invested significant share of their income to develop mentally and physically strong generation with creative as well as adoptive abilities. They used school curriculum as a tool to develop strong national feeling and a sense of responsibility. This effort was very successful combined with appropriate economic policies which support each other. Besides these efforts they obtained foreign technologies through different means. The government has played

crucial role in all cases facilitating both expansions of education and technology acquisition. Given these facts what policy lessons can we draw from their experience?

(1). **Ensuring compulsory basic Education and eradicating adult illiteracy**: means every citizen should at least have an elementary plus lower secondary education. This is a crucial and determining factor for any development success. It provides the labor with basic adoptive knowledge. Besides, it is highly difficult to change unproductive culture, behavior and work ethics of people without broad basic education. Many less developed countries have number of unproductive long stayed cultures, which are bottleneck for development. Broad education for all youths in the same age is highly important in shaping future citizens. This policy instrument works well in countries that are able to control population growth. Thus it is also important to put prime importance in reduction of birth rate.

(2). **Financing Education**: in many countries most of the education financing burden is born by government indiscriminately, and the public enjoy its benefit without bearing much cost. In Korea parents share the largest portion of education expenditure. Their share of spending increases with the increase in educational level. The government's financing is highly concentrated in primary school education and partly in middle school leaving higher education mainly to the private sector both for financing and service provision. This has important policy implication for less developed countries. Such shared financing scheme eases the burden on the government budget and enable the government to use the funds for alternative purpose.

(3) **Fostering private participation in education service provision**: In Korea, the government limited its role to certain strategic areas. Mainly to primary, partly secondary schools, strategic science and technology schools, certain national universities, and research institute. The remaining larger share was filled by private sector. Government invited participation of private schools by providing various tax incentives, subsidies and loans. This enabled the government to mobilize additional resources and accommodate growing educational demand without drastic expansion of public expenditure.

(4) **Establishing responsible institutions for sectoral planning:** As Korean and other HPAEs show, establishing responsible institutions for each sector was the major strategy. For instance, EPB as upper economic planning coordinator, KDI for policy research, KIST and latter KAIST for technology, KOTRA for trade, KEDI for education planning and many others for different areas of economic activities.

KEDI has played a crucial role in coordinating demand and supply of work force. It coordinates education development plan with manpower development plan. Mere expansion of education without considering labor demand in the labor market causes manpower mismatch and unemployment. In such case, whatever investments made will not be profitable. It is profitable only when educational planning is made on the basis of manpower demand projection. The KEDI continuously reexamine the school curriculum to incorporate useful labor market skills and knowledge.

Importing advanced institutions and adopting them in the way to fit local conditions is the most important and general lesson that all less developed countries can draw from East Asian experience. Japan took the industrial experiences from the western countries in establishing responsible institutional base. The four late developed North East Asian countries followed Japanese path as the major guideline. Also, since 1980s, the South East Asian countries have followed the same path.

(5) **Outward looking growth strategy**: investment in education is like any other investment, which is based on its expected returns, it could be monetary or non-monetary benefit. In case of Korea, the rapid expansion of education is also a result of high return from its investment. This was in turn, successful because of out-ward looking growth strategy which increased the demand for skilled labor force. It is advisable for any nation to search for its comparative advantage and link its economy to world economy, which lead to higher efficiency and innovation. It will be highly difficult to convey significant economic progress solely depending on domestic resources.

(6) **Technology Acquisition**: As explained in the earlier sections, the main cause for widening gape between poor and rich countries is '*knowledge*' that enable appropriate use of resource. The government effort to attract foreign best technologies

in all possible ways[10] is important. At the early stage of development the government effort is highly important, but in the later stage promoting private sectors role is more meaningful. All of East Asian economies are very keen in acquiring foreign technology. They are selectively open to international trade but fully open to foreign technology. To bring certain level of economic change, it's highly important to put strong efforts in technological development.

(7). **Strong and transparent leadership**: leadership performs an important part providing guidelines for both government and private organizations, encouraging cooperation, and mobilizing resources needed to realize national goals. Leadership in Korea, especially at early stage of development was competent, stable and pragmatic, cooperative, fill responsibility in areas they assigned for, and transparent. In every sector, leaders set target to be achieved after certain years, and continuously strive to achieve it.

(8). **Construction of basic infrastructures**: Early availability of basic infrastructure is crucial for economic take off. The infrastructures like road, telecommunication, fertilizer and cement factories, provide initial base for other later measures.

To sum up, education is not all for economic development, development requires package of policies which support each other. Besides education, competent leadership, stable macroeconomic and political environment, equitable shares of national benefits, expansion of basic infrastructures that increase the communication, strong property right, controlled population growth, and performance based industrial policies are crucial to bring any change. However, the human capital provide the initial base for these all. The government policy that put considerable importance to education, trade, and technology, supported by strong leadership, is doubtlessly always successful.

[10] FDI, Licensing, capital goods purchase, trade relations, domestic R&D, and any other formal and informal means

Appendix

Scholarship and Tuition Exemption

The government support financing of higher education for eligible students who met certain criteria. The ratio of students exempted tuition fee from 1965 to 1995 increased from 0.2 percent to 1.5 percent. For high school the students supported by the government and schools tend to be much higher in the vocational education than in academic high school. This is due to the governments' policy to induce more middle school graduates to vocational high school as to meet the demands for skilled work force (Paik 1998). Interestingly, the ratio of students supported by scholarship and tuition fees exemption to total students in higher education increased from 30.3% in 1975 to 51.3 % in 1985. This clearly indicates the government policy measure in fostering higher education.

Student Loan

In Korea there are two kinds of students loan programs available to college students according to the sponsoring organizations (Paik 1998). Collage and university or junior college students (except graduate students) can get loan from the "Korean Scholarship Foundations", which is established by the government in 1989. In this case students are exempted from paying interest. In other words they only repay the principal loan. Second, college students can also borrow money from private banks. In this case the borrower charged a fixed, below market interest rate. To be eligible for the Korea Scholar ship Foundation loan, a student's GPA must be in the upper 50 percent of total students and also his/her financial status must pass the needs test. Borrowers begin to pay their loans one-year after the graduation. The repayment period estimated on the bases of the number of semesters, which the student borrowed (e.g, if for borrowed for two semesters' pay within two years). Here the most important fact is the government role in facilitating all these opportunities to foster further education.

Table 1b: Number of students per class, 1945~1975

Types of Schools	1945	1952	1956	1960	1965	1970	1975
Elementary	54	62.6	55.5	57.4	65.4	62.1	56.7
Middle		60.6	65.9	48.3	60.7	62	64.5
Academic High School	55.3	34.8	46.3	45.7	59.8	60.1	58.1
Vocational High school	49.6	45.9	44.9	33.8	53.5	56.1	57.0

Source: McGINN, 1975. Education and Development in Korea. Pp49

Table 2b: Comparison Among Countries of GDP and Educational Effort

Countries	year	GDP ($)	1st level	2nd level	3rd level
Korea	1960	155	96	27	4.7
	1972	387	100	47	8.1
Paraguay	1960	164	101	11	1.6
	1972	373	107	17	3.3
Morocco	1960	164	49	5	.8
	1972	306	55	13	1.6
Turkey	1960	190	75	14	2.9
	1972	546	105	32	5.6
Iraq	1960	65	65	1`9	2.0
	1972	73	73	26	6.3
Venezuela	1960	1043	100	23	4.0
	1972	1579	101	47	12.6

Source: McGINN, 1975. Education and Development in Korea. PP.64

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