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**Inter-Korean Economic Integration and Development:
The dynamics of Technology Transfer**

**Il-Doo, Seo
© October 2001**

**Thesis submitted in partial fulfillment of the requirements for
the degree of Master of Arts in International Development Studies
at Saint Mary's University
Halifax, Nova Scotia, Canada**

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Inter-Korean Economic Integration and Development: The dynamics of Technology Transfer

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Abstract

The purpose of this thesis is to explore the path of technology transfer between South and North Korea in the course of economic cooperation and integration. This study examines the implication of technology transfer from the German and European Union economic integration and the challenge of Vietnamese transitional economy as models to reduce the possible economic and social impacts in North Korean economic integration. As well, while reflecting on the models of other countries, the comparison of system, structure, the stage of Korean technology, and technology policy for manufacturing industry between South and North Korea is analyzed to suggest the possible policies for sound economic integration and sustainable economic growth for unified Korea. As a result of researching the model of Germany, EU and Vietnam and the Korean context of technology and comparison of industry and technology, this thesis finds that technology is a critical factor in reducing the economic and social impacts before and after economic integration through systemic institutionalization. The establishment of an institution for technology transfer and exchange of knowledge to meet sound horizontal economic integration is imperative to generate the environment of ongoing innovation for current needs as well as future needs of Korean industries. As well, policies for Korean peninsula should be made in technological education, in infrastructure and environment for new technologies, and in diffusing knowledge and ideas, all with the aim of enhancing national capability and constant innovation of nation through free movement of production elements.

Chapter I

Introduction

1. Posing the problem

Since unification in 1989, Germany has had to face periods of serious social unrest and economic depression. Rapid unification¹ followed by transition of their system from socialist to capitalist has caused destruction of industries and mass unemployment in the former East Germany. The exodus of East Germans to West Germany disrupted society, creating conditions for an economic crisis in the economy. The German government had to transfer a vast amount of capital into the economy to support unemployed workers in the former East Germany. Even though the government has spent between 800 billion and 1000 billion US dollars since 1989, the social conflicts in Germany have deepened, causing discomfort with the cost of unification² in West Germany and a sense of shame in East Germany. The East German economy was the strongest economy in terms of productivity in Eastern Europe, which points to the fact that Korean people will pay a more expensive unification cost than Germany, if the economic gap between South and North Korea continues to widen.

¹ South and North Korea have proposed confederation (two countries in a nation) and federation (one country in a nation) as steps of completed unification. These proposals imply that rapid unification is undermined by South and North Korea as a problematic approach. As well, South and North Korea acknowledge that complete unification needs some kind of steps (Dong A Ilbo Dec 14, 2000). See Appendix I for the concepts of confederation and federation.

² Unification cost is social and economic opportunity cost which is caused by difference and separation of countries and will cause conflicts in the course of unification, when countries, having different systems, realize the unification (Seo 1997: 153). Economic integration (free trade zone, customs union, common market, and economic union) is not necessarily the same as unification, when there is not rapid unification. Therefore, economic integration is possible without unification and could be one of the steps toward unification, when there is controlled unification. Unification cost is classified as a wasted expense where investment is lost without retrieval of cost, and investment cost which is transformed into a means to generate goods and services (Kim 1996: 275). Investment cost is useful to decrease the obstacles of unification and establish the desirable

However, the model of the European Union provides paths and stages of institutional integration for technological conversion by creating a supra national institute to meet the needs of European identity and the development and innovation of systems. A study of EU integration is meaningful to learn the impact of institutional integration on technological conversion as an alternative to the business actor driven model of political integration or functional integration³. Although institutions and institutionalization of needs are important elements in the development of technology, the economic integration of the EU provides a better strategy than that of the rapid political integration in the German case, which caused a decrease of productivity in capital and labor as well as structural difficulties for national innovation.

Rapid integration following the political destruction of East Germany was hazardous in terms of cost and social unrest. What is the best strategy to cope with unification cost and social unrest in Korea? Economic integration⁴ without institutionalization of technological development in North Korea would generate the same result of mass unemployment as in German unification. Unemployment will result because technology is central to regional change, both positive and negative, and to economic change, job-creation and job-

economic system and structure for unification. Technology transfer is one form of investment cost to increase the development in North Korea and decrease future problems during unification.

³ By actors and incentives of integration, economic integration is divided into institutional integration and functional integration (Son, 1996: 12-13). Institutional integration is the integration methods in which economic actors determine conditions and types of integration through mutual agreement among them. In this case, institutional integration is called formal integration, because integration is determined by the formal cooperation between government and economic entities. Functional integration means the formation of regional economic areas which are driven by private economic actor like TNCs and their incentives that seek self-interests beyond national boundaries. This is integration called informal integration, because it is led by private economic actors rather than government.

⁴ Economic integration between south and North Korea will be institutional integration which is formal integration, because the government of South and North Korea want to regulate the speed and the degree of integration to meet their objectives, prevention of system destruction when there is no rapid unification. As well, while integration between South and North Korea is sectoral integration for South Korea, integration for North Korea is global integration as well as sectoral integration. In addition, the Inter Korean economy is in the process from local integration to regional integration, because the integration of Korea will start from Free Trade Area to Customs Union, Common Market, and Economic Union.

destruction. Technology is the most obvious cause and effect of the cumulative wealth of rich nations (Ayres 1998; Foray and Freeman 1993; Rosenberg, Landau and Mowery 1992; Malecki 1997). Technology has the promise, more than any other phenomenon, to bring poor nations out of poverty (Malecki 1997). Therefore, the dynamics of technology transfer and institutionalization are a critical factor in reducing the consumption of time, energy, capital, and labor. When technology transfer becomes a critical factor in reducing the imbalance of productivity between economic actors and equalization of human capital, the result is the most effective and reasonable process for countries, which want to integrate horizontally⁵. Economic integration should bring peace and development into the Korean peninsula. Therefore, an important issue is that Korea needs to conceive proper paths and systems of integration for technological conversion, which will be good for both Koreas. As a result, an examination of the European Union Model for economic integration in terms of technological conversion and productivity growth and examination of the development paths in several individual countries such as the experience of Germany and Vietnam could have important values as models.

As a foundation of this thesis and for further examination of the Korean context: economic, social, and political environments will be identified to provide a rationale for North Korea developing technology in the manufacturing sector⁶ and to improve technology transfer for systemic economic growth and institutionalization. There are at least four principal considerations.

⁵ The vertical integration of economic actors often caused economic dependency and dependent development, while horizontal integration would generate effective results for integrated economies. As well, economic integration is interpreted as a process leading toward the formation of common economic area in which discrimination does not exist to generate economic equality of opportunity and efficiency.

⁶ Bessant argues that "one of the most significant tools in manufacturing strategy is technology, the combination of equipment, software and organization which facilitates manufacturing"(1991: 15-16).

A. Korea does not have enough arable land to engage in agricultural development to allow for economic growth (APCSS 1998)⁷. Therefore, agrarian reform, as in the Vietnamese Model, is very limited as a development strategy in North Korea. It could be used as a short-term strategy to reconstruct the economy and improve employment and self-sufficiency of food in North Korea but it cannot generate rapid economic development in the country, which is needed to reduce the social and economic cost of unification. Also, the structure and system of North Korea is based on out-of-date heavy industries, technology and human resources. Therefore, there is need for a major technological conversion.

B. The combined population of South and North Korea is almost 70 million. The production of two South Koreans will be needed to feed one North Korean, if there is rapid unification. This is a big issue which may create social instability in a unified Korea. In the case of Germany, four West German people were needed to feed one East German person⁸, but even so unification created many social and economic problems, despite the strong economy in West Germany.

C. The economic gap between South and North Korea is almost 12:1⁹; therefore, Korea

⁷ Asia-Pacific Center For Security Studies (September 11, 1998) states that Perhaps out of concern about their own food security vulnerability, many Asian countries have attempted to pursue what they view as the ideal of "self-sufficiency" even in the face of evidence that such policies are extremely inefficient. North Korea, for instance, emphasizes the concept of "Ju Che" designed to achieve comprehensive national security. The drive toward self-sufficiency has often been used by many leaders in the region as a justification for subsidizing inefficient domestic producers. Once again, this reflects a sentiment among many Asian countries that a minimum level of food self-sufficiency is a prerequisite for national security. This also may explain why most countries in the region have tended to restrict food imports in the interest of promoting food self-sufficiency. Ironically, however, the reality is that this region, with its large population and disproportionately small quantity of arable land, is increasingly turning to imports to satisfy its food needs. Some countries have quietly abandoned the idea of self-sufficiency altogether. China, for instance, has reduced its cereal self-sufficiency goal from 100 percent to 92 percent.

⁸ Bank of Korea (1990) and Korea Trade-Investment Promotion Agency (1994) stated that while South and North Korean population was 44.5 million and 23 million in 1994, the population comparison in German was 62 million in West Germany and 16.5 million in East Germany in 1989.

⁹ Economic indicator of Korea Trade-Investment Promotion Agency (1994) indicated that the gap between South and North Korea is 17.8:1 in GDP and 9.2:1 in GNP in 1994. For the gap of Gross National Income in

needs long term integration to reduce the gap in the economies and allow for rapid economic development in North Korea. In the case of Germany, the government had prepared for unification for 40 years, starting with economic cooperation. Rapid unification will cause social, economic and political instability in the Korean peninsula and throughout East Asia.

D. North and South Korea do not have important natural resources which can be exploited for economic development, unlike Germany and Vietnam which have sufficient and important natural resources that they can use to attract foreign investment and resource based industries. Therefore, North Korea needs strategic development of its hi-tech manufacturing sector through technological innovation and labor intensive industries to absorb sufficient labor. As well, North Korean trade with other countries will help the Korean economy overcome its lack of natural resources and arable land.

However, even though there will be a certain level of development in labor intensive industries in North Korea, as was the case in Vietnam, labor intensive industry, which is driven by neoliberalism and the business sector, can not spur long-term economic development. It must be accompanied by technological development, as this is needed to reduce the gap on the Korean peninsula. This must be created through institutionalizing the needs of the Korean peninsula. As Dunning (1993) argued, private economic actors like Transnational Corporations never want to develop the technology in developing countries, when there is no interest and advantage to exploit. Therefore, the economic and social gap will not be reduced on the Korean peninsula if the current system is pursued using a neoliberal approach. In this situation, South Korea needs different strategies to develop

year 2000, South Korean has 12.7 times larger income than North Korea (KOTRA 2001).

North Korea, while exchanging the four necessary elements of production (goods, service, capital, and people) to promote a rapid technological conversion. Consequently, the development of North Korea should be supported by a systemic approach of development through creative destruction from inside, not outside of the countries while regulating transnational corporations (TNCs) which will exploit the abundant labor in North Korea and create a distorted industrial structure. Therefore, institutional integration is more meaningful than functional integration. The lessons are in Europe which developed their economic system by resisting the pressure of peripheralization from the center, mainly British imperialism and USA hegemony, which made the EU successful in their industrialization through protection of industry and following liberalization policies of other countries to expand their industrial output.

A study of the possibility of development in manufacturing industries through technology transfer and institutionalization of economic integration is an important issue, because development is almost impossible without developing and internalizing institutions of technology. This leads to a sound economic performance which is not manipulated by the economic center as in developed countries, but instead creates the system of creative destruction for development in the Korean context. The thesis of this study has been formulated in the Korean context, and the focus on technology and institutionalization, and its contribution of economic development is most appropriate in Korea. Technology refers to new and better ways of achieving economic ends that contribute to economic development and growth (Stewart and Nihei 1987). To make this point, economic integration and development will be considered as interdisciplinary issues in the economic, social and political issues.

2. Basic Concepts

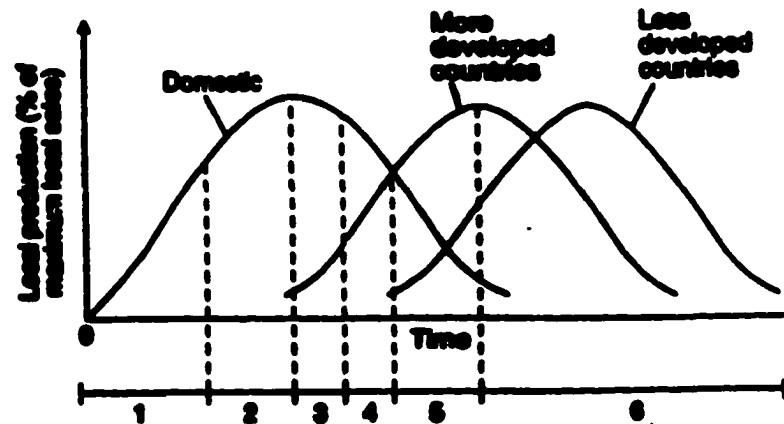
2.1 *Technology*

The concept of technology in a narrow context simply means machines and tools, and more broadly, the organization and methods for the production of material wealth. Galbraith noted that “technology means the systematic application of scientific or other organized knowledge to practical tasks” (1974: 31). Some argue that these ideas are too broad to distinguish one technology from another. Braun (1998) defines technology as the ways and means by which humans produce purposeful material artifacts and effects. As well, he defines technology as the material artifacts used to achieve some practical human purpose and knowledge needed to produce and operate such artifacts. In this definition, technology always consists of material artifacts like machine and means, and of the software like knowledge and ways. Others argue an alternative concept of technology to be “a process which, through an explicit or implicit phase of research and development (the application of scientific knowledge), allows for commercial production of goods or services”(Dussauge, Hart, and Ramanantsoa 1992: 13). The concept of technology in this thesis is interpreted as a process and institution which, through the systemic application of scientific knowledge, allows for commercial production of goods or service, because economic integration¹⁰ is also a process leading toward the formation of a common economic area in which discrimination does not exist, to generate equality of opportunity and efficiency. Therefore technology is systemically applied knowledge contained in human capital, organizational structures and behavioral patterns and which are conditioned

¹⁰ See appendix I.

three categories of countries: technologically advanced countries; more developed countries (MDC); and less developed countries (LDC) (1991: 64-68).

Figure 1. 2 Product Life Cycle Phases



Source: Aggarwal 1991: 67

After the first phase when a new product is technologically successful in the domestic market, advanced countries move to the second phase. During the second phase, export to MDC takes place, because of declining domestic sales in developed countries and the development of substitute product. Some MDC governments may raise tariffs or impose quotas to lure the technology transfer from firms in developed countries. In the third phase of the cycle, MDC manufacturers will experience profit without limitation of the high costs associated with small-scale production. In the fourth phase, the firm in developed countries will choose to supply the technology to LDC markets. In the final phase, the LDC's manufacturers, with low labor cost, become exporters to the MDCs and developed countries. Aggarwal implies that investment in research and development (R&D) will be recovered over a repetitive product life cycle in different categories of countries, and the LDC will get technology cheaper than developing it domestically.

2.3 *Technology Innovation*

Braun argues that there are two major forces for innovating technology: 1) “the internal logic of science and technology which is never satisfied by human needs”, and 2) “economic force”, because “technology is a crucial weapon in the relentless quest for economic growth” (1998: 13). Freeman and Perez classify the innovation as four types: incremental innovations, radical innovations, change of technology system, and change in techno-economic paradigm (technological revolution) (Freeman and Perez 1988). As well, in the UNCTAD Bulletin, “Schumpeter defined innovation as all efforts by entrepreneurs to develop the new commodity, the new technology, the new source of supply, the new type of organization, or creative destruction¹¹, in the modern world”(1995: 2). In Schumpeter’s vision, “short-run monopoly is accepted as a necessity for innovation and technological development. Further expansion of this monopoly capital can be found in new markets searching for new products, other companies (conglomeration) or new regions (multinationalization)”(Hagedroon 1989: 59). Hagedroon cites in Monopoly Capital (Baran and Sweezy 1966: 59-62) that “one sector consists of small business, price takers, which is frequently coupled to calculations and strategies of TNCs Business. Innovations are often pioneered by entrepreneurs and small business while large companies take over such activities once success has been proven”(1989: 59).

In Schumpeter’s theory, the dynamic character of capitalism and the disequilibrium effects of innovation are stressed even more ... throughout his theory,

¹¹ Schumpeter stressed the dynamic element in competition is innovation which goes further than price competition or quality competition or competition in marketing because this form of competition stems from new commodities, new technologies and new forms of financial organization. Economic change is induced by these new combinations, which leads to creative destruction as a process of destroying and reshaping of the old into new industrial structures. In that context, Schumpeter emphasized that economic analysis should not study industrial structures as such, but instead concentrate upon the investigation of the creation of new and the destruction of existing structure and role of competition, monopoly and company behavior in this process

Schumpeter paid attention to the profitseeking stimulus for innovation which through diffusion would cause a bandwagon effect after the first successful introduction ... Hagedroon argued that "the attention paid to evolutionary change, disequilibrium, competition through innovation and the process of diffusion which is to be found in both Marx and Schumpeter has most valuable elements for understanding present industrial development (Ibid: 50).

Ruttan added that "Schumpeter was primarily interested in changes in the production functions of the technological leaders, the innovating firms, because of the growth forces which adoption of new methods of production set in motion. The business cycle, in Schumpeter's system, is a direct consequence of the appearance of clusters of innovations"(Ibid: 335). "Schumpeter introduces here the dynamic role of innovators"(Mahajan 1991: 345). Kwon argues,

beyond the usual neoclassical gains from trade due to comparative advantage, in the Schumpeterian system, international integration increases the benefits from innovation. Technological change can be generated both by technology transfer and by indigenous efforts to assimilate and improve imported technologies. In this system, exports are a very important means of acquiring technological mastery and serve as a direct means of improving productivity. Exports and technology determine not only the industrial structure but also the economic position of a country in the international hierarchy (1992: 31).

While research indicates the importance of structural factors such as the number and size of firms in an industry, in affecting competitiveness and innovation (Porter, 1990; Pavitt 1991), others emphasized the importance of institutional factors influencing national systems of innovation (Lundvall 1992; Nelson 1993). The relational aspects of inter-organizational links in promoting innovation build upon earlier models by emphasizing inter-functional and inter-organizational structures and interactive activities, strategic decision making, and enhanced use of electronic media. However, innovation is very complicated to analyze. Marceau (1992) identified different paradigms to innovation at the macro-level, such as national systems of innovation, technology system, clusters, chains of production, and complexes. Freeman (1987) illustrated national systems of innovation as the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies. These networks are very

(Hagedroon 1989: 38-39).

complicated, as there is a broad range of institutions which exert an influence on the creation and use of technology.

Some institutions such as financial institutions, legal institutions, science and technology institutions, and educational institutions are very important for technology innovation. In addition, government policy can effectively encourage innovation. According to Nelson (1993), the most crucial and effective policies are indirect taxation and export promotion, while science, technology and innovation policy are of direct importance. Nelson argues that encouragement of R&D co-operation and the creation of venture capital funds promoted the technology transfer of science base industry. He contends technology transfer is cheaper, while calling for innovation policy. In this thesis the innovation system is creative destruction and is influenced by the institutional factors such as financial institutions, legal institutions, science and technology institutions, and educational institutions. Therefore, full competition and a minimalized state for economic growth in the theory of neoliberal approach are not appropriate to drive institutions for creative destruction and technological progress.

2.4 Technology Transfer

Commercial technology transfer is highly monopolistic. The transfer of technology should be beneficial and profitable to the owner of the technology who will not normally transfer the technology except in a situation where a transfer does not threaten the monopoly. Technology is necessary to occupy the market, or bring huge profit; therefore, developed countries restricted the export of advanced technology in order to control their monopoly.

As well, technology transfer can be a multiple exchange, as in the transfer of the

rights to use, not in ownership. The price of technology lowers, when it is transferred to a number of end-users. A transfer of ownership is more expensive as the trade involves both the transfer of ownership and the right to use.

In addition, technology transfer does not follow the market rule of exchange: The research and development cost and the price of technology are simply not the same. The potential profit of the technology is more important.

The main mode of technology transfer in the initiation stage of manufacturing, according to Correa, includes:

1) informal transfers through the acquisition of machinery and equipment; 2) imitation through reverse engineering; 3) technical assistance provided by original equipment suppliers (OEM); 4) turn-key agreement and licences in cases relating to large scale industries; 5) Foreign Direct Investments. In the second stage, Foreign Direct Investment, licensing, and joint ventures become important as mode of transfer (1999: 3)

In this context, the institutionalization of technology transfer through a strategy of implementation and management at the national level is emphasized in the current world practice of technology transfer and technology innovation for economic growth. The roles of actors are also important to absorb imported technology into internal national industries. The need of institutionalizing the economic area and integrating the economy is required to properly transfer technology as an engine of development at the national level and generate new technology in the integrated region to increase productivity. Therefore, technology transfer is much easier in the environment of institutionalized areas such as free trade area, customs union, common market, and economic union.

2.5 Technological Conversion and Productive Transformation

In the examination of technological transformation in the North, Patel (1993) argues that a process of technological conversion requires: first, a high and sustained rate of growth of economic output; second, acceleration of the growth pace and shortening of the time-span; third, the size of population and spread of technological transformation; fourth,

geographical concentration of world output; fifth, structural transformation through urban and rural division, reversal of the share of industry and agriculture in production, a change in the composition of industrial output from light to heavy industry, and a decline in the share of personal consumption expenditures; and sixth, 'a series of motive forces'.

As to these motive forces, Patel states that "the emphasis in explaining economic growth has shifted from the use of capital formation as a prime factor to the strategic role played by technological progress" (1993: 53). This is, he adds, because "the process of transformation requires either the developing and creating technological innovations, or obtaining access to the world stock of technological knowledge" (Ibid: 52).

Science and technology are recognized as the dynamic factors of economic growth and, in addition to a process of technological conversion, productive transformation requires four factors: the inter-relationship between science and technology, the growth of physical technology, investment in human resources, state intervention to secure the necessary infrastructure, and a national ethos (Ibid: 33-58). Patel on this point notes that "the interaction of science and industry was fundamental" (Ibid: 53). He elaborates on this point as follows:

Once the connection was perceived, policy came into play. Organized research and development (R&D) began...in order to promote technological development in specific areas. A new institutional arrangement, indeed a major social innovation, had made its appearance...the sequence science-technology-development and constant backwards and forwards interplay in this sequence are critical both in explaining the past history of technological transformation and looking towards the future. Moreover, these brought into play a command over the vast financial resources, new financial organizations and institutions, which were as essential as access to, and mastery of technology (Ibid: 53).

As for non-technological factors in the promotion of productive transformation, Patel (1993) notes that the investment of human capital increases labor productivity and widens the range of production processes. Patel also emphasizes that

government promoted national spirit, protected national industries, expanded national education, encouraged national research and technological capabilities, expanded domestic markets, reduced external dependence and vulnerability, and often engaged in colonial conquests and fought deadly wars among themselves to

assert national economic supremacy (1993: 58).

Patel (1993) adds that national ethos or the spirit, or the temper of the time, are factors which have a role to play in the process of technological transformation, although by no means definitive or determining. To supplement the concept of national ethos or the spirit, science and technology can no longer be narrowly focused on basic research or of scientists working in isolation. Indeed, it is necessary to think about innovation in a broader sense and “not focused on high-technology fringe” (Bradford 1994: 60). Networks of many types are needed, with many links, in many locations. There is a need for formal and informal institutionalization, the process of which creates an environment of technological capability, affected by state policies and the needs of people. Correspondingly, policies for science and technology must take into consideration much more than science and technology. Both formal institutionalization of factors which explicitly affect science and technology and those which only indirectly influence the accumulation of technological capability must be addressed. These comprise, first, a concern for market structure, so that firms are subject to competitive pressures at home similar to what they will face in global markets (Bell and Pavitt 1993; Porter 1990). Second, the equilibrium of market based on static approach and neoliberalism still does not focus on the areas of education, training and research, so these must be initiated and coordinated by government, but not so that firms’ actions in these areas are excluded or inhibited. Third, university research, which is usually basic or fundamental in nature, provides important skills, background knowledge, familiarity with research methodologies and instrumentation, and membership in informal and international networks of professional peers. Fourth, government needs to support the institutions that comprise the technology infrastructure of an economy, and institutions that complement and sustain the

actions of private firms (Bell and Pavitt 1993: 173-7). Fifth, a free flow of information and feedback must take place. A policy commitment to support R&D for monitoring international technology intelligence for alternative sources of technology is an important allocation of government funds (Radnor and Kaufman 1988). Broad economic policies (those affecting credit, trade, investment and labor) and human resource policies, especially regarding education and training, are also needed to support scientific and technological activities (Dahlman 1989; UN Office for Science and Technology 1980). Finally, policies must be flexible enough to change over time in response to the capabilities of local firms and of the labor force. The most important thing is that the government policy and its institutionalization have to be congruent with not only the requirements of productive transformation of an economy but people's basic needs, and the ultimate and intermediate goals and the objectives of development must not be forgotten or misplaced in the process of technological conversion and productive transformation.

3. Theoretical Issues

3.1 Productivity Growth and functions

The critical factor in the dynamics of aggregate 'growth' (in national output) is productivity growth. According to the neoclassical model, total (Q) is the product of two inputs or factors of production- capital (K) and labor (L)

$$Q = f(K, L) \text{ or } Q = K^a L^b$$

The productivity of capital (output per unit of capital) and of labor (output per unit of labor) in an economy can be measured from these simple functions: (a) and (b) have an elasticity of substitution with respect to both capital and labor. The sum of a+b (<0, =0 or

>0) shows whether productivity is decreasing, remaining constant or is growing. Productivity growth, in this model is predicted in increasing the volume of capital (capital investment) and labor inputs (units of labor time or the number of workers).

However, in the analysis of productivity growth and its dynamics, proponents of New Growth Theory (NGT) discovered that total factor productivity (TFP) is always greater than the direct contributions of capital and labor and that the difference is explained by reference to technology, which it is added, should not be treated merely as a 'residual' (attributing to it the unexplained variance). In fact, the productivity of both capital and labor depends on, is determined by, conditions of technological conversion physical technology (embodied in machinery and technology of production) and social technology (embodied in social organization, skills and knowledge). Thus the critical factor for increasing productivity growth is technological progress. New Growth Theory (NGT) explains this in terms of a linear function:

$$Y = F(R, K, H) \text{ or } Y = AX$$

As formulated by NGT, R, physical capital (K) and human capital (H) are inputs to generate total output. As a broad measure of capital, X multiplied by technological constant of national and regional characteristics generate total output.

This formula recognizes that R&D (research and development) is imperative for achieving enhanced variety or quality (Grossman and Helpman 1991; Pack 1994; Romer 1990). Also, new growth theorists recognize that externalities exist and serve to protect a nation's R&D with intellectual property rights and other laws. However, There are many difficulties in testing this model empirically (Pack 1994). For one thing, as noted by Romer, "no data are available on local production of knowledge or inward flows of

knowledge, leading R&D institutes to use investment in physical capital as the principal empirical variable” (1994: 20). From this dilemma, Nelson (1995) emphasizes that institutions are variable among nations. In this connection, Porter (1990) emphasizes that the cross-national variation found in a multitude of political, social, legal and institutional elements of countries affect their competitiveness in different industries. Porter’s framework suggests that there are variations that could be studied systematically and lead to national differences in policy (Roobeek 1990). Nelson (1981), in the same connection argues that in the neoclassical institutional environment, there is no space for labor unions, banking systems, schools, or regulatory regimes. Further, technological knowledge is free and a public good in the neoclassical model. In the long run, an important new area of research and modeling is in evolutionary or neo-Schumpeterian models and theories.

3.2 The Debate on Technology and Growth

‘Growth’ and ‘development’ were considered as synonymous in terms of first two decades of development thought (1950-1970) and according to Rostow (1960) in the form of successive stages-from establishing preconditions of growth to the creation of mass consumer society. However, development is more multidisciplinary than economic theory is able to comprehend, and more cumulative than simple formulas are able to universalize (Streeten 1980). Development has to cope with issues of quality of life and society. Development dynamism is the product of change involving the entire infrastructure of society - economic, spatial, institutional and social. It is a phenomenon that can restructure a nation’s socioeconomic base, as Patel (1993) and Weitz (1986) noted with regard to the technological transformation of the Third World.

As a neoclassical theorist, McCombie (1988) argues that the growth of productivity

occurs when efficient allocation of resources (labor and capital) in inter-region and industries improves, and the rate of technical progress improves with diffusion of innovation rate caused by differences in the level of technology¹² to which the regions have access. In addition, the neoclassical theory emphasizes a factor of mobility, which has concentrated research on capital and labor as a growth theory. Neoclassical theory is that labor flows from low wage to high wage regions and capital or investment flows in the opposite direction, since high wages imply low returns on capital, and low wages result in high return (Greenwood 1985). These flows continue until wages are equal in each region (Ibid 1985). In this theory, a region can grow only if labor or capital flows from other regions (Anderson 1976; Richardson 1971). Therefore, growth is essentially a reallocation process (McCombie 1988). In the neoclassical model, labor is also treated as a homogeneous input, without recognizing that varying skills or capabilities, and differences in the growth of output are due ultimately to variations between regions in the growth of their labor force (Kurgman 1994). As for labor, there are two conflicting, or different, perspectives. According to Braverman (1974), labor-saving investment generates a de-skilling of labor and a degradation of the work force. Others, however, focus on conditions for improving the productivity of labor. In this view, improvements in the quality of labor come from education, health, training and experience, all of which can be considered investments in human capital (Becker 1964; Mackay 1993; McCrackin 1984; Nussbaum et al. 1988).

However, there are immeasurable considerations such as learning by doing and

¹² The practice of developed country to developed high-technology is mainly horizontal cooperation among developed countries in which developing countries are marginalized with option of taking mature and conventional technology that requires more labor and natural resources than cumulative high-tech and vast amount of capital.

learning by using (Chatterjee 1994). In this context, with reference to both the contributions of capital (investment at entrepreneurship and management) and labor (adding value), Maddison (1994) concludes that technical progress is the most essential characteristic of economic growth.

Neoclassical theory generally assumes that new technology is freely available to all, even though it is not available to all and can be expensive, and largely disregards the actual mechanisms of technical change (Farerberg 1994). As well, neoclassical theory does not mention that the knowledge required to enter into a technology in its early phase is easy to access through universities and other public sources, but later knowledge becomes private or proprietary (Perez and Soete 1988). Nelson (1981), in this regard, notes that productivity growth is achieved by complementary ingredients such as technological advance, capital growth, and rising educational attainment. Fagerberg (1994) also identifies a number of interdependencies between technological progress and capital and labor. As a further study using the evidence of interdependencies, 'new growth' theorists, such as Nelson (1994), Pack (1994), Petit (1995), and Romer (1990), advocate investments in R&D, in infrastructure and in human capital through education for economic growth, which in turn generate the application and diffusion of technology by making technological advance endogenous or internal, and promote the growth of externalities that increase the economies of scale and cumulative causation between countries. They argue that R&D is necessary to attain enhanced variety or quality (Groomsman and Helpman 1991; Pack 1994; Romer 1990). The new growth theory takes technological differences as a given, and as the prime cause of income difference across countries (Fagerberg 1994).

However, new growth theory also has a flaw, which is its lack of attention to

institutions and institutional change. Freeman (1994) argued that new growth theory focuses on R&D and externalities rather than on organization and institutions (Pack 1994). Evolutionary theories explicitly incorporate the variety of products, processes, economic agents and institutions that exist in the economy (Antonelli 1995). The creative destruction and disequilibrium explains realistic portrayals of the process of diffusion and the differential accumulation of technological capability in the firm's application and innovation (Freeman 1994; Silverberg 1990). Technology is retained more in people and organizations. In the words of Dosi

Experience and skills embodied in people and organizations, capabilities, and memories overflowing from one economic activity to another tend to organize context condition that are (a) country-specific, region-specific, or even company-specific and (b) as such, determine different incentives, stimuli, and constraints to innovations, for any set of strictly economic signals (1988, 1146).

Development is related directly to the capacity of the local staff to absorb technological knowledge, and human capital is most critical (Niosi, Hanel and Fiset 1995), because the actors who create the institutional structure play an important role in sustaining a technical culture within the economy. These institutions support learning and move it along a technical trajectory to keep up with innovations and international technical knowledge. Therefore, people who have the skill and ability (human resource, social capital) to transform to the new technical frontier are a much more crucial factor for keeping pace with ongoing innovation rather than cost advantages due to low wages.

Economic development depends on the activities of the firm's operation within opposing and cooperative firms, and also on the strength of relevant institutions, including education and research institutions and informal networks. At the national level, investment should be made in education, infrastructure for new technologies, and in the diffusing of knowledge, all with the aim of enhancing national capabilities (Freeman 1995). Public investment in education and training is one of the few variables that

significantly affected growth in GDP in the USA from 1955 to 1992 (Cullison 1993). Also, investment by firms in people which allows an accumulated body of knowledge, resources, strategies and culture is another factor to represent assets complementary to innovation embodied in equipment and machines (R. Thomas 1994). In this connection, competitiveness is kept not only in the capacities of individual firms, but also in the web of interconnections that establishes the opportunities for all firms (Cohen and Zysman 1987).

3.3 Actors of Technology Transfer

There are two arguments on the process of technology transfer: One of these concentrates on business actor driven technology transfer with laissez-faire, while the other focuses on the skepticism of neoclassical approach and a need of government intervention and policy implementation.

(a) Neo Classical Approach

Ricardo argued that mutually beneficial trade between countries arose not because of the absolute technological superiority (higher productivity) of labor in one country as compared with another, but because of the relative technological superiority of labor in producing one product as compared with others in the same country. The static approach to trade theory of Ohlin (1967) argued that countries well-endowed in capital will export capital-intensive goods and countries well-endowed in labor will export labor-intensive goods and that equilibrium will be reached when factor prices are equalized. Complying with classical theory, Neo-liberals note that efficient allocation under laissez-faire and comparative advantage creates maximization of economic growth (Wade 1992: 271). Therefore, liberalization of local enterprise networks from political regulation through centralized government is considered a prime condition of success for innovation and

industrial growth. Lar (1985) suggests that labor intensive, low cost labor, and low end industries are viable to create capital by trading in the products which are produced by low cost labor force, while continuing to keep the production cost low. They theorize that international free market, free capital, and free trade approach make the allocation of economic resources more efficient and that Foreign Direct Investment from foreign capital and technology will generate sufficient capital and technology to nurture immature indigenous industries. In addition, they emphasize the role of Trans National Corporations (TNCs) operation in developing countries, and the international division of labor as important factors to attract Foreign Direct Investment such as capital, technology transfer, and job creation. Also, they urged that application of the theory of transaction-cost minimization to Transnational Corporations (TNCs) yield an optimistic view regarding transfer of technology (Islam 1990; Teece 1986). Technology and its efficient use will determine competitive advantage and the economic success of nations and of enterprises (OECD 1992: 167-185). Research has been largely done from the perspective of the supplier firms like TNCs with emphasis on corporate policy rather than on public policy. The dominant assumptions of this stream are that the technology market is a buyer's market and the market mechanism provides a much better solution than any international or national regulating system.

(b) Skepticism of the Neoclassical Approach

There is growing skepticism about technology transfer via TNCs and neoclassical theory of trade. Based on the assumptions of the dependency school of economic development that the free market does not provide a very appropriate transfer mechanism, Evans (1979) noted that TNCs are beneficial in that they generate labor intensive industries

based on natural resources but they are very problematic in the upgrading the industries. Successful 'dependent development' is possible when there is a willingness to invest by the TNCs and their allies (Evans 1979) as well as an effective transfer of technology.

Technology transfer, however, only occurs when there is an 'end product life cycle'. Vernon(1979) argued that (a) if there is strong consumer demand in a given country for product and process innovation, the chance of innovation is greater than in countries where consumer demand is more conservative; (b) an entrepreneur generally prefers to invest in innovations for the home market rather than those for the foreign market; (c) the closer the producer is to the market, the lower the costs associated with the transfer of market knowledge. The Vernon model explains that the TNC phenomenon is possible when there is high demand for certain products. This means that if there is no demand, there is no innovation and transfer of technology. As well, the transfer of high technology is impossible for developing countries. The production and transfer of technology is mainly for the export of low-end and labor intensive industry.

On the other hand, apart from the idea of the product life cycle theory, some fundamental questions concerning the TNC phenomenon appeared in the case of Dunning's eclectic approach. His theory states the conditions for the creation of a TNC as being the presence of advantages dependent on ownership, the presence of locational advantage and arguments for internalization. The first condition, the presence of an ownership advantage, means that a given company enjoys specific, unique production conditions enabling it to generate a future flow of income and profit (Dunning 1993). The second condition is the existence of locational advantages relating to production in the host country (Dunning 1993). The third factor is the existence of arguments for internalization:

exploiting ownership advantages by not contracting out the associated activity but deliberately pursuing it and retaining control over it. Generally speaking, there are arguments for internalizing economic activities if there is a certain advantage by incorporating part of the company's economic environment into one's own business. This is the case, for example, where people want to be more certain about market events connected with the technology process, which is known as the technology transfer problem (Dunning 1993).

UNCTAD economists have argued that

at the national level, government intervention is necessary, inter alia, in the form of industrial policies and technological strategies for the transfer, adaptation and eventually development of technological capability ...while technology contributes to enhancing efficiency, competitiveness and growth, it can also create certain socioeconomic imbalances and inequalities ...efficiency and equity are not necessary coextensive, and the imbalances and inequalities caused by technological development will not be remedied through market forces alone"(1995: 2).

The UNCTAD approach has been noted in four major areas: "1) formulation of technology policies and plans and their implementation of strategy by appropriate institutional structures; 2) the establishment of regional and sub-regional centers for the transfer of technology; 3) supporting of sectors of critical importance to developing countries; 4) training programs, workshops and exchanges of personnel"(Patel, 1985: 138-140). Patel argues that the evolution of a strategy for steering the process of technological transformation will have to be based on the building blocks of the past, which were outlined earlier, but will also have to explore many new ways of meeting the challenge ahead (Ibid: 141). Adebajo (1985: 184) noted that the international community of developing and developed countries, as well as international organizations, fully recognizes that access to and mastery of modern technology are essential for the economic and social progress of developing countries and that action should be taken to bring about a restructuring of existing technological relations between the developed and the developing

countries.

Evans noted developmental state as follows

Autonomous state structure and bureaucracy cannot be insulated from society, but must in the contrary, in order for the state to be able to act as a developmental state, be embedded in a concrete set of social ties that bind the state to society and provide institutionalized channels for the continual negotiation and renegotiation of goals and policies. Only when embeddedness and autonomy are joined together can a state be called according to this perspective-developmental (Evans, 1995: 12-13).

The cooperative connectedness between society and state or embedded autonomy generates the important structural basis for successful state involvement. Kwon (1994) supported the belief that the role of governments provides an example of the need for a certain kind of market organization or soft infrastructure as well as for the role of government in promoting an important learning process and offsetting externalities. He criticized neoclassical theory, which assumed implicitly that technical progress would automatically follow capital accumulation, ignored such a learning process.

3.4 Technology Transfer in the WTO Agreements

Even though technology is being treated as a fundamental factor in any developmental strategy of developing countries, the access to new technology is difficult through trade and investment liberalization, because “research and development are concentrated in a few developed countries” (Freeman and Hagedroon 1992: 10). As well, R&D is less internationalized than all other dimension of corporate activity, such as production and sourcing (Correa 1999: 2) and limited to a company’s home country and among other developed countries (Callen, Costigan and Keller 1997: 2-3). The technological alliance of developed countries has marginalized developing countries to the point that a complex network of cooperation in high-technology through strategic alliance occurs in the countries which have similar levels of technology, while the transfer of conventional technology occurs between partners of unequal technological level except for

some firms in developing countries (UNCTAD 1998: 27-29). Technology transfer alone would be insufficient to develop a viable technological infrastructure (UNCTAD 1993; Correa 1999: 10), because technology transfer needs policies aimed at the absorption of foreign technologies and the building up of local capabilities (Correa 1999: 10). Therefore, an examination of the WTO agreement is required to deal with innovation and a systematic approach on development and transfer of technology issues.

(a) TRIPS (Trade Related Aspects of Intellectual Property Rights) Agreement

The TRIPS Agreement provides a base strategy on technology transfer and its institutionalization between countries. The protection of intellectual property rights requires a pre-condition for innovators to license¹³ their technology, while guaranteeing the increase of technology transfer, because the patent holder may prefer better conditions and commitment to exploit their invention through exports or subsidiaries (United Nations 1993: 20). An important issue is that technology is under the possession or the property rights of private or public entities, while WTO agreements deal with practices by governments (Correa 1999: 9), that is, government has responsibility for the protection of intellectual property rights. Korea needs to expand public research and development to ease the transfer of technology and to establish the institution of common use of technology.

Article 7 of the TRIPS Agreement states that one of the specific objectives of the agreement is the transfer and dissemination of technology for particular needs and policy objectives in national registration. However, according to Article 67 of the TRIPS

¹³ WTO members may authorize the use of patents without the consent of the owner for public non-commercial use and when the rights-holder is not willing to use the patent or let others use it, with the result that there is scarcity of the product in the country, thus adversely affecting public interest, the granting of license to an applicant without the consent of patent holder normally emerges (Lal Das 1998: 118). As well,

Agreement, there is no specific responsibility of technical assistance from developed countries, if there is no mutual agreement in terms and conditions (Correa 1999: 12). Instead, according to Article 66.2 of the agreement, developed member countries are obliged to provide incentives¹⁴ under their legislation to enterprises and institutions in their territories for the purpose of promoting and encouraging the transfer of technology to least developed countries (LDCs) in order to enable them to create a sound and viable technological base (Correa 1999: 12). However, the specification of obligation is not defined. The Agreement on Subsidies and Countervailing Measures (which currently permits subsidies for research and development under certain conditions) could be reviewed so as to explicitly allow for subsidies for the transfer of technology and associated equipment to LDCs (Ibid: 12).

(b) Other Agreements

According to Article 8.2.a, the Subsidies and Countervailing Measures Agreement admits non-actionable assistance for research activity up to 75% of the costs of industrial research and up to 50% of pre-competitive development activity. It does not allow countries to exempt the assistance for the acquisition of technology. Exemption is only considered, when the developing countries have a special and differential treatment. Admissibility of subsidies conferred in developed countries in relation to technology transfer to developing countries (GATT 1994; Correa 1999).

According to international law, “both Koreas can be considered sovereign entities”. As a result, any direct trade between the two Korean states is actually international trade rather than domestic trade. As well, Article 1 of the General Agreement on Trade and

when the authorization of such use will be mainly for supply to the domestic market, the use of the patent without the consent of owner is permitted (Ibid: 119).

Tariffs (GATT) clearly provides for general most favored nation (MFN) treatment among WTO members. Basically, MFN treatment means that a WTO member cannot give preferential treatment to the imports from one country- regardless of whether the exporting country is a WTO member or not- unless the importing country provides the same advantages to all other WTO members. However, the GATT/ WTO system does provide for some flexibility. Article 24 of the GATT deals with territorial application for frontier traffic, customs unions, and free trade areas”(Horigan, D. P. 2001: 19). If there is no destruction of the free market system and WTO, South Korea, a member of WTO and OECD, has to follow the principles of the current market system, even though “developing countries should be careful not to assume commitments, including by means of technology related performance requirement” (Correa 1999: 17). Technology transfer will have better conditions in free trade areas, and further custom union common market, and economic union, because technology is kept within a country’s boundary. The only way to challenge the WTO system of world economy is to build a regional economy to free up the movement of the four elements of production, goods, service, capital, and people. Therefore, the institutionalization of a supra national institute is required to check and balance the external shock and develop the new technology by influencing the business actor.

1.5 Institutionalization of needs

Institutionalization means creating an environment of both public and private symbiosis to nurture networks of agents interacting in a specific technology area for the purpose of generating, diffusing and utilizing technology. In that perspective,

¹⁴ Correa defined incentive as a advantage (1999: 15)

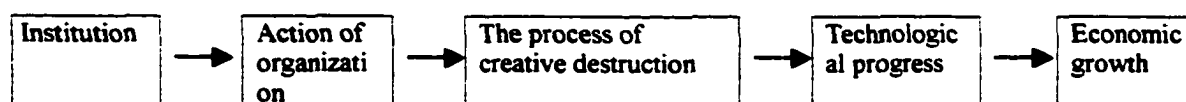
infrastructural and networking aspects of technological systems are extremely important.

Carlsson argues that

techno-economic selection takes place in a socio-cultural environment... the process typically involves interaction and communication among actors. ...the character and structure of the selective mechanisms constitute important characteristics of technological systems affecting their innovative ability (1991:93-118).

Therefore, institutions are both enabling and constraining factors with regard to technological capability. Also, institutions¹⁵ provide socially negotiated sets of guiding signals that drive the economic actors to certain action, and a structure for everyday life which is evolving and continually altering the choices available to society, because “socio-economy is an instituted process¹⁶ vested with a certain unity, performance, consistency and overall gaplessness”, but which also has “a capacity to transform while maintaining its integrity as an institutional order” (Lachmann 1971: 75). As Figure. 1.3 describes, institution influence to the action of organization and organization adapts efficiently to create a monopoly through creative destruction. The process of creative destruction generates technological progress and economic growth. A successful economy should be efficient enough to overcome the limit of its resources.

Figure. 1.3 Dynamic Case of Institution and Economic Growth



Source: Yeager, T. J. (1999). Institutions, Transition Economics, and Economic Development, in Aoyama Sigeru (2001). Introduction of New Institutional Economics, Tokyo: Toyo geizai shinbun sha.

The technological environment of a nation depends on a stable macro-economic

¹⁵ Institutions exist to reduce the uncertainties involved in human interaction. These uncertainties as a consequence of both the complexity of the problems to be solved and problem-solving software... possessed by the individual. It is sufficient to say here that the uncertainties arise from incomplete information with respect to the behavior of the other individuals in the process of human interaction (North, 1990: 25).

¹⁶ Instituted process is a culturally unique pattern of institutions linking socio-economic actors. Lachmann interpreted that “an institution provides the means of orientation to a large number of actors. It enables them to coordinate their actions by means of orientation to a common set of signposts (1971: 49-50).

environment or market friendly policies. It also depends to a large part on the legal and institutional structure in which firms must operate. Perhaps the most important role for government is the provision of a legal system that defines property rights (including intellectual property), contracts and bankruptcy (World Bank 1996). Policies can overcome weakness in the entrepreneurial fabric, and strategies and actions of firms themselves are critical for exploiting and learning from market opportunities (Hobday 1995: 1188-9).

However, more important than formal structures and institutions are the conventions that support learning and movement along a technological trajectory-creating and sustaining a technical culture within an economy (Storper 1995; Sweeney 1991). This culture is needed for keeping pace with innovations and international technical knowledge. Therefore, human resources must be skilled and able to switch to new, frontier technologies. The ability to keep pace with ongoing innovation is a much more powerful determinant of competitiveness than cost advantages due to low wages (Mody, Suri, and Tatikonda 1995: 583). In the Korean context, the institutionalization of technology transfer and productivity transformation (technology transformation) could provide an imperative socio-economic infrastructure or environment to generate mutual economic development between South and North Korea. Also, the institutionalization of productivity transformation (technology transformation) and technology transfer for economic integration and further unification is more possible with state-led policy agreements between South and North Korea rather than the free flow of economic actors without regulation. Both South and North Korea have to protect their own political system from rapid integration and unification to allow sufficient time for preparation.

3.6 State System as a Creator of Institution

For a sound economic performance, the role of institution is very important as this thesis addresses; therefore, the state system is also important to establish institutions which make a creative destruction system as a necessary condition to rehabilitate the malfunctioning economy. A sound political system checks and balances the powerful political parties who have their own interest and generates a system to protect public goods; therefore, the power of people should be enough to resist the monopoly of specific corporations and hegemony of any party. This is called contract theory (Weingast, 1995: 1). The government decides the rule of game in society, but if the power of government is more powerful than that of the people, the government would deprive the private property of people¹⁷. This relationship of tension between people and government decides the predatory characteristics of a nation. In contract theory, time and tax system are necessary to create revenue and growth of economy, while in predatory theory (North, 1981: 21), the ruler of a country removes the dynamic incentives for economic development to maximize his or her own interest.

Contract theory is based on long term economic development. If the country wants to have a high standard of living, it should establish institutions to promote the development of market and generate a system to accelerate creative destruction. In political systems, there are many types, but in this thesis, two systems, federalism and confederation are considered

¹⁷ In terms of socialism, the shumpeterian definition of socialism is not focused on statization of the means of production nor on the eradication of private property, but rather on its socialization, which involves essentially the redesign of the frontiers between private and public in the economic sphere. In the Schumpeter's word, socialism is defined as... an institutional pattern... where the economic issues of society belong to the public

(a) Federalism

Federalism is a political system which has two characteristics: 1) government has at least two levels which own a clearly decided extent of rights; and 2) an institution exists so that each level of government manages an independent execution of rights. That is to say, an upper level of government can not absorb and control the lower level of government (Weingast, 1995: 4). Therefore, each level of law has its own extent of duty and rights to apply. Along with two conditions of federalism which prescribe the division of government rights, a third requirement is the generation of a market preserving federalism. This was addressed by R. Sannwald (1959): 3) the lower level of government rather than upper level has a primary responsibility on economy; 4) a common market clearly exists, because lower level of government is prohibited from generating an artificial trade barrier in country; and 5) lower level of government has to face hard budget constraints. A lower level of government can not expand the spending over the extent of income, in other words a lower level of government is not allowed to print cash and borrow money to use. Those five conditions allow the government to maintain the market in country. In the third and fourth conditions, lower levels of government decide the economic policy and guarantee the movement of capital and labor. However, the lower level of government has a limit to support other regional governments in city and county on economy, because a regional government is competing to get limited resources. Inefficient and strict institution on regional economic organization will cause the movement of economic organization to other provinces and regions. This does not mean that laissez-faire is the best policy, because individuals and organizations have their own

sphere, but where almost all liberty of action should be permitted to the administrators (Schumpeter, 1992: 216)

preference on economic institution which make different types of economic regulation and express their opinion by the movement of economic organization to another region or province. The lower level of government is regulating the economic institution on economic activity; therefore, hard budget constraints are required to feed the efficiency of institution. If the lower level of government supplies capital, when the regional government is in risk, the regional government will not worry about the result of its policy. Financial regulation is required to control the rights of regional government on market. For the fourth condition of federalism, a single market is guaranteed by prohibiting the barriers between province and region. This happens because the upper level of government needs to preserve the country as a whole against the regional economic organizations which want to protect their own interest from competition with other economic organizations. For the second condition of federalism, each government should have its legislated independent control, because the upper level of government could change the constitution to suit its preference and absorb the lower level of government which regulates the function of individual and economic organization. According to Weingast, two conditions are required to maintain balance among levels. First, the people of a country should decide the extent of government power and proper role of government; therefore, people should have a strong consensus to check and balance the execution of policy and decision making. Second, people should have the ability and intention to punish the government, when the government practices a policy, and rights beyond those rights decided on by people (1995: 10). People should be ready to punish the government, when needed. Therefore, the market preserved system should have a rule of behavior on political institution based on contract theory and promote formal institution.

(b) Confederation

Confederation is the union of countries which execute some extent of ability on foreign affairs and economic policy implementation, after two or more countries conclude treaty with equal qualification. The union itself is not an independent country and therefore is limited on its ability to deal in foreign affairs by treaty constraints (Jennings and Watt, 1992: 246-247), that is, the member countries of a union have independent sovereignty and the relationship¹⁸ between member countries is under international law (Verdrob, 1964: 334-335).

The rights of confederation¹⁹ are executed together by the decision of organization²⁰ with a mutual agreement for the specific interest in the specific field (Jang, 1989: 235-259). The common organizations of confederation consist of representatives of member countries and exercise the rights of war, treaty conclusion, and delegation. The decision is

¹⁸ The characteristics of relation between union and member countries in confederation are as follows: 1) confederation does not have a perfect ability of rights and execution under the international law; 2) confederation does not have its territory and territory belongs to member countries; 3) the international responsibility of member country is on member country; 4) member countries own their military power; therefore, the war between member countries is not a civil war but war on the international law; 5) people in member countries have a duty of defense and tax on their own countries; 6) common organization of confederation is organization with a mutual agreement which consists of representatives of member countries (Jang, 1989: 235-259).

¹⁹ Confederation has some extent of rights to execute common issues like productivity growth with establishing economic union, but rights are limited within the the basis of Treaty. This point differentiates the confederation from sovereignty and the distribution of power is prescribed as a content of confederation treaty. Confederation has some rights: 1) confederation has the regulation rights on war and peace, ratification of treaty, and elegaton of diplomatic mission (Kuns, 1929: 478). In this point, foreign and military policy coexist closely and confederation excludes the use of military between member countries, because confederation protects the member countries from external shock and contributes to peace. Therefore, a confederation treaty includes rights of arbitration and procedures for war between member countries. As well, confederation can interfere in situation of internal instability to maintain peace and order (Brie, 1986); 2) the establishment of regulation on currency, measuring, postal service, trade, transportation and religious system belong to rights of the organization of confederation as a task of confederation and under the control of confederation. However, without publication of law, the rights of confederation can not influence people (Ebers, 1910:264); 3) confederation does not have financial revenue and relies on the share of expense from member countries (Kunz, 1929: 479); 4) a confederation can not revise the treaty of confederation to expand its rights without majority rule.

²⁰ In confederation, each government establishes common organization to regulate common interest of countries and holds some extent of regulatory power on common organization. Establishment of confederation does not mean to generate new main bodies of law, but rather forming the new relation under the existing law.

made by the unanimity of member countries but the decision of confederation can not regulate the people of member countries directly until the member countries accept and legislate the common agreement of confederation as a national law (Kim, 1958: 42).

Confederations exist with important elements such as sovereignty of member country (Brie, 1986:91; Brierly, 1963:129-130), a treaty based on international law (Verdrob, 1925-1926), independence of confederation on international law (Pfizer, 1835; Martitz, 1868; Meyer, 1868; Haenel, 1873; Landband, 1876; Stengel, 1898; Rosenberg, 1905), pursuit of common target (Bindschedler, 1962: 564; Anzilotti, 1929: 113; Kelsen, 1948: 207; and Sempf, 1987), integration period as a confederation (Schmitt, 1928:366; 1987; 24), transfer of rights to confederation (Kuns, 1929:478-479); Brie, 1986; Erbers, 1910:264), and organization of confederation (Jellinek, 1992:185). The members of confederation should be sovereign states²¹ and the form to integrate countries by establishing treaty under international law separates confederation from federation, which integrates countries by national law. Therefore, confederation is not a nation but has an ability to decide foreign relation in specific field for common wealth of confederation prescribed by treaty. However, even though the member countries maintain their independence, the member countries are not perfect sovereign nations, because confederation holds the ability on decide on foreign relation in specific field (Verdrob, 1925-1926).

There are other perspectives, which view the confederation as a special interest group. Lanband (1876:58) argued that confederation, as an interest group, is an expression

²¹ Sovereignty means the establishment of law and order to deal with foreign relations on international law and admit international law as a power beyond individual country (Brie, 1986:91). The member countries of confederation have independent rights to manage foreign relation without the order of another country (Brierly, 1963: 129-130). Independence means the freedom from control of other country, not freedom from law.

on common opinion of member countries. It means that confederation is a symbol of international law and creation of legal relation. Also, confederation is not a corporative body and exists within national law. That is, confederation contains unity and collective power to express an opinion, which makes it different from a simple collection of individual countries. Confederation is not a simple community and it controls the organization of itself as whole organization. This whole organization can oppose the opinion of member countries as a confederation, not as a single country. In this point, the characteristic of confederation means community for the whole unity.

In terms of the form of union, the norm of confederation has a common target to pursue, when adapting treaty on confederation and constitution (Bindschedler, 1962: 564). Therefore, confederation pursues political targets as well as administrative, cultural, technological targets. Political targets includes the execution on rights of decision making for independence, security, no invasion of territory, guaranteeing the peace among member countries, war, and peace (Anzilotti, 1929: 113). The economic difficulties with lack of technological edge in the EU also became political targets, solved by establishing customs union, common market, fiscal federation, and currency union to develop an environment of productivity growth and technological innovation. If the target is threatened, confederation can receive a commission to interfere in the actions of the member country by interpreting the agreement of member country. In this case, confederation can also receive a commission on preserving constitution of individual member country and establish common regulation of lawsuit and organizing court (Kelsen, 1948: 207). Therefore, confederation not only has a function to solve conflicts with coordination of opinion and but also has common characteristics of political structure. The most important

feature of confederation is that confederation should have organizations to execute the duty and obligation on treaties. Those organizations are independent from member countries and can make a decision on member countries. However, this organization is not a central authority to control people of member countries directly. The function and role of common organization is different and decided by the common target of the confederation. Common organizations in the aspect of function include decision-making machinery, executive machinery, and grievance machinery. Of those machineries, the decision making machinery, confederation parliament, is most important (Jellinek, 1922: 185) and consists of representatives of member countries who are elected by the parliament or government of member countries (Westerkamp, 1892: 454; Kunz, 1929: 470). The representatives of confederation parliament also receive absolute power and responsibility of member countries and execute absolute delegated power. Each representative has a direct responsibility on detachments: Therefore, this kind of confederation parliament is described as a parliament of absolute power with ambassadors present in confederation to represent member countries. In this parliament, each member country has a ballot by the principle of equality. Confederation parliament can establish other machinery like commission, summit meeting, international parliament, and dispute inquiry commission which can regulate all actors of confederation. In those machineries, dispute inquiry commission is most important to regulate actor to keep the Treaty of confederation.

3.7 Theoretical Argument on Economic Integration for Productivity Growth and Technological Conversion

There are major arguments on economic integration for productivity growth and technological conversion on their own perspectives of integration. Customs union

theories argued that lifting tariff barriers are most important for productivity growth, while optimal currency area theorists proclaimed that lifting all barriers including both tariff and non-tariff barriers is a necessary condition to bring about stability. From the criticism on concentrating trade and issue of barriers, fiscal federalism theorists argued that redistribution of wealth is most important to reduce the technological gap of region. All these theories are trying to explain the economic integration from their own perspectives and what they consider as a necessary environment, but neglected that who and what is generating those aspects and stages of integration or environment of productivity growth with technological conversion. This fact is argued in the accounts of institutional theories, which explain the driving force needed to achieve economic integration for productivity growth and development to meet the needs of people.

(a) Customs Union Theory

Following the work of List, classical protectionism has been transformed into a new protectionism of trade by creating economic blocs such as EU, ASEAN, LAFATA, and NAFTA. Economic Union generates two sides of effectiveness on other economies, because the Union applied protectionism on non member countries, but trade liberalization on its member countries. There were mainstreams approaches to argue on the Customs Union: neo classical and protectionism.

The neo classical approach focused on analysis of efficient resource allocation, and argued that Customs Union increased efficiency of resource allocation by generating free trade through lifting tariff and trade barriers. Viner (1950:44) formulates the argument of neo classical approach and suggested the condition of free trade for maximizing the effects of free trade in areas by observing the change of production condition in member

countries.

Viner (1950:44) argued that Customs Union generated trade creation as well as trade diversion effects and theorized the effect of Customs Union on production pattern and resource allocation between member and non-member countries.

Table. 1.1. Trade Creation effect

Before creating CU	A	B	C	After creating CU	A	B	C
Production cost(sales price)	35	26	20	Production cost(sales price)	35	26	20
100 % tariff of A state	n.a	26	20	100 % tariff of A state			20
Price of A state	35	52	40	Price of A state	35	26	40

Table. 1.2 Trade Diversion effect

Before creating CU	A	B	C	After creating CU	A	B	C
Production cost(sales price)	35	26	20	Production cost(sales price)	35	26	20
50 % tariff of A state	n.a	13	10	50 % tariff of A state			10
Price of A state	35	39	30	Price of A state	35	26	30

Source: Tanaka, S, et.al. (2001). Contemporary European Economy, Tokyo: ARMA.

Note: B is member country of Customs Union and C is non member. CU means Customs Union.

Viner suggests two sides of effect in Customs Union, while analyzing the price of goods, as tables 1. 1 and 1.2 show. Table 1.1 simplifies the effect of Customs Union in that A country get a trade creation effect²² by lifting tariff on B, but generates trade diversion effect²³ by lifting on B. in this situation. However, the basic assumption of Viner is unrealistic in the point that price elasticity of demand on goods is nonelastic in his assumption and the establishment of Customs Union will change price of goods which generates a substitution effect between goods. The change of consuming rate between goods may change consumption pattern, that is, if the price elasticity of demand is not

²² The decrease of import price from member country generate trade expansion, because low cost provider in member country substitutes high cost provider in non member country. This phenomenon called trade creation effect. Viner thought that the efficient allocation of resource in Customs Union will increase welfare in global level.

²³ When tariff increases the price of product in non member country, trade divert for the product of member country. In this case, the member country will have trade diversion effect. Viner argued that import substitution of expansive products would generate minus effect on welfare of global level.

nonelastic, consumption will increase with the establishment of Customs Union. If the production cost in a member country is cheaper than the cost of domestic production, then both countries will have benefit from import substitution. Meade and Lipsey observed the process of change in consumer pattern by the change of price with fixing the production pattern, and analyzed fluctuation effect of welfare. The differentiated tariff levy on goods caused by Customs Union caused the change of consuming pattern by changing the relative price. On the one hand, the consumption effect has an interrelationship with the size of tariff rate, that is, the higher tariff rate is before establishing Customs Union, the more new trade creation effect is generated and the efficiency of consumer is increased. On the other hand, maintaining the high tariff on non-member country causes the loss of welfare with substitution of the goods from non-member countries, which have high production efficiency by goods from a member country, which has low production efficiency. The static effect of Customs Union was analyzed by trade creation and conversion effect, and consuming effect and dealt with the issue of resource reallocation.

However, in reality, the dynamic effect of Customs Union is more important than static effect, because the expansion of market influence technological change, efficiency in the use of production element, and quantity of element supply. In 1960, Balassa analyzed the dynamic effect of the customs union which stimulates the scale of economies, investment and competition, and technological innovation, while reducing the uncertainty of trade and affection on other non member countries (1973: 101- 188). The dynamic effect approach is focused on realization of scale of economy in production. The dynamic effect of Trade Union is as follows. First, Customs Union generates scale of economy. The industry having competitive advantage will increase the profit of mass production by

expanding production facilities. Mass production allows new production methods which need high technology and influences the reduction of cost in production planning, research and development, and information gathering. The reduction of production cost by mass production will cause a decrease in product price. Also, industries specializing in fewer products because of the expanded market generate standardization of products and contribute to the increase of profit since it creates improvement and efficient production along with standardization of the production process. Second, Customs Union causes the increase of competition. The increase of competition contributes to the increase of efficient production (Tinbergen, 1960: 1-5), that is, the abolishment of tariff among member countries causes the intensification of competition in the area of Customs Union and the competitive and efficient companies in production survive, while non competitive companies disappear. Finally the existence of efficient companies will increase efficient production. Also, Customs Union intensifies competition between new imported and domestic products and promotes the decrease of risk and exchange of information by trade. Third, Customs Union accelerates the technological development. The expansion of market will promote technological innovation by increasing the scale of corporations (Balassa, 1973: 164-165). Technological development is much easier in the large scale of economy, because the capital for the cost of R&D and long term development planning and fixed investment cost can be generated by spending; therefore, the technological development accelerates and economic development is promoted. Fourth, Customs Union will decrease the uncertainty. Lifting the risk among member countries will increase the trade among member countries. The risk the trader must confront is the uncertainty of demand prospect. Especially, tariffs of the importing country, quota, and the fluctuation of

foreign currency and subsidies cause the sensitivity of export demand but the exporter can not foresee the fluctuation of export demand. Without certainty, the investment in production and sales of product will be inefficient. However, Customs Union generates the stability in regional market by lifting tariff or non tariff barriers and exporter can plan and execute more active investment in a stable market (Park, 1984: 356). Fifth Customs Union promotes investment. Customs Unions increase the demand of production with the comparative advantage of member country, but because of the lack of skilled labor, existing facilities can not satisfy the demand and require new investment. New investment will create new facilities with specialization of the production process. The investment capital is generated from the savings of people and corporations, because Customs Union increases the income. The foreign Investment also increases with the increase of corporate profit. Sixth, Customs Unions influence the member countries. Customs Union causes trade conversion effect on non-member countries, but if the income in Customs Union improves and economic development accelerates, the imports from non-member country also increase. Therefore, in the long term, the increase of income in Customs Union will improve the welfare of non-member countries by offsetting the bad influence of trade diversion effect.

Balassa (1973) suggests the dynamic effect of Customs Union makes it difficult to find evidence and puts a limitation on theorization, because the dynamic effect of Customs Union includes many complex factors including consumer profit, producer profit, government tariff revenue, production costs of member country tax before and after establishing Customs Union, price change caused by tariff, demand of importing country, and so on (Tanaka, 2001: 47).

The argument of neoclassical theorists is that free trade is the best method to maximize the welfare of the world. If two or more countries make a Customs Union by lifting tariff barriers, free trade will increase world welfare. However, the argument of neoclassical theorists has a problem when applied to under developed countries, which have different systems of economy, society and politics.

Neoclassical economists, who emphasize free trade, theorized that the methods of economic integration could serve as a method for maximization of world economic wealth. List interpreted customs union as an effective means for the protection of infant industries (Johnson, H. G, 1965; Cooper, C. A. and Massel, B. F, 1965). Following the writings of Vollverein and List, Johnson, Cooper, and Massel further developed the argument of protectionism. Their argument focused on the interest of protection and special treatment with the perspective of free trade for member countries, that is, protectionists argued that proper and indiscriminated protective treatment would increase profit more than resource allocation and welfare effect (Kim, 1986: 7-18). Cooper and Massel disagreed with neoclassical theorists who considered that the decrease of income caused by trade conversion effect is bad and the increase of income by specialization of industry is good. They emphasized the advantage of industrialization through economic integration rather than the disadvantage of income decrease by trade diversion, because the industrialization of underdeveloped country is more valuable than its loss from economic integration. This is the main reason why underdeveloped countries prefer economic integration (Cooper and Massell, 1965: 461-476). That is to say, the expansion of industrial production is an effective tool to promote growth through employment and income gain and improve social welfare; therefore, economic integration is preferred as a political measure to increase the

industrial production. Johnson (1965) also agreed with the argument of Cooper and Massell in his theory of industrial production preference (Johnson, 1965). From Johnson, the theory of industrial production preference is a collective preference to maximize industrial production and employment through the protection of government in the case of international competition, even though the efficiency of individual consumption, which leads to consuming the lower priced goods, is sacrificed to economic integration. In the case that collective preference is for industrial production, Customs Union, the discriminated tariff reduction policy is much more profitable than the free trade approach through indiscriminated tariff reduction. Also, while the reduction of discriminated tariff for specific area suppresses the bad influence on most industrial production in the home land by controlling the import from non-member countries, Customs Union is a very efficient protective policy of industrial production as a measure to expand the export of industrial products to member countries.

Dell (1966:17) also argued that economic integration is an effective tool to extend the scale and efficiency of protection. For developing countries, the Import Substitution Policy addresses increased efficiency of economic performance by magnifying the realm of Import Substitution from one country to region; therefore, economic integration for free trade in member countries and discrimination for non-member countries is necessary to extend the realm of Import Substitution. Dell (1966:17) theorized that if the protected market in developing economies spreads, the opportunity for scale of economy and specialization of interest could be escalated by increasing the productivity of existing industries, and could contribute to the development of industries for neutral and capital goods in the region.

The protectionist approach provides the theoretical development for economic integration among underdeveloped countries. Because the increase of industrial production promotes social welfare through employment and increase of income, Customs Union as a tool of protection to enlarge industrial production is necessary to establish production for developing countries. Even though integration theorists totally disagree with the perspective of free trade theory, the mechanism to establish economic integration is based on protectionism and development theory which has been developed since 1950s. Therefore, the theory for integration of underdeveloped countries has a totally different paradigm from neo classical theories and developed countries in which the source of benefit is redistribution of resources and extended global markets. Especially, economic integration as market expansion policy necessary for industrialization has been emphasized as a political measure to complement structural fragility of developing countries in the beginning stages of industrialization. However, in the case of an under developed country in which industrialization is not progressing and has comparative disadvantage in industry, a simple economic integration of market can not guarantee the dynamic effect of economic integration merely by division of labor and intensification of competition in region; therefore, economic integration in developing countries required additional regulation policy like industrial complementary treaty and regional investment plan as in LAFTA, ASEAN, and EU.

(b) Optimal Currency Area Theory

While Customs Union theory is focused on market for goods and trade to maximize welfare implication through discriminating markets, optimal currency area theory deals

with the money market for production factor. The contribution on optimal currency area²⁴ theory comes from Mundell (1963), McKinnon (1963), Kenen (1969), Grubel (1971), Presley and Dennis (1976). The debate on optimal currency area theory focuses on the relative merits of fixed versus flexible exchange rates. The argument for the flexible exchange rate approach is that both internal and external balances should be maintained by a flexible exchange rate in countries which experience price and wage rigidities (Friedman 1953:157-203). This is required because policy to payoff international payments imbalance would produce unemployment or inflation under the condition of fixed exchange rates of price and wage, while under flexible exchange rates, changes in the exchange rate would reduce payment imbalances without the burden of severe adjustment experience (Kawai, 1992: 78).

However, from the viewpoint of optimal currency area theory, currency area or fixed exchanged rate may manage internal and external balance much more efficiently than flexible exchange rates in the condition where the integrated region's economy is highly corporative as an economy. In this point, Mundell argued that the establishment of currency area is much more efficient than flexible exchange rate, if there is maximization of rapid and efficient mobility of all factors of production in the area. The flexible exchange rate within an area would be required to not disturb the real adjustment of all production factors.

McKinnon elaborated his argument on the degree of external openness of a region in that higher openness will generate more benefit from a Currency area, because the price

²⁴ Currency area means that fixed exchange rate and common currency exist. Optimality is interpreted as an ability of area to maintain internal (full employment and low inflation) and external balance (payment equilibrium) in terms of cost without interference from monetary and fiscal policies. The concept of optimal currency area is based on the argument over relatives merits of fixed versus flexible exchange rate.

change caused by exchange rate flexibility does not effectively contribute to trade and wages. The efficient monetary policy for internally open but externally relatively closed economy would generate price stability for trade of goods internally and externally flexible exchange rate for its external balance.

The view point from cost and benefit generates arguments on the participation of currency union (Ishiyama, 1975, 344-383; Tower and Willet, 1976). However, the costs associated with this type of union, such as losing monetary independence, instability, caused by a low tolerance for unemployment and pressure from monopolistic industries and labor unions would cause short-term problems. The benefit of this approach is long term: A single currency generates simplicity of calculation and accounting, free flow of information for transactions, reduction of risks in exchange rate fluctuation, and maximization of trade and specialization²⁵.

However, the main approach for customs union and optimal currency area theory is static and fails to uncover the process of deepening and widening communities. Both focus on market relations among goods and factors of production and fail to shed light on the importance of political and supranational institutions in the process of integration. Also, it is natural to explain that the regional integration covers factors beyond the trade in goods, services, and economic factors. In this point, “the importance of this political dimension of regional integration may well exceed that of the more direct implications having to do with trade flows”(Melo, Panagariya, and Rodrik, 1993: 176). Lawrence also noted that

Most theorizing about regionalism in economics considers these arrangements in the context of a traditional paradigm in which trade policy is characterized by changes to barriers at the border. Regional arrangement are modeled either as customs union ... or as free trade area ... But although the removal of internal border barriers is certainly an important feature, focusing only on these barriers overlooks much of what regional arrangement are about. The traditional perspective is at best incompleting and at worst misleading. In many

²⁵ Kawai, Optimum Currency Areas, p. 80.

cases these emerging arrangements are also investment. Once tariffs are removed, complex problems remain because of differing regulatory policies among nations (1996: 7).

As Lawrence argued, the remaining complex problem of regional integration is in the solution of the political arrangement. The explanation of mere market integration neglects the institutional elements which are important factors in the dynamic aspects of the phenomenon needed to explain reciprocal relationship between economic and politico-institutional factors.

(c) Fiscal Federalism and Economic Integration of Functional Approach

Fiscal federalism, derived from public finance theory which analyzes the special fiscal issues in federal countries, is based on the literature on public goods, taxation and public debt incidence, and various parts of location theory. It explores the reasons for introducing a federal structure, finds the rules for the assignment of authority over various parts of fiscal policy to different levels of government, and considers the efficiency implications of migration from one jurisdiction to another, as well as the role of intergovernmental revenue transfers and their most desirable forms in a federal structure (Musgrave, 1959; Oates, 1972; King, 1984). Many of the issues in fiscal federalism are found by an examination of regional institution-building on the model of European Union which is searching for the desirability and efficiency of fiscal coordination among EU member states. The high mobility in factors of production implies that migration of capital, labor, consumers, and taxpayers was promoted to get interest from the regional differences in taxation and in supply of public goods. This issue implies the potential influence for fiscal spillover beyond borders generating incentives for fiscal policy coordination and raising the issue of determining the proper fiscal policy decision making (Buiter and Kletzer, 1992: 647). Fiscal coordination, which ranged from simple agreement to mutually

applied centralized policies, relies on the extent of spillover, the cost of enforcement of an agreement, and the extent of economies of scale from centralization (Inman and Rubinfeld, 1992: 654-660; Neven, 1992: 98-103). The object of policy makers is generating allocative efficiency through coordination as well as the achievement of distributional goals. The free movement of taxpayers across borders of member countries decreases the available revenue which local government needs to use and redistribute locally. This addressed a need for central redistributive policies (Bureau and Champsaur, 1992: 88-92). The economic integration raises the question of redistribution policy to support the loser in the game. The enlargement of a compensatory mechanism is required to expand the fiscal responsibility of the central authority in a region. The essence of Fiscal federalism provides the linkage between the evolution of private markets and the creation of new institutions beyond the appropriate policy. The contribution of Alessandra Casella is worthy to understand the linkages (Casella, 1994: 61, 267-284; Casella and Feinstein, 1990; Casella and Frey, 1992: 639-649; Casella and Weingast, 1995). Casella explores an understanding of the relationship between the development of market integration and shaping the configuration of public goods provision within a region. She tries to connect concepts and ideas in public finance on international trade and economic geography (Krugman, 1991) and links the determinants institutions with characteristics of economic markets. Casella utilizes institutions and jurisdiction interchangeably and defines them as a “club whose members jointly decides on, finance, and enjoy an excludable public good” (Casella, 1992: 115; Casella, 1994: 268). In the concept, markets are defined as “sets of traders who exchange private goods” (Casella, 1992: 115). The main argument is as follows: at first, the widening of markets needs centralized regional institutions to achieve

coordination and reduce transaction costs. However, the difference of economic roles and needs within the region is evident, when integration deepens. This required rise of a broad range of public goods. “Jurisdictions must be redrawn to satisfy the requirements of unified, more competitive, more sophisticated markets”(Casell, 1994: 267). What needs to be established is “functional federalism” or a regime where individuals and member states organize themselves into a pattern of similar jurisdictions, along with making jurisdiction responsible for the provision of a specific class of public goods. These jurisdictions have variable memberships, which depend on the extent of policy under consideration, and they represent a highly decentralized system of economic organization (Casella and Frey, 1992: 640).

However, what she is missing in her argument is institutionalization of the collective action by supranational institute and the other supply-side conditions for successful integration to bring about the willingness of potential providers to supply common institutional arrangements. The institutional integration is much more appropriate to supply conditions of integration, as this thesis argues.

(d) Institutional Theories

Integration is merely considered as voluntary linkages that the economic actor drives to change the key area of domestic regulation and policy to establish the supranational level. However, the great account of market integration is not explained in purely economic theories, but in reference of institutional factors.

The integration treaty is given with the condition that the potential economic gain from integration is promised and significant. The potential for gain may grow with diffusion of new technologies. In this case, the market player is willing to have an

incentive to generate regional institutional arrangements that make the realization of these gains possible; therefore, a critical driving force of integration became market players who demand regional rules, regulations, and policies. Second condition should be playing on the fulfillment of supply conditions. These conditions are those under which the political leaders are willing and able to accommodate demands for regional institutions at each step of the integration process. The chances of power retention and improvement from regional integration should be fulfilled for political leaders by improving domestic economic conditions, which are the most important issues of politicians and people in the capitalist system of world. However, the regional integration is impossible without coordination of rules, regulations, and policies, because the issue of collective action problem draws on the establishment of institutional leadership which can distribute gains from integration. The treaty of integration then requires supranational institutions for successful integration and improvement in the conditions of economy with rules of cooperation acting as constraints, when national self-sufficient economic policy is not enough to satisfy the need for economic growth and welfare. Therefore, supranational leadership is generated by strong market pressure for integration and coordination of leadership.

The second institutional factor to generate institutional integration is found in the crucial account in externalities of existing economic union to protect or protect the single national economy through trade diversion or creation, investment, and aid. Those externalities generate incentives of the action of member countries as well as non member countries on membership of economic union. However a non-member country cannot be a member of economic union, if the need and condition for political and economic gain is not met.

There are three main institutional theories on regional integration from the demand side of institutional change which are the process of providing common rules, regulations, and policies for region. Property-rights theory, economic history, and new institutional economics are refining the explanation on the evolution of domestic institutional arrangements and logic on the dynamics of regional institution-building. The common concept of institution is a set of formal and informal rules, regulations and compliance procedures designed to constrain and shape human interaction and structure the incentives of actors involved in an exchange relationship in order to maximize the wealth or utility of these actors (Yarbrough, 1992: 11; North, 1981: 201).

Property-rights theory argues that key actors and motives are the driving force of institutional change. In this theory, the driving force and demand for institutional change is derived from the bottom of economic hierarchy which has opportunity cost in an institutional arrangement (Libecap, 1996; 34-58; Hurst, 1964). Davis and North also argued that the formation of new institutional arrangement is required to generate the possibility of profits through creative destruction of existing structure (Davis and North, 1971:59). The argument of Harold Demsetz provides best account of property-rights theory, as follows.

Property rights develop to internalize externalities when the gains of internalization become larger than the cost of internalization. Increased internationalization, in the main, results from changes in economic values, changes which stem from the development of new technology and the opening of new markets, changes to which old property rights are poorly attuned (Demsetz, 1969: 350).

The economic history school explores the analysis of the impact of new technologies on markets and institutions by applying the concept of transaction costs which are the costs of specifying, negotiation, monitoring, and enforcing contracts that underlie exchange, that is, they are the costs of capturing the gains from market exchange (North, 1985: 558). The argument of North is that the size of market is expanding with new

technologies which ease communications and shorten distances. There are two effects of technological innovation. First, it puts pressure on replacing the existing restrictions with more specified common law. Second, the growing size of the market transformed from vertically integrated production to specialized production. The growing transaction cost of measuring input and output for specialization requires organizational innovation to reduce the transaction costs. In the view of North, technologies and transaction costs are causing unlimited effects on each other: technological change leads to increased specialization which induces organizational innovation and in turn induces technical change, which requires further organizational innovation to realize the potential of the new technology (North, 1981).

New institutional economics theory also focused on transaction costs in political rules of game for interest and the production technology to explain industrial organization from market exchange to vertically integrated exchange which has differences of transaction costs (Williamson, 1975; *ibid*, 1985). It develops the idea that “transaction costs are economized by assigning transactions to governance structure in a discriminating way” (*Ibid*, 1985: 18). The higher the existing transaction cost, the greater the institutional change required to promote efficient exchange.

Followers of institutional theories view the regional institution-building as an attempt to internalize externalities that cross borders within regional union. Also institutional change was argued from the viewpoint of demand side conditions for regional integration. The increase in cost of externalities with new technology generates the potential for gain from market exchange and a return of this gain to regional rules, regulations and policies. In other world, as new technologies increase the extent of markets beyond the boundaries

of a single state, actors who want to gain from widening markets will seek to change an existing structure of governance to realize these gains to the fullest extent. There are issues of externalities, transaction costs, and demand for integration. From the demand side, the costs of international trade and investment transaction are risky because of the uncertainty caused by civil unrest and economic mismanagement and firm and government level opportunism (Williamson, 1985: 47). Therefore, the investors want to change the expropriation measures²⁶ through laws and regulations in the host country. Firms want to minimize transaction costs by using organizational techniques which have the purpose of internalizing externalities through vertical integration, long term licensing agreements, and multinationalism (Yarbrough and Yarbrough, 1992: 34, 88). However, Williamson, criticized this and feels that internal organization may also experience serious incentive and bureaucratic disabilities (1985: 163). The successful provision of a new governance structure may promote further market integration, hence putting the structure under pressure to adapt. The critical role of market players in integration was addressed in the experience of European integration in 1980s. European industrialists played as actors to establish the Single European Market for rapid technological change. (Sandholtz and Zysman, 1989: 95-128).

However, some early institutional theories have been criticized for overlooking the importance of supply conditions with demand condition, because if the demand is not met by supply, no change will occur. The argument from the demand side is just distorting the important supply conditions.

²⁶ The measures includes local equity obligations, profit remittance controls, forced sales, export performance requirements, forced partnerships, local content requirements, licensing restrictions, financing restrictions, restricted markets, tax discrimination, export quotas, supervision of transfer prices, and the prevention of local acquisition (Lipson, C. (1985). *Standing Guard: Protecting Foreign Capital in the Nineteenth and Twentieth*

Supply conditions in which political leaders are willing and able to accommodate demands for functional integration depend on the payoff of integration to political leaders. Economically successful leaders are not willing to lose political autonomy and political power to supranational agents, because the expected marginal benefit from integration such as reelection and retaining political power is not guaranteed by the cost of integration. However, in the circumstance of economic difficulties, political leaders are concerned with security for themselves and become willing to implement economic policies that enhance the overall efficiency of the economy, that is, the distributional issue becomes of secondary importance to reduce the resistance of interest group (Rodrik, 1994:61-88), even though there is willingness of leaders because of economic difficulties, supply of integration depends on collective action which has great effect in Prisoners' Dilemma and coordination games (Sindal, 1985:923-942; Stein, 1983:115-140; Martin, 1992:765-792; Garrett and Weingast, 1993:173-206). Though Prisoners' Dilemma game is the main approach on international cooperation literature, regional integration is much more relevant in the coordination games, because regional integration schemes usually surpass the removal of border barriers and contain efforts to apply common regulations and policies. The strong pressure for coordination derives largely from the desire of big firms to establish regional production networks to decrease costs and maintain international competitiveness.

The strategic forms of the Prisoners' Dilemma and coordination games are illustrated in figure. 1.4.

Figure. 1.4 Collective Action

		State B	
		Y1	Y2
State A	X1	3/3	1/4
	X2	4/1	2/2

		State B	
		Y1	Y2
State A	X1	4/3	2/2
	X2	1/1	3/4

Prisoners' Dilemma

Coordination

Source: Snidal, D. (1985) American Political Science Review 79: 923-942

In both games, the policy options are X1 and X2 for state A, and Y1 and Y2 for state B. The entries in each box represent ordinal payoffs for states A and B, respectively (an optimum ordinal payoff is 4 and minimum is 1). Prisoners' Dilemma game is main representation of externalities where actors apply costs on each other independently of each other's action in the pursuit of their own private gain (Snidal, 1985: 926-927). State A will apply its dominant strategy X2 and state B will choose its dominant strategy Y2. The choice of dominant strategy will end up being not only the least preferred outcome for either state A or B, but also the most preferred outcome for either state A or B. Therefore, both states should cooperate to reach payoff 3/3, but they lose the most preferred outcome by deferring strong incentives to choose dominant strategy X2 and Y2. However, the cooperation to harmonize the interest of each state will be difficult if the membership of actors increases. The cooperation to share information and communicate with each other will be problematic and actors in cooperative arrangement may cheat each other. The success of Prisoners' game relies on the repetitive cooperation, if the outcome of continued

cooperation is bigger than the benefits of cheating each other at any one time (Axelrod, 1984; Hardin, 1982). Also, the prospect of cooperation improves if Prisoners' Dilemma games are linked issues or specific gain, because there is fear or incentives that non cooperation spread into other areas (Snidal, 1985: 939). However, uncertainty and incomplete information in the world, repeated play, issue-linkage, and reputation does not provide sufficient guarantees against violations of cooperation rules. Much more sophisticated arrangement may be required to regulate the violation of actors (Bulow and Rogoff, 1989: 155-178; Veitch, 1986; Ostrom, 1990; Grief, Milgrom, and Weingast, 1994: 745-776). Milgrom, North and Weingast express as follows.

A reciprocity strategy requires that an actor know his current partner's previous history. When such information is different or costly to obtain, decentralized enforcement mechanisms break down. Institutions... resolve the fundamental problems of restoring the information that underpins an effective reputation system while both economizing on information and overcoming a whole array of incentive problems that obstruct the gathering and dissemination of that information (1990: 21; Axelrod and Keohane, 1986: 226-254).

Supply condition of a group of countries demands establishing commitment institutions such as centralized monitoring and third party enforcement to enhance compliance with the rules of cooperation. Commitment institution increases the chances of cooperation by acting as regulations in the circumstances where self-reliance measures are insufficient to prevent violations. Commitment institutions are most effective if they provide direct access to those individuals who have interest from seeing integration completed like European Court of Justice and the Commission of European Communities.

Coordination game raises different issues from Prisoners' Dilemma games. Snidal describes them as follows.

The problem in Prisoners's Dilemma is that in pursuing its self-interest, each state imposes costs on the other independent of the other's policy, where in the coordination game each imposes costs or benefits on the other contingent upon the other's policy. The collective action problem is that neither state can choose its best policy without knowing what the other intends to do, but there is no obvious point at which to coordinate (1985: 931-932; Stein, 1983: 125-127).

In the coordination game, figure. 1.4, state B prefers policy Y1 if state A applies

policy X1, but prefers policy Y2 if A applies X2. Once a cooperative solution is achieved, it is self enforcing and state does not have incentives to violate, that is, the problem in the coordination game is one of choice between multiple stable and efficient equilibrium over which states have opposed interests, while the problem in the Prisoners' Dilemma game is how to escape from a single stable but inefficient equilibrium (Snidal, 1985:932). The collective action problem in coordination game is solved if there is one state or regional leader whose membership or cooperative effort is perceived as most important to the group. The policy adaptation of the leader is political as well as economic and the least cost required. A benevolent leader can also solve the distributional problems which derive from the long term repetition of Coordination game. If X1 Y1 in figure. 1.4 is the repeated outcome of coordination game, state A will be satisfied, while state B only get second best gain, The small difference which depend on the question of fairness and equal distribution of the gain from cooperation (Grieco, 1990; Krasner, 1991: 336-366). The regional leader then needs to ease distributional issues to smooth the economic integration (Keohane, 1984). Supply condition for successful integration demands the presence of an undisputed leader in the region for closer ties. The regional leader not only plays the role as a pivot in the coordination of rules, regulations, and policies, but also the role as redistributors to ease distribution tensions.

The success of regional integration in institutional theories required at least three integration conditions. First, a regional group should generate important gain from integration. Second, the regional group requires a regional leader as an institutional pivot. Third, the existence of a monitoring and enforcing institution is also required to generate crucial effect on the integration process.

As another condition for successful integration conditions, there are external effects to non-member countries. The process of internalization of externalities can create external effects or externalities on the countries which do not belong to the community. Non-member countries may face temporary or lasting discriminatory trade policies (Kruger, 1995: 19-33) from the community and they have to decide to join or create another community. The deepening and widening of integration also causes the investment diversion of non-member countries. The enlarged and integrated market is attractive for foreign investors to take advantage of the scale of market, and then foreign investors will divert their investment from non-member countries to member countries. In addition, the malfunctioning economy pressures the politician to join the community to have a reelection chance. Usually the non member country can pursue a merger with the area generating the external effect or establish counter regional group.

4. Theoretical Framework

Technology is a critical factor for increasing the economic growth. This clear conclusion is drawn from diverse theoretical perspectives including neoclassical, structural, and Marxist. However, technology transfer via the neoclassical approach of capital investment is not appropriate for a process of horizontal economic integration. This is because the economic gap does not decrease with the allocative process of labor and capital, but instead generates dependent development and exploitation of labor (Evans 1979; Braverman 1984). In addition, new production technology is possessed in private as well as public and secured by national law and regulations, especially new technologies are not freely available to all. Neoclassical and new growth theory approaches also paid insufficient attention to institutional factors.

The internalization of technology increases productive growth, not by facilitating capital and investment, but by producing a process of technical change in the organization of production. In the free market system it is possible to generate labor intensive industries which have to exploit the abundant labor with its equilibrium function of labor and capital, but there is a great obstacle in spurring further building of indigenous technology capability, because the technology is secured in private, public, and nations by intellectual property rights. Technology should be 'internalized' through the systematic application of scientific or organizational knowledge with institutionalization. For horizontal integration and decreasing inequality, policy and investment should be made in education, in infrastructure for new technologies, and in diffusing knowledge, all with the aim of enhancing indigenous capability.

Therefore, the development of technology in North Korea has to come from the institutionalization of productive technology in both Koreas through legal agreement of customs union, common market, and currency union for the needs of the Korean Peninsula. The institutionalization of treaties for economy in Korean Peninsula would provide the necessary environment for a dynamic innovation system to drive the actors of the economic system and in turn influence the informal institution of the nation. The South Korean government and people need to establish a system of technology transfer to North Korea while regulating neoliberal technology transfer through an investment package of investment for internalizing the requirement of the North Korean industries and the needs of its people. Also, the exchange of knowledge is a critical factor in reducing the technological gap between South and North Korea, and for enhancing the institutionalization of technology transfer and economic growth and transformation.

It is clear in this thesis that while technology is most important factor to maximize productivity, the institution and institutionalization need infrastructure and certain environment to make dynamic technological innovation possible. This is major challenge for integration and development of the Korean peninsula.

5. Question of the Study

The alignment of North Korea with the socialist bloc led by the former Soviet Union since the 1950s generated a process of rapid economic growth and development before 1970s. However a series of external shocks, such as the conflict between the former Soviet Union and China, and the destruction of the socialist bloc has led to an economic depression which has set in as of the 1990s (Hwang 1995; Lee 2000).

Fortunately, North Korea has exhibited a willingness to join the international market by establishing a relationship with South Korea and other capitalist countries. The South Korean economy is in this context reviewed, and to some extent used, as an intermediary in the transfer of technology into North Korea. In the global context only a cooperative nation will be integrated into a unity within a national context. However, even though there are positive movements from North Korea, and economic growth is resuming with the economic cooperation between South and North Korea, there is a growing concern derived from the experience of German Unification. The German economy and society experienced a long-term economic depression and social impacts after rapid unification as a direct result of conditions generated in the process of economic integration between East and West Germany. An optimal economic integration was hampered by the rapid unification or neo-liberal approach of Washington consensus without the institutionalization of important factors like technology integration and production factor

movement, which are required for industries and actors in the process of unification. Neo-liberal approach has nothing to do with development with human face and welfare of people. In existing socialist states, the transition is inevitably required to generate productivity growth and there are three models in which world capitalist system provides as table.1.3 classified.

Table. 1.3 Issues and options in post-communist institutional change

Type of capitalism	Washington Consensus	Alternatives	
	Anglo-Saxon	West-European	East Asian
ECONOMIC CHANGE			
Phasing	Stabilization/ liberalization first	Institutional change first	Institutional change first
Pace	Fast	slow	slow
Scope	Minimal state, Maximum market	Active state	Active state
Social solidarity	Low	High	High
POLITICAL CHANGE			
Political liberties	Extensive	Extensive	Restricted
Institutional arrangement	Executive dominance	Legislative dominance	Executive dominance
Popular participation	Low	High	Low
Type of decision making	Elite pluralism	Corporatist/consocial	Corporatist
Sequencing	Democracy first	Democracy first	Economic change first

source: Norgaard, O. (2000). Economic Institutions and Decocratic Reform: A Comparative Analysis of Post- Communist Countries, Cheltenham, UK: Edward Elgar: 61.

In the current model of capitalism, North Korea has to choose or find its own alternatives. Also, the path and ends of national economy and politics in the Korean Peninsula are important to decide the destiny of the nations. To indicate a possible path for technology transfer during economic cooperation and integration of South and North Korea, this thesis poses the following questions:

- (1) On the condition that technology is an important factor to reduce the economic gap

between developed and developing countries, what do South and North Korea need to do with technology transfer during economic cooperation and integration to reduce the economic and social impacts?

(2) What is a possible policy and strategy for technology integration and development between South and North Korea?

In addressing these two questions, this thesis will examine the implications of technology in the Germany unification process as a fast phase based on Washington consensus, and Vietnam as a gradual phase as an East Asian Alternatives for North Korean integration into the global technology system. Finally the model of the European Union will provide the gradual phase with institutionalization for both South and North Korea. The model of EU suggest the possible path and development for better integration as an existing and still processing economic, social and political integration. Also, the comparison of system, structure, the stage of technology in world economy, and technology policy for industry between South and North Korea will be examined for the recommendation of possible policies and possible integration of economy, society, and politics. This analysis will allow us to find the appropriate path for technology policy, transfer and institutionalization in the sound economic integration of South and North Korea. The aim is to search for a model of sustainable economic growth for a unified Korea.

6. Thesis Statement

Technology is a critical factor for reducing the economic gap between South and North Korea and for minimizing social unrest in the process of economic integration through systemic institutionalization. The institutionalization of technology transfer and the

exchange of knowledge through the education system, joint venture projects and research programs, and expansion of public technology can play a most important role in the process of horizontal economic integration. Therefore, people with the skills and abilities (human resource) to adapt the new technology frontier constitute a critical factor in the process of technological conversion and productive transformation. The institutionalization of technology transfer between South and North Korea are much more crucial factors to keep pace with ongoing innovation rather than merely being cost advantages due to low wages with high productivity. In this context, appropriate policies should be established relative to education, infrastructure for new technologies, and for diffusing knowledge and ideas, all with the aim of enhancing national capability and constant innovation.

7. Methodology

The analytical framework of this research is based on an assessment of the unification process in Germany and the process of unification and transition from centrally planned economy to state-led development in Vietnam and consocial and corporatist European Union. The German model of economic cooperation will be examined for problems involved in the course of economic integration with fast pace of transition and policy implication for the unification of the two Koreas. In addition, the case of Vietnam and the European Union can be assessed as possible models for North Korea. These can be considered in terms of technology transfer, within the context of an institutionalization policy designed as a means of coping with various 'externalities' Especially, the model of EU suggests possible paths of integration through institutionalization for the Korean Peninsula.

The analytical tool for South and North Korea is based on structural and systemic

differences in industries, technology and economy, while concentrating on political and social issues.

With regard to data collection, this research is largely conceptual, but the statistical data on the rate of technology transfer are available from the South Korean National Assembly Library and Ministry of Unification, which contain South Korean National Bank data and North Korean economic assessments. Current statistical data are also available via newspapers, Internet, and journals in South and North Korea. The data on other countries will be mostly drawn from Internet databases and books in the Halifax Regional Libraries and Japan External Trade Organization (JETRO) in Japan.

8. Structure of the Thesis

The argument of this thesis is structured as follows. Chapter I provides a conceptual introduction and theoretical argument to deal with the implication in the German and Vietnamese, and European models to the applicability of the Korean context. The chapter concludes that technology is a critical factor for increasing economic growth with institutionalization. It is argued that the institutionalization of technology transfer and exchange of knowledge could play an important role for horizontal economic integration. Therefore, people with the skill and ability to adapt and transform the new technology frontier (human resource), and the institutionalization of technology transfer between South and North Korea are critical factors in keeping pace with inducing high rates of productivity growth. In addition, it is argued that policies should be made in education, infrastructure for new technologies, and in diffusing knowledge and ideas, all with the aim of enhancing national capability and allowing for constant innovation in the nation. Also, this chapter provides the argument of economic integration from neo-liberal, and

alternatives. This chapter focused more on the supply side of integration rather than demand side, and concluded that the institutional approach is required to generate the integration of both Korea and their people.

Chapter II gives the experience of Germany and Vietnam with unification and transition. The German model provides the experience of economic integration and implication of technology. The German experience gives that German practice before unification had missed institutionalization of technology transfer and the needs of the East German manufacturing sector, which eventually led to mass unemployment and economic depression. Institutionalization of technology with employment and technology policy was practiced after unification and there was a certain reduction of social and economic impacts. The German experience implies that South and North Korea could institutionalize their needs in technology transfer and development before unification in order to reduce possible economic and social impact after unification.

The Vietnamese model gives a possibility of application for North Korea to cope with external technology and externality or the process of institutionalization of technology transfer, aided by state policy, for building indigenous technological capability with gradual approach which is different from neo-liberal principle. The challenge to institutionalize the Vietnamese capability is evident in their policy implementation on R&D. However, the innovation of system and open door policy to cope with external technology is a necessary evil, while reducing the speed of transforming the Vietnamese system to provide the sufficient adaptation period for a new economic environment. The Vietnamese experience provides one of best models for North Korea to cope with external technology in their policy implementation which has shaped Vietnamese

institutionalization of technology transfer and productive transformation.

Chapter III provides the ongoing model of European Union for Korean Peninsula and more proper economic institutionalization. The path and struggle is survived as an important lesson for Korea to overcome the failure of EU and learn from it. The role of institutions and institutionalization of needs has been addressed in the paths and experience with gradual approach. As an existing model of integration, European Union provides lessons, its challenge and further issues which need to be solved for welfare of people and social democracy. The deepening and widening is necessary to generate the solid integration, but the integration is not coming automatically without political coordination through supranational institute in the model of EU. The problems in customs union were solved with political agreement to share the cost and benefit of integration through the implementation of Single European Act and Maastricht Treaty. Also, the limitation of single market has been overcome with currency union to generate a single economy. Further integration will require another agreement to generate federation of politics as well. All those processes came from institutionalization for the needs of European economies or increase of productivity growth through innovation of the system. The Single European Act was an important law to legalize the production factor movement and demand legal agreement of further integration, Maastricht Treaty. The role of Germany was important to generate single European Union as well as the supranational institutes which represent the need of enterprise and people in EU. The current challenge is to support the transition of Central and Eastern European Countries with allowing gradual approach to integrate into more enlarged Europe. The technological and capital support from EU provides important interest for transitional economy in EU and there is on going

coordination to share cost and benefit of integration. This is derived from the Treaty of European Union as a self regulatory enforcement for the welfare of Europe as a set of lights to guide the actors of innovation in Europe.

Chapter IV assesses the systemic and structural difference in the manufacturing sectors of the two Koreas as a case study for transfer/transformation and its institutional dynamics-my argument. South and North Korea have developed economic cooperation and there has been economic growth in North Korea since 1999. However, the institutionalization of technology transfer between South and North Korea has not been implemented in their policies. This point implies that South and North Korea will face similar challenges, as the Germans experienced with shock therapy. Therefore, institutionalization of technology transfer and productive transformation is a pre-requirement for economic integration between South and North Korea which is provided by the lesson from the failure and triumph in German, Vietnam, and EU.

Chapter V summarizes the findings of chapters two, three, and four and will draw out their theoretical policy implications as it affects the study of this thesis. This chapter concludes that technological integration and transfer within framework of institutionalization is a means to reduce the knowledge gap between South and North Korea, and make the Korean economy sustainable in the future. The knowledge grows in people who have institutionalized their needs within the legal agreement of state and establishment of supranational institute which can guide the behavior of economic actors. The states, institutions, enterprises and people have to cooperate to achieve horizontal economic integration which is optimized in economies of similar size. The market function is not perfect to meet the needs of the Korean people and Korea. Both Koreas individually,

have to institutionalize their needs for innovation and productivity growth. As a final conclusion, a recommendation policy is suggested.

Chapter II

The Model of Productivity Transformation and Technology Transfer

1. Introduction

The experience of other countries is important for Korea to learn the limitations and challenges to cope with the current and future obstacles in unification of the Korean peninsula. In terms of economic integration between different economic systems, there are two models: German Model, and Vietnamese Model. However, the Vietnamese model has a limitation of application in that the scale of economy between South Korea and North Korea has a large difference in the stance of industrialization, scale of capital, and quality of labor. Therefore, the Vietnamese experience was eliminated, but utilized for the reform of North Korea in transition of Science and Technology system.

The German experience is similar to the Korean situation in the size of territory, population, and income gap. As well, economic integration, promoted by West Germany rather than East Germany for 40 years can be compared to the Korean economic integration model except for the eventually absorbed integration of East Germany with shock therapy; therefore, the German experience will provide the model of problems of economic integration and potential solutions which will be explored in the next chapter. As well, the historical review of the German experience will provide the implication and expected process of economic integration. In this chapter, the German experience of economic cooperation and integration will be examined as a model of economic integration for the field of technology transfer and manufacturing industries as a neoliberal approach and Washington consensus, while the Vietnamese experiences will be confined to

check the possibility of reform and an open door policy for North Korea as a Asian alternative. Also, the limitation of both Vietnamese and German model provides the lesson to learn from the implication of institutionalization and requires studying the model of EU as a next chapter.

German Unification and Problem of Economic and Social Integration.

2.1 General Economic Comparison between East and West Germany

Evaluation of the unification in Germany shows that the initial expectation drifted and the solution was far from reality. The extreme discourse often expresses the belief that East Germany was colonized by West Germany, because even 10 years after the economic and social unification the expectation of German people, especially those of the former East Germany had not been met. The unprepared unification of Germany has caused social and economic unrest since 1989, even though the West German economy is the third largest in the world after USA and Japan²⁷.

Table 2.1 The Comparison of Economy²⁸ in East and West Germany (1989)

	Unit	East Germany	West Germany
Population	Million	16.5	62
Labor Power	Million	9	28
Territory	KM2	108	249
GNP	\$ Billion	0.01595	1.1943
GNP/person	US\$	9,667	19,243
Labor Productivity/person		40100 EM	80900 DM
World Export Occupancy Rate	%	1	10
Monthly Wage/person		1100 EM	3300 EM
Average Pension/month		370 EM	1100 EM
Labor Hour/week		43	38
Saving Rate	%	7	13.9

Source: Korea Bank survey department 1(1990)

²⁷ World Development Report 1991 indicated that West German GDP recorded \$ 1,189,100 million, third only to the USA (\$ 5,156,440 million) and Japan (\$ 2,818,520 million) (1991: 209).

²⁸ Because of systemic difference, the comparison of economy between East and West Germany was difficult, but the endeavors of Ministry of Statistics in West Germany made it possible to compare two different economic systems with ratification of union in currency, economy, and society which concluded as unification.

Table 2.1 illustrates that in 1989, East Germany had 60% of West Germany's GNP, 35% of Labor productivity, and 50% of labor productivity. The scale of the West Germany economy was 10 times greater than that of East Germany. The economic gap between East and West Germany is similar to the Korean situation. The restructuring of industries without social integration through the equalizing human resource became one of the critical points which devastated the post unification situation of the German economy. Table. 2.2 illustrates structural difference of economy and expected mass unemployment. The industrial structure of East Germany shows that the industries were concentrated in the manufacturing sector, including agriculture and mining, while West Germany focused on service, including finance and insurance. This data shows that in 1989, manufacturing, energy and mining, and construction industries in East Germany used more labor²⁹ than West Germany: 43.6% in West Germany as opposed to 53.3% in East Germany.

Table 2.2 The Industrial Structure of East and West Germany (1989) (Unit: %)

Sector	East Germany	West Germany
Agriculture, Forestry and Fishery	9.9	3.9
Energy and Mining	3.2	1.7
Manufacturing	34.1	31.4
Construction	6.1	6.6
Commerce	7.8	13.0
Transportation and Telecommunication	6.8	5.6
Finance and Insurance	0.7	3.1
Eating and Lodging	1.9	3.1
Miscellaneous	29.7	31.7
Total	100.0	100.0

Source: The Ministry of Finance (1991).

²⁹ Table in OECD Economic Survey 1990/ 1991 (1991), quoted from Institut für angewandte Wirtschaftsforschung (1990) illustrated that age of machinery in East German was much older than West Germany's and there was no constant innovation of equipment which needs a large labor force: East German equipment occupied 0-5 years (32.0%), 6-10 years(27.4%), 11-20 years (19.4%), and above 20 years (21.2%) in 1977 and changed 0-5 years (27.0%), 6-10 years(22.5%), 11-20 years (29.4%), and above 20 years (21.1%) in 1989, while West German equipment occupied 0-5 years (39.3%), 6-10 years(31.7%), 11-20 years (23.6%),

Between 1970 and 1989, the number of employees in each sector had changed. In West Germany, the number of employees in manufacturing had decreased from 10 million to 8.7 million, while the number of employees in manufacturing in East Germany had increased from 2.9 million to 3.2 million (Seo 1997: 60). This effect resulted from the innovation of West Germany, transfer of some parts of manufacturing industries and division of labor.

Between 1985 and 1988, East Germany had an annual trade deficit of 0.3 billion DM and the following year, 1989 recorded 0.25 billion Deutsche Mark (DM) deficit. The trading partners of East Germany were mainly socialist countries and accounted for 71.1 % of total export and 68.4% of import between 1985 and 1988. As well, the economic cooperation and trade between East and West Germany increased 20 times from 40 million DM in 1950 to 15.3 billion DM in 1989. Especially after 1970, it increased rapidly³⁰. For East Germany, West Germany was the second largest trading partner (10% of total trade) after the former Soviet Union, while being the 15th trading partner for West Germany (Kim, Yeo, and Hwang 1992: 99; Seo 1997: 63).

2.2 The Process of Economic Cooperation between East and West Germany

The relationship between East and West Germany was seriously ravaged by East and West ideological conflict during the 1950s and 1960s with cold war conflict between the former Soviet Union and U.S.A. However, after 1970, the relationship became closer and achieved unification was achieved in 1990. The reason for successful unification was a mutual belief through economic and social cooperation. However, cooperation could not

and above 20 years (5.4%) in 1977 and changed 0-5 years (40.2%), 6-10 years (29.7%), 11-20 years (24.7%), and above 20 years (5.3%) in 1989.

³⁰ Seo (1997), quoted from statistisches Bundesamt (1991). DDR 1990, Bonn: Zahlen und Fakten: 58.

generate integration before 1989. Finally, the rapid unification³¹ in economy and politics created side effects and obstacles in the current era such as unemployment, social disorder and bankruptcy.

2.2.1 The Process of Economic Cooperation and Integration

2.2.1.1 The stage of trade (1950- 1971)

In this stage, the two countries set up different economic systems: social market economy³² in West Germany and centrally planned economy in East Germany. In West Germany, the market was considered as the key place to perform the function of generating wealth for the nation under the condition of free competition, while government was acting as an intermediary to distribute the wealth to other sectors to decrease the inequality and increase common wealth (Schnitzer 1972: 9).

Meanwhile, in East Germany, the bureaucracy and their economic planning operated the economy and played the main role in socialist resource allocation (Ibid: 4). The rights of private property was confined to only handcraft industries, agricultural industries, and service industries, and even then it was small³³. The countries kept cooperating with each other and on July 6, 1951, the two countries concluded the Berlin agreement which was comprised of 1) article to use VE(Verrechnungseinheit) as a common

³¹ The speed and radical character of the changes since the November Revolution of 1989, which marked the end of over forty years of Communist rule in East Germany, has taken everybody by surprise...including those political actors whose decisions are shaping the emerging structural and institutional outlines of the new Germany (Pickel, A 1992, p. 187). Pickel states that "the transition process from a centrally-planned to a market economy is to be achieved rapidly through radical measures of institutional change, legal liberalization, and privatization (Ibid: 187).

³² The law of labor participation, enacted in 1951 and social law, established in 1952 protected an equal rights of representation between labor and executive (Seo, 1997: 64). Social market economy or welfare state is a commitment to an equitable distribution of income and minimum living standard for all of its citizens and to full employment as the most important goal to be supported by public policy...the objectives of full employment and social welfare have been accomplished through state intervention in the economy (Schnitzer 1972: 32-33).

³³ Schnitzer (1972), quoted from Staatliche Zentralverwaltung für Statistik (1971). Statistisches Taschenbuch 1971, East Berlin: Staatsverlag der DDR: 27.

payment unit; 2) use of central bank as a transaction bank. West Germany exempted tariffs and levy on East German products before 1951, and after that, when the two Germanys joined GATT, the internal trade between them received recognition as domestic trade. The Berlin Agreement supported trade between East and West Germany before unification.

Table 2. 3 East German Foreign Trade by Major Source (1969)

Country	Exports (million Valuta Marks)	Imports(million Ostmarks)
Soviet Union	6,961.7	7,326.0
Czechoslovakia	1,740.7	1,544.3
West Germany	1,176.0	1,733.6
Poland	1,324.0	1,095.5
Hungary	779.2	875.0
Bulgaria	640.6	609.9
Total	17,443.0	17,239.1

Source: Staatliche Zentralverwaltung fur Statistik (1970).

Note: The Valuta Mark is only used in foreign trade and has the following conversion values: 4.2 Valuta Marks= \$1; 4.667 Valuta Marks=1 Soviet ruble. The Valuta Mark does not have the same value as the domestic Ostmark. The Valuta Mark is also expressed in terms of an official gold parity.

Even though the two countries faced political struggle and competition, in 1969, West Germany was the third largest export country and second largest import country for East Germany as table.2.3 demonstrates.

The deepening of the cold war affected product trade, but it increased again after 1970. The reason why the trade and cooperation increased was that while West Germany increased trade as a political aspect, East Germany increased trade as an economic aspect. After 1967, West Germany simplified the trade procedure to widen the internal trade in Germany and established a public corporation for industrial equipment and supported the equipment fund for East Germany³⁴. As well, West Germany provided a no interest financial loan to East German industries of about 25% of total production amount in the

³⁴ Kim, Y. Y., Yeo, I. K., and Hwang, P. T. (1992). The Study of Sectoral reality in German Unification. Seoul:

previous year. Owing to this action, the amount of trade³⁵ between East and West Germany grew from 0.74 billion DM in 1950 to 4.4 billion DM in 1970³⁶.

As table 2.4 illustrates, in the East German economy, the industrial sector was the most important in economy and occupied 60.9% of East German Net Product in 1970 with a concentration in heavy industrial production. East Germany was one of the world's foremost industrial countries in terms of industry, even though relying on raw material from Soviet Union.

Table. 2.4 Contributions to East German Net Product by Sector (1970)

Sector	Million Ostmarks	Percent
Industry	68,580	60.9
Construction	9,247	8.2
Agriculture	13,140	11.7
Transportation and Communication	5,723	5.1
Trade	14,181	12.6
Other sectors	1,682	1.5
Total	112,553	100.0

Source: Staatliche Zentralverwaltung für Statistik (1971).

The machinery and transport equipment was the most important industry in East German in terms of its contribution to its economy.

2.2.1.2 The stage of industrial cooperation (1972-1989)

The relationship between East and West Germany improved after the summit meeting in 1970. In December 1972, the two countries concluded the East and West Germany Basic Treaty and joined the UN together as different nations in 1973. After the East and West Basic Treaty, the two countries promoted industrial cooperation as well as

Korea Tax Institute.

³⁵ In 1989, the amount of trade reached 15.33 billion DM. In this period, exports were primary composed of industrial goods and specialty equipment such as fishing vessels, tractors and agricultural machinery, cranes and hydraulic lifts, cables and power lines, factory machinery, furniture, clothing, and optical equipment. Imports from other countries were mainly raw material, machinery, electronics, and equipment.

³⁶ See Kim, Y. Y., Yeo, I. K., and Hwang, P. L. (1992).

trade of products. West Germany formed a vertical relationship of cooperation through transfer of technology. West Germany pushed ahead with transfer of patents, direct investment, joint production with East Germany, and fortified cooperation with East Germany even in the other countries for joint investment and joint production³⁷. In 1984, Volkswagen started a joint investment project with East Germany and produced 30,000 Volkswagen autos. By 1980, most of the corporations in West Germany which had more than 500 employee had cooperative relationships with East German firms. However, for small and medium sized enterprises in West Germany, only 3% of them had a relationship with East Germany, because most East German enterprise was concentrated in the form of Kombinat (industrial complex), and they wanted to do business with large enterprise (Choi 1991: 175). Even though there were several forms of economic cooperation and technology transfer, the economic cooperation was not enough to generate real interest mutually and performed as a one-side support from West Germany to East Germany. The East German government regulated capital investment through Joint Investment Law. Consequently, in the field of processing industries, consignment production, and joint production, cooperation in the aspect of production reached 7 to 10% and capital investment was confined 2 to 3% of total trade (Park 1989: 360). East and West Germany concluded the Cultural Agreement in 1986, and Science and Technology Cooperation Agreement and Cooperation for Environmental Protection Agreement, but East Germany collapsed rapidly without the fruit of new agreement on science and technology (S&T). Following tables are indirectly illustrating the knowledge gap between East and West Germany and demonstrate the lack of technology transfer which is mainly done by the

³⁷ "In the face of decreasing labor availability, clothing manufacturing plants moved from concentrated urban industrial areas to structurally weak regions (border regions with the GDR, Bavarian Forest)" (Raasch, S. and

market.

Table 2.5 and 2.6 explain the over-qualification of labor and lack of higher educated labor in East German. Table.2.5 demonstrates that East German labor is well educated and East German market has a sufficient work force with high labor productivity.

Table.2.5 Educational Structure of The Labor Force (1988)

	East German		West German	
	Thousands	Percent	Thousands	Percent
Total labour force	8,980	100.0	29,779	100.0
With qualifications of which:	7,068	78.7	21,358	72.5
Higher education	626	7.0	2,906	9.9
Technical education	1,416	15.8	2,506	7.0
Apprenticeship	5,026	55.9	16,396	55.6

Source: Klodt, H. (1990); OECD (1990).

However, the difference was particularly marked in the area of technical education though given the nature of production process in place, it seems that workers were often overqualified: an extraordinary high proportion of the work force was engaged in manual assembly operations and a relatively low proportion in machine-based manufacturing (OECD 199), as table 2.6 demonstrates.

Table. 2.6 Employment by Activity (1998) (unit: %)

	East German	West German
Machine-based assembly	12.9	15.7
Manual assembly	11.8	4.3
Farmwork	6.6	3.8
Repairs and maintenance	12.0	8.0
Planning, R&D	6.1	5.5
Services	6.6	9.8
Supervision	6.1	6.5
Management	12.6	16.6
Transport, retail	13.9	18.0
Medicine, social	4.4	5.9
Teaching	6.6	5.3
Culture	0.4	0.7

Source: Dostal, W. (1990); OECD (1990).

The work force that was overqualified, compared to West German standard, needed to be reeducated with advanced technologies. These factors illustrated the lack of technology transfer between West and East German caused mass unemployment³⁸ in East German since 1989.

2.2.1.3 The stage of economic integration (1989- present)

With a rapid integration of the economy³⁹, the impact on industry in Germany was serious, because the manufacturing sector in East Germany was less competitive on the international market than in West Germany under conditions of currency appreciation and wage increases for East German employees who had low labor productivity and were over-employed in East German state owned enterprise. The low level of innovation and lack of technological knowledge made products non-competitive and led to a slump in production, which were linked to the collapse of the export sector due to the lack of international competitiveness of the East German products. As a result of problems in the industrial sector, industrial production in East Germany decreased to a third of its level prior to unification in 1991 and only recovered to its 1990 level in 1995⁴⁰. Table 2.7 presents the mining, industrial, and industrial sectors that suffered a higher percentage of job loss. This phenomenon resulted from marginalization of support in East German manufacturing

³⁸ In the process of unification, East Germany had to experience rapid transition of system from socialist to capitalist, and rapid unification of economic structure caused mass unemployment trying to keep national competitiveness in economy. The Unified Germany practiced social integration through establishment of equal wage and target the year 1994 as a period to complete social integration, because the equal distribution of wealth was considered as a basic condition of social unification. However, The target has not met their expectation yet and far from reality. Actual decision making of wage level was distorted by the power relation between employer and employee (Kim 2001: 2-3). The unification without long term structural and systemic innovation of both economies has caused long term pain during rapid structural and systemic adjustment.

³⁹ Pickel argued that "such systems are highly complex socio-economic structure, networks of institutions with formal and informal rules and corresponding attitudes, expectations, and interests... it is impossible in principle to replace one system by another in a wholesale fashion... a wholesale strategy of socio-economic transformation may therefore produce a whole range of negative unintended consequences, such as permanently high rates of unemployment, de-industrialization, and social polarization" (1992: 196-197)

⁴⁰ Kim, M. H. (2001), edited from Statistisches Bundesamt (ed.). Datenreport 1999: 252.

industries. The problems of manufacturing industry depend on two factors: first, the lack of demand for its products in both domestic and foreign markets, and, second, and the absence of supply to meet potential demand owing to an insufficiency of investment. "The first problem stems from a lack of competitiveness in terms of costs as well as poor quality and product availability and second from a lack of profitability" (OECD 1993: 27). These are problems largely inherited from the former regime: there has been a declining comparative advantage in several traditional export industries (eg. chemicals, machinery, and cars). Also, the depression of unified German economy is perpetuated by the slow buildup of a new and competitive production structure in the field of high technology (eg. office machines and computers, telecommunications equipment, aircraft, audio-visual equipment, information technology (OECD 1994).

Table. 2.7 indicates the rise and fall of employment rate in sectors. The fall of employment is severe in manufacturing sector.

Table. 2. 7 Sectoral Change of Employment in East Germany 1989- 1994 (in 1000s)
A. Sectoral Employment (1,000s)

Year	I/89	II/90	I/91	II/91	I/92	II/92	I/93	II/93	I/94
Economic Sectors									
Agriculture and Forestry	985	656	468	361	290	251	229	218	204
Energy and Mining	306	271	243	222	212	197	178	157	147
Manufacturing Industry	3265	2653	2364	1839	1404	1342	1206	1153	1100
Construction	846	660	569	570	706	749	757	791	800
Trade and traffic	1652	1320	1292	1218	1162	1158	1154	1189	1205
Services	962	670	870	966	992	996	1036	1065	1090
States	1750	1705	1458	1454	1436	1427	1412	1380	1403
Total employment	9932	8035	7369	6767	6354	6276	3135	6116	6113

and recovery of East German economy became sluggish after 1996 and 1997. The economic growth rate from 1992 to 1995 was about 8%, but decreased to 2% which was lower than West Germany (Statistisches Bundesamt, 2000). The unemployment rate in unified Germany surged drastically as table. 2.8 shows.

Table. 2.8 Unemployment Rate after German Unification (1991-1998)

Year	Unified German	Ex West German	Ex East German
1991	7.3	6.3	10.3
1992	8.5	6.6	14.8
1993	9.8	8.2	15.8
1994	10.6	9.2	16.0
1995	10.4	9.3	14.9
1996	11.5	10.1	16.7
1997	12.7	11.0	19.5
1998	12.3	10.5	19.5

Source: Statistisches Bundesamt (ed) (2000). Datenreport 1999, Bonn

The Gap of unemployment rate between West and East German was 19.5% to 10.5%. Comparing to 1989 (0%), it is social shock and painful experience for East Germany.

2.3 The Policy for Transitional Labor Market and Technology since Unification

The instrument of short term employment is used to absorb employment shock and is aimed at decreasing the social impact of the mass unemployment. However, short term work does not increase the quality of the labor force. The government policy on the labor market was to establish a self-sufficient employment system which was based on an internationally competitive market economy (Spangenberg 1999: 223). A secondary labor market was established as a temporary instrument in reducing the high unemployment originating from rapid economic integration. Its target was to provide the adjustment period for the labor force to join in new market environment. This secondary market has generated particular organizations which use job-creating measures and re-educates

employees with financial support from the Treuhandanstalt (trust agency). There was an emphasis on environment measures as well as those of restructuring infrastructure and plants to increase employment. Secondary labor market policy reduced the number of unemployed by 1.2 million in 1994 (1.5 million in 1993, 1.8 million in 1992) (Spangenberg 1999: 223). The principal instruments of labor market policy have been implemented in: vocational training; further professional education; vocational rehabilitation; support of paid employment and self employment; job creating measures; wage subsidies for long-term unemployed; seasonal financial support of the building sector; and premature retirement (Ibid: 223-224).

“The obsolescence of production technology as well as the poor quality of products has been identified as a concern adversely affecting economic adjustment and enterprises’ competitiveness” (Ibid: 225). Technological progress which aims to renovate these factors of the East German production function has been promoted by research policy which can be identified as an essential instrument of economic policy aiming at the institutionalization of a self-sufficient East German economy. The former centrally organized research infrastructure was privatized and decentralized as part of the fundamental institutional change. The restructuring of industrial research infrastructure has been supported by institutions of the federal government and the state governments. Until the end of 1994 a total of DM 2.4 bn had been spent for restructuring R&D capacities to increase the technological competitiveness of East German companies, to enforce the innovative strength of SMEs (Mittelstand-small and medium-sized enterprises), to promote the establishment of business on technological grounds and to create an infrastructure

which supports R&D (Federal Ministry for Economics BMWi⁴¹ 1995; Spangenberg 1998: 225). The dominant instruments of the public research policy have been the following: Kreditanstalt fuer Wiederaufbau (KfW) Innovation Programme; TOU-Setting Up Technology Oriented Companies; Research Participation and Cooperation; R&D Personnel Promotion; Research Promotion in Manufacturing Industry; and Promotion of Segmented R&D Areas (Ibid: 225-226).

The Policy for transitional labor market and Technology since unification implies that South and North Korea could reduce the problems of unification before actual unification occurs, if the policy can be institutionalized during the period of economic cooperation and integration. Therefore, the period of economic cooperation and integration is important for Korea to reduce the gap in technology and economy through institutionalization of technology transfer.

2.4 The Problem of Economic Cooperation and Integration

In May 18, 1990, East and West Germany concluded the Agreement of Currency, Economy, and Social Integration, and when it became effective, the unified government carried out the currency and economic integration. However, the economic integration was performed mainly by West Germany and the East German economy became integrated into the system of West Germany. There was mismanagement of policy implementation level during integration and failure of applying shock therapy of Washington consensus as follows.

A. Even though the economic gap in comparison of GDP, GNP and total amount of trade was about 7.0:1, 2.0:1 and 13:1(BOK 1990), in the process of currency integration,

⁴¹ BMWi represents Bundesministerium fuer Wirtschaft (federal ministry for economy)

the East German currency became overvalued. The exchange rate, fixed at 1:1 or 1:2, evoked an increase of the exchange rate in East Germany. As a result, the price of products increased and the manufacturing industries lost the comparative advantage of price. As well, the preference for foreign product in East Germany, with wage increases and an open market to foreign product, resulted in a large number of bankruptcies in East Germany. It accompanied the increase of unemployment.

B. The uncertainty of ownership of real estate in East Germany generated the evasion phenomenon of undertaking the former collective and state owned enterprises. In the case of demand on real estate ownership, the real estate had to be returned without protection. The private property which was confiscated during the rule of Soviet Union from 1945 to 1948, was not returned, but the private property confiscated after 1949 had to be returned, when there were claims.

C. Unification came to Germany without the expansion of institutionalization of agreement and gradual approach for science and technology, and cooperation and slow integration phase for R &D institutionalization. The institutional framework had to be established before unification with the sufficient period of implementation and diffusion of technology was needed for the decrease of low labor productivity and increased the competitive power through the innovation of industries in East Germany which could have international comparative advantage in the situation of wage increase.

D. The economic integration in East Germany was done by liberal principle such as privatization and decentralization. However, rapid and excessive privatization generated the issue of unemployment of workers who used to work for State-owned companies owing to structural change of ownership and lay-off of low productive labor.

3. Application of Vietnam for North Korea (Market Socialist Approach for Technology)

3.1 *The Reform and Open-door Policy of Vietnam*

3.1.1 The Reform of the Vietnamese Economy

After 1976, Vietnam attempted to unify the country economically. However there were limitations in recovering from the ravages of the war. As a consequence of low production and productivity, the Vietnamese started economic reform. There was an announcement to reduce central planning to encourage economic activity. The reform concluded in the Doi Moi or 'new way' which was declared by the Party's VI th Congress in 1986.

Table. 2.9 Annual Investment of Foreign Capital in Vietnam (1988-1994)

Year	No. projects	Capital (USD million)
1988	37	360
1989	69	512
1990	108	589
1991	150	1185
1992	192	1905
1993(Jan-June)	110	1648
1994(Jan-June)	137	1800

Source: General Statistical Office of Vietnam (1992).; Vu Tuan Anh (1995).

However, the rapid opening up of the market increased macroeconomic imbalance and the economy performed poorly until 1989. The abolition of import restrictions and devaluation combined to produce industrial contraction in 1989 (Irvin 1995), while positive real interest rates, the institutional reform of the financial sector, and public finances stimulated domestic savings. Foreign capital was one of the engines to improve the poorly performing economy after 1989 (table 2.10).

Table. 2.10 Investment of Foreign Capital in Vietnam (1988-October 1992) by Sector

Sector	No. projects	Capital (US\$ million)	Percent of Total
Industry	265	1,200	30
Oil Exploration	21	1,032	26
Agriculture, foodstuffs	21	261	7
Fisheries	38	203	5
Hotel, tourism, services	57	778	20
Other services	69	217	5
Transport, communications	16	175	4
Banking	9	110	3
Housing construction	5	7	0.2
Other sectors	5	10	0.3
Total	506	3993	100.5

Source: World Bank Vietnam (1994); World Bank Vietnam (1993); Vu Tuan Anh (1995).

After 1989, foreign capital was an influx to the Vietnamese economy mainly due to manufacturing industry and oil exploration as table 2.11 exhibits. Table. 2.11 illustrates that development by foreign investment was into petroleum and labor intensive manufacturing industries. As well, the investment was mainly in industries which were low capital intensive industries. The industries which required huge capital investment and were less profitable did not perform, as in the case of transportation and communication. The growth rate from 1981 to 1985 was strong but became weaker. With Doi Moi, the economic growth rate increased rapidly after 1989. Since 1989, an improved trade surplus, spurred on by the rapid growth of joint ventures in such areas as agro-processing and petroleum extraction, brought a successful stabilization of the macro-economy with market transition from centrally planned to a market economy.

Table. 2.11 Average Growth Rate of Economy

	1976-80	1981-85	1986-90	1991-93
Population	2.3	2.26	2.0	2.3
Labour force	2.8	3.8	3.1	2.9
National income	0.4	6.4	3.9	3.2(1991)
Industrial production	0.6	8.8	5.9	11.6
- Capital goods	7.1	6.4	7.2	-
- Consumer goods	-3.3	11.3	5.7	-
- Agricultural production	1.9	5.3	3.9	4.6
Exports	11.0	15.6	28.0	22.5
Imports	6.4	7.2	8.2	27.2

Source: World Bank Vietnam (1994); World Bank Vietnam (1993); Vu Tuan Anh (1995).

Vietnam in the late 1980s experienced rapid export-led growth with low inflation and became Asia's most attractive country in terms of affluent natural resource, high life expectancy, literacy and egalitarian distribution of land. "In 1989, Vietnam became the world's third largest rice exporter" (Heibert, 1990) as well as an oil-exporter, which is an important source of foreign exchange. Between 1990 and 1992 Vietnam suffered as it tried to maintain its stabilization and reform program while facing the external impact of the collapse of the Soviet Union in 1991. Aid from USSR and Eastern Europe disappeared quickly. On the other hand, the party's Central Committee called for an end to state-enterprise subsidies, the use of commercial criteria in credit allocation and the streamlining of government administration to consolidate Doi Moi. Vietnam's macro-economic performance recovered strongly during 1992 from the surplus in rice and petroleum. The two most important import commodities are capital goods and refined petroleum products. "The normalization of diplomatic relations with OECD countries and formal ties with the multilateral institution were renewed and the US trade embargo lifted. As well, the development in the oil sector" (Irvin 1995) and the rapid expansion of labor-intensive manufacturing reflected "average 13% growth rate" (UN 1998). "Export from

manufacturing surpassed \$1 billion in 1994” (World Bank 1995).

Table. 2.12 Savings and Investment Requirements: Tentative Projections (in percent of national income)

Sources of savings	1990	1995
Domestic savings	4	13
Foreign savings(current account deficit)	8	5
- from convertible area	1	5
- from non-convertible area	7	0
Gross investment	12	18

Source: Vylder, S. D. (1995).

As table. 2. 12 illustrates, the savings rate was growing rapidly, especially, the growth of domestic saving became an important source of further economic development, even though the saving rate was lower than other Asian countries such as South Korea, Taiwan, Singapore, Japan.

Table. 2.13 Vietnam’s Merchandise Exports and Imports 1986-94- Convertible Area, in Current UD\$ (million)

Year	Exports	Imports	Balance of trade
1986	307	-453	-146
1987	430	-465	-35
1988	465	-603	-138
1989	977	-985	-8
1990	1,176	-1,242	-66
1991	2,100	-2,300	-200
1992	2,600	-2,500	100
1993	2,900	-3,000	-400
1994(est.)	4,000	-4,300	-300

Source: Vylder, S. D. (1995).

The growth of merchandise export was drastically increased after 1989 with exports of agricultural products, as table 2.13 demonstrates. Before the Asian economic crisis began in early 1997, Vietnam’s economic growth was in the midst of a period of growth. However, after the economic crisis in Asia, “the indirect effect was very painful to the Vietnamese economy with a drop in foreign investment and export. As well, key exports such as rice, textiles, footwear and sea products have suffered under competition from

similar goods exported by Thailand and Indonesia, whose currencies have tumbled against the dollar. In 1998, the Vietnamese experienced 4.8% growth and 7.4% in 1999” (USEIA 1998). The dependency on technology and capital from external sources shows that the weakness of Vietnamese economy is the lack of technology and capital and the dependency on foreign technology and capital has a limitation, because without interest, there is no investment for Vietnamese. The factory, invested in by foreigners, will move to other countries to seek low labor cost regardless of the suffering of Vietnamese market and people. Vietnam needs to generate R&D that can create the employment needed to ensure the further development and growth.

3.1.2 Policy Change on R&D

There was policy change to improve the technological competence and further economic development. Policy change was closely related to the country’s political economy to help it cope with the international and domestic environment. As table 2.14 shows, the period between 1958 to 1975 was the time when planners and decision-makers in the highest level of the party and government decided and supervised the scientific and technological activities. In this period, the transfer agent was usually the former USSR which led the socialist countries in technology development. R&D were defined as a non-productive activity.

Table.2.14 Policies to Link R&D and Industrial Innovation (1958- 75)

Policy objectives	Creation of a broad, national base for science and technology; founding of new universities and R&D institutions
Instruments of implementation	Centralized planning of available resources
Key actors	Politicians; top government administrators
R&D institutions involved	General, non-specialized R&D institutes
Main R&D links to industry	Vertical links established and industry maintained by the Hanoi ministries and related government agencies

Source: Annerstedt, J and Ha, N. T. (1995).

Government couldn't stimulate the technological innovation, because the entrepreneurs did not actively seek specialists in science and technology who could support the innovation of R&D and firms. Most R&D activity was under the pressure of ideological constraints. After unification, the rehabilitation policy of the Vietnamese economy was to generate industrialization.

Table 2.15 Policies to Link R&D and Industrial Innovation (1976- 80)

Policy objectives	Development of national scientific and technological capabilities (national resource surveys, basic research facilities, etc.) for industrial benefits
Instruments of implementation	Ministerial coordination of existing institutions and programs
Key actors	Prominent scientists; politicians
R&D institutions involved	Specialized R&D institutes; selected research units at major universities
Main R&D links to industry	Non-official (or informal) contracts between R&D units and industrial firms; the first horizontal linkages

Source: Annerstedt, J and Ha, N. T. (1995).

However, there was no indigenous capacity building for R&D and no access to better technologies from western countries. As well, technology transfer was introduced through industrial machinery provided by USSR and Eastern European Countries. The R&D and technological service contracts were mainly for agricultural products, such as pest control technique. The horizontal linkage between R&D institute and industrial firms was not treated as a legal activity until 1981 as the table 2.15 explains.

With the approval of government on task-oriented R&D, there were growing activities for national programs and projects of technology which applied to industries and agricultural products as table 2.16 explains. In this period of development, research was more important than practical application of science and technology. As well, there was an endeavor to generate industrialization such as establishing pilot plants and experimental

workshops or building science and production complexes, and education research and production complexes. However, growing difficulties with fiscal problems had a limitation, and the government had to find other policies to generate industrialization.

Table 2.16 Policies to Link R&D and Industrial Innovation (1981- 87)

Policy objectives	Effective transfer of R&D results to industry
Instruments of implementation	Providing incentives through the ministries and related government agencies
Key actors	Prominent scientists; top managers in industry; ministerial decision-makers
R&D institutions involved	Highly specialized R&D institutes; pilot plants and experimental workshops
Main R&D links to industry	Research and development contracts; national science and technology programmes

Source: Annerstedt, J and Ha, N. T. (1995).

Consequently, the inefficient Soviet and Chinese model was replaced by a western model and technology and industrial innovation have had a positive impact in the Vietnamese economy. The command economy had a limitation in that it could not generate incentives for further innovation. Since 1986, the market economy principle was introduced with changing environment of world politics. R&D and technology became important factors for rehabilitation and innovation of Vietnamese industries and started to apply their own initiatives to search for R&D and technologies, as table.2.17 demonstrates.

Table 2.17 Policies to Link R&D and Industrial Innovation (1988-)

Policy objectives	Satisfying the needs of industry; effective transfer of technology and related knowledge; capacity to receive foreign industrial technology and know-how
Instruments of implementation	Government deregulation
Key actors	Entrepreneurial scientists; top and middle managers in industry
R&D institutions involved	R&D centers; consultancy firms; engineering units in industry; technology service centers
Main R&D links to industry	Collaboration and de facto integration of R&D units and industrial firms; contracts for joint research and technical service activities; other commercial links

Source: Annerstedt, J and Ha, N. T. (1995).

There was a big change of governmental policy driving the economy toward technical change and industrial innovation with foreign technical consultant services, especially for advice and guidance on modern technologies and their application, because there was no alternatives for government. The role of government became smaller than before economic reform, and the deregulation followed as a market principle. Science, technology, and innovation were focused to foster entrepreneurship and individual incentives. Both market-related and technology-related industrial innovation were recommended and discussed. There were big challenges to create linkages to connect the science, technology, finance, and market. The strategies to cope with creating linkage were similar to those of highly industrialized countries. Technology service centers began to appear and create the linkages between R&D institutions and industries for commercialization and national system of innovation. With reform, the technology service center played its own role to generate profit with relative autonomy from government. Since 1997, the creation of the center became easier and there was no longer regulation to hinder initiatives of scientist and engineers as well as firms. The policy, made by government was to keep the scientists and engineers at the research institute, while allowing them to work at the industries on a part time basis. It was possible because the government permitted them to create the linkages to industries such as research outside of the R&D institute and consultant work.

3.1.3 The Stages of Science and Technology Policy in the Market-Socialist Reform in Vietnam

Science and technology policy has been applied in a market economy and divided into following stages: 1) “reform within the framework of state monopoly on economy, science and technology and the centralized command economy”(Dam, V. C 1992); 2)

“decentralization of the command system, but still within the framework of a state monopoly on economy and S&T”(Ibid.); 3) “privatization of economy, science and technology”(Ibid.); 4) “New challenges in S&T development: Restructuring of the S&T network”(Ibid.); 5) “the impact of government policy”(Ibid.).

3.1.3.1 Stage one: reform within the framework of command economy and state monopoly.

In a socialist economy, science and technology belong to the state and the public. The planning and result of R&D are centrally controlled by government decision-makers. In this stage, the main point of reform was to improve the planning system for better decision making at the government level. However, even though the government intended to realize the R&D objectives which combined the state resources with governmental key program for application of R&D in production, the result did not fulfill the objectives, because there was a limitation of a command economy.

3.1.3.2 Stage two: decentralization of the command system within a state monopoly.

Since April 29, 1981 with declaration, Decree No. 175-CP, the ban on the contracting between R&D institute and other organization was lifted to render the autonomy and financial independence to R&D organization. The main reform at this stage was as follows: 1) direct linkage in science and technology (S&T) activities; 2) diversification of activities of R&D organizations; 3) diversification of financial sources of R&D organizations; 4) financial autonomy of R&D organizations; and 5) reorganization of R&D organizations (Dam 1992). Decree No 175-CP officially allowed horizontal economic relationship between S&T activities and others, or R&D organization and production area. The activities on R&D became diversified to scientific research, applied

research, and experimental work such as sample analysis and pilot projects (Anh 1991).

Table 2.18 demonstrates the diversification of R&D activities since 1981.

Table 2.18 Distribution of Financial Sources, Percentage of Contracts Relating to the Diversification of R&D Activities

Activity	1982	1986	1990
Transfer of Technology	15.0	14.0	15.0
S&T Service	75.0	43.0	39.5
Pilot projects and production	10.0	43.0	45.5

Source: Dam, V. C. (May 1992).

Followed by Decree 175-CP, Resolution 51-HDBT on S&T of May 17, 1983 by the Council of Ministers permitted R&D organization to cooperate following activities: 1) scientific research, development and technology transfer; 2) S&T services; 3) production which includes experimental workshops and pilot manufacturing, and production of single articles which includes the experience of each R&D organization in accordance with the market demand (Dam 1992).

Table 2.19 Distribution of Financial Sources for R&D Organizations in Selected Ministries, 1981-85 (%)

Ministry of	No. of projects	State financed	Financed from industry
Food Processing	49	81	19
Manufacturing and Metallurgy	48	86	14
Foodstuffs	15	69	31
Survey and Topography	11	12	88
Higher Education	61	96	4

Source: Dam, V. C. (1995).

As well, financial support from government was diversified to other industries, owing to direct S&T activities. Table 2. 19 shows the diversification of financial sources. In 1991, the private bank accounts of R&D organization were liquidated and new sections in R&D organization were born as a production sector from a role of an administrative structure. As well, the R&D organization had a right to establish new organizations as

affiliates such as experimental workshops, pilot projects, small-scale series production, consultancy service, training units and farms in agricultural research, and shops for selling their various products (Dam 1992).

3.1.3.3 Stage three: privatization of economy, science and technology

In 1987, privatization of S&T commenced with state decision 134-HDBT which opened the possibility of private S&T activities. This decision was complemented by a series of modifications: the Decree and Law on Foreign Technology Transfer into Vietnam in 1988, the Decree and Law on Protection of Industrial Property in 1989, and Decree 35-HDBT on S&T in 1992 (Sung 1992). The market system in Vietnam brought a shift of government role from distributor of funds as subsidies to manager in order to channel all possible sources of financial support for the objective of R&D activities. The government Decree 20-CP, since 1965, had played the role of regulator for command economy. However, in the introduction of market economy, government needed a new approach to intellectual property. There was Decree 31-CP which identified initiative and complemented it in 1981. Since then, more significant change was made in the licensing issue which led to a shift to commercialization of technology in 1989 (Dam, V. C. 1993). The shift included initiatives, useful methods, know-how, patents, trademarks, and industrial designs to attract the foreign investor.

In this stage, significant progress indicated that the privatization of S&T which meant separation from command economy. The initial experience in privatization was in Government Decree 134-HDBT on S&T issued in 1987 which recognized the right of S&T activities in different economic sectors including private sector. The Decree and Law made rapid change on Transfer of Foreign Technology to Vietnam which admitted the

right of the individual to import technology into Vietnam. The recognition of individual right was confirmed with Decree 35-HDBT on S&T in January 28, 1992.

3.1.3.4 Stage four: new challenges- restructuring of the S&T network

The transition from command economy had been made through rigid divisions as follow: 1) market system needs to encourage production and research to increase comparative advantage and competition; 2) market based industries required unlimited production with demands; 3) role of state decentralized to ministries. 4) direct link between technologist and entrepreneur brought direct link between R&D institute and production unit. In this stage many institutes and organizations had been split into several units. As well, the institute was managed by companies and unions of enterprises. Competition in R&D and the production sector increased further demand for privatization in S&T activities to apply the reform to market economy. The gradual shift to market economy encouraged commercialization of R&D and its products. The subsidizing system decreased, because individual institutes started to fund their own R&D activities. In addition, government institutes had to compete with private institutes to survive in R&D competition. There were two main streams to restructure the R&D performance: restructuring of the R&D organizations and the development of a new style of S&T organization. First, the restructuring of R&D organization suggested the following possibilities to increase market function of economy: 1) the possibility of merger between institute and firm; 2) the possibility of unionization of institute in science and technology production; 3) the possibility of specialization of goods which resulted from research; 4) the possibility of development of institute as higher education college system; and 5) possibility of transformation to engineering enterprise which has producing technologies.

In these possibilities the state had to encourage the institute to make their own decision which would be appropriate to their own demand. Universities and colleges absorbed the autonomous research institutes. However, medical research and agricultural science which had social value continued to be subsidized from government and specialized in higher education centers. In the second stream, while the Vietnamese economy enters market reform, there were two challenges: how to connect scientific research to higher education; and how to make dynamic relations between research and development to increase production. In these issues, on the one hand, the Vietnamese were concerned that there was lack of cooperative linkage which connected science to production and a lack of people who could apply the result of research in production. On the other hand, Vietnamese were concerned that the problem was a shortage of economic and social dynamics which could create comparative advantages and incentives. The Vietnamese resolution was to create a natural relationship between S&T institute with training and the production sector, which complied with Vietnamese reform of economic system. The endeavor of the Vietnamese made these kinds of activities: pilot projects of research-formation-production cooperatives under different forms; science-formation-production unions; science-technology-industrial parks which were activity of state, private, foreign, or joint venture. Especially, the transformation of the Science Park drew great attention, because the Science Park could gather the group of research institutes into a special S&T zone to create specialized production and give incentives for comparative advantages and therefore attract the domestic and foreign investment. As well, the Science Park required infrastructure for facilities because the Science Park created a geographical concentration of collaboration in research and production. There was a role for the state vis-a-vis the

Science Park as an investor from research to production, builder of infrastructure for research purpose or as a customer, and in the renting of the S&T zone to entrepreneurs.

3.1.3.5 Stage five: the impact of government policy

The role of administrative authorities related to S&T, along with market reform, became smaller than its role in a command economy, but has given effective help in developing and applying S&T policy. State policy on technologies and reform is discussed as follows: 1) reorganization of the S&T institute for better performance and technical efficiency in production; 2) avoiding a dilution of scarce state financial resources; 3) reorganization of the S&T institute from state management to management by the scientific community; 4) reorganization for enforcement of cooperation through bilateral and multilateral linkages between research, higher education, and the production sector. Vietnamese reform was different from Eastern European reform in terms of its speed and application. Vietnamese considered the existing organization as a driving force for changing themselves without confusion and insecurity caused by reorganization. Also, the organization changed itself in terms of self-adjustment rather than external adjustment and perpetuating the consistent and flexible policies in labor and finance. Engineering institutes were reorganized as an independent technology institute, a science-production union or a state enterprise. Some are left as before. The dynamics of Vietnamese reform in S&T was the point that administrative decision was not taken until all conditions are sufficiently developed for reorganization in terms of self-reorganization.

4. Conclusion

4.1 The Lesson from Germany

Even though East and West Germany started their economic trade and cooperation, there was no defined institution of technology transfer and institutionalization of needs which could reduce the problem of economic integration like mass unemployment and bankruptcy of East German industries before unification. Actually, the legal agreement on S&T between West and East Germany could play a role of reducing the gap between each country's industries and human resources, but it could not generate positive economic results because of rapid unification. Consequently, the gap in human resource and industries between East and West Germany has caused the problems of economic integration as well as social instability. Even though there was division of labor⁴² between two economies, it could not reduce the technological and economic gap over 20 years. Since unification, Unified Germany has practiced the policy for transitional labor market and technology development through institutionalization of a self-sufficient East German economy to increase employment level and industrial competitiveness. The German economy is in the process of decreasing the obsolescence of production technology in East German by a policy for development of quality labor and technology which is competitive in the world market. This institutionalization of self-sufficient East German Economy and policy implementation for the integration of technology and labor could be applied in the period of cooperation, and Germany could reduce the speed of unification to allow the economic integration to be sufficient in quality for viable unification. The failure of German integration provides the lesson to explore the institutionalization of European

⁴² Division of labor between East and West Germany was mainly vertical and top-down from West to East. As well, it was done by market forces without consideration of dynamics of technology transfer.

Union model.

4.2 *The Lesson⁴³ from Vietnam*

The experience of Vietnamese reform has had its dynamics in terms of economic development and economic growth. Also, the rapid expansion of industry shows a great possibility for playing a role as an economic power. However, there are built-in limitations to the Vietnamese economy because technology and capital was based on overseas investment rather than expansion of the Vietnamese domestic market. There is no high technology transfer, but the Vietnamese continue to struggle to facilitate technological capability with institutionalization. Most technology transferred to Vietnam has been labor intensive and needed to be innovative for the next stage of growth or to be transferred to other countries in search for lower labor costs. When the Vietnamese economy can not reward foreign investment, this investment will be radically reduced. There is a limitation to capitalist development dependent on other advanced economies. However, the power of the Vietnamese policy makers to drive the engine of growth in the country is that they are not in a hurry to change the economic structure to make changes, with which the other sectors of the economic system cannot comply or adjust. Reform, which is slow but effective, has created the current dynamics in the Vietnamese economies. The challenge to institutionalize Vietnamese capability is evident in their policy implementation related to R&D. This is an area in which Vietnam's experience is highly relevant to problems which North Korea is likely to encounter. However, the lesson from the Vietnamese experience could be good to North Korea in the circumstance that South Korea provides necessary

⁴³ Pickel argued that "the generally accepted lesson of the Communist experiment in the East and in the West is that market economies are far superior to planned economies in terms of efficiency and technological innovation. However, two simple empirical and historical facts are often ignored in the current celebrations of the market model" (1992: 196). The report of the South-South Commission (1990: 93), quoted by Loxley, J.

Chapter III

The Model of Productivity Transformation and Technology Transfer in EU

1. Introduction

The model of productivity transformation and technology transfer in the European Union provides a lesson, which is different from that of Germany and Vietnam in the point that the EU generated its independent features of institutionalization. These included the establishment and development of a national economy through an institutional approach with demand and supply of integration for technological conversion; institutional integration using a supra national institute; and a common industrial and regional policy for the reconstruction of Europe as an economic federation. These allow for the exchange of knowledge for dynamic innovation and productivity growth. The European Union has satisfied demand and supply conditions by deepening and widening the economic integration using technological conversion to achieve economic benefits and dynamic development of technology. Advantages such as reduction of goods and service price, scale of economy for technology spillover, and enlargement of competition have been achieved through the movement of the essential elements of production: goods, services, capital and people. The demand conditions are met through three important Treaties driven by corporate actors in process of attaining deeper integration with technological conversion, including the constitutionalization within the Treaty of Rome⁴⁴, the events

⁴⁴ Rehabilitation of European economy after second world war indicated the possibility of economic cooperation, and with the Spaak report for Customs Union became important issue to concrete peace and economic development. The cooperative development between France and German came from the lack of natural resource in France and the interest of common market in German. As well, the change of international environment in politics and economy provided the chance to see same interests like peace and economic development. The Treaty of Rome or Treaty on EC was signed on March 25, 1957 and came into effect on

leading to the Single European Act⁴⁵ and the Maastricht Treaty⁴⁶. The supply conditions of integration were met by the roles played by institutions of commitment, such as the European Commission and the European Court of Justice. As well, Germany played an important role as a regional leader to generate successful collective supply. The demand and supply conditions were a driving force in generating the infrastructure of technological innovation and spillover. This chapter explains how the model of the EU provides important lessons for the potential institutionalization on the Korean Peninsula to

January 1, 1958. The supra national institutes became European Communities in 1967. The objective of Treaty of Rome was to establish common market with lifting borderline and to make the foundation to generate permanent close cooperation among European Citizen. Treaty of Rome was a constitution to provide the text of economy. The Treaty of Rome Article 3 prescribes the abolition of tariff and trade barriers among member countries and gradual introduction of common external tariff. Especially, the treaty Article 48 states that the barriers to prevent the free movement of labor, goods, service, and capital should be lifted. Also the common agricultural policy (Treaty on EC Article 38) and transportation policy (Treaty on EC Article 74), and fair competition policy (Treaty on EC Article 85) was prescribed to adopt. In addition, The Treaty required reform of tax system to maintain the balance of taxation which is need for the function of common market (Treaty on EC Article 99), and established European Social Fund (Treaty on EC Article 123) and European Investment Bank (Treaty on EC Article 129) to reduce the regional gap and to promote the development of undeveloped regions. However, there was no comment on social and regional policy except support policy for Structural Adjustment. The time period in realization of Treaty was planned by 12 years with 3 stages of each 4 years. The realization of the spirit of the Treaty required specific measures and reliable price system to support single market and economy. Also, the policy objective for price stability required the sacrifice of policy objective and also demanded the time to understand the need of stable price system. The world currency crisis in the 1970s provided the chance to create the stable currency system. The intention of European Communities generated Single European Act to deepen the experience and idea which came from the conception of the common currency institute (Song, 1997: 22-25).

⁴⁵ The legal basis for Internal Market Programme was brought about by the Single European Act which came into effect on July 1, 1987 and established the required institutional reform. The White Paper enumerated close to 300 proposals for adoption by the Council of EC Ministers and implementation by the member states. By the end of 1992, about 90 percent to these proposal dealt with at the community level while implementation appears to be lagging in general and in some member states (e.g, Italy) even more so than in others (Ohno, 1993)

⁴⁶ The chairman of the Commission, Delors submits the report on plan to realize economy and currency union with the request of the European Parliament. Delors suggest the three stages: 1) the integration of internal market of community, promotion of private use of European Currency Unit, and full liberalization of capital transaction; 2) the establishment of European Central Bank System (this system, which consist of central bank of member countries, formulate common currency policy of member countries and primary objective of European Central Bank is to maintain the stability of price); and 3) the fixation of exchange rate and introduction of common currency. Delors's plan made clear decision that economic policy of member countries have to be reflected to execute successfully. In September 1991, the establishment of economy and currency union was decided at the Maastricht Summit in Holland, in February 1992, the member countries signed the treaty and in January 1993, the Treaty came into effect after the ratification in the parliament of member countries. The Maastricht Treaty or Treaty on European Union basically accepted the Delors's plan and planned to realize the economy and currency union by three stages. Maastricht Treaty prescribed three stages: 1) realization of single market by the end of 1992, including the free movement of labor, capital, goods, and services; 2) the preparatory stage for currency union (primary target in stability of price system and coordination of currency and fiscal policy among member countries); and 3) the use of single currency and formation of single economy. Besides of economy, Maastricht Treaty clarify the direction of cooperation at the

provide the necessary environment of innovation and productivity growth.

2. Institutional Approach and Demand, Supply and Externalities for Integration with Technological conversion

The most important lesson to learn from EU is that it generated its institutionalization of technology transfer using an evolutionary approach developed during the process of deepening and widening European integration. The generation of the European Union featured politico-technological independence from the Cold War system and economic independence from the USA, IMF, GATT, and WTO. Hence, the generation of the EU provides an alternative to USA-led economic integration (Marting, 1958). There were four stages to developing the institutionalization of the EU. The first stage was the establishment of the European Coal and Steel Community (ECSC). The second stage concluded with the ratification of the Treaty of Rome, which created customs union and the European Economic Community. The success of ECSC led to the creation of customs union with the introduction of the European Economic Community. The Treaty of Rome became the institutional basis for integration with technological conversion in specific fields using supra national institutes such as the European Coal and Steel Community, the European Atomic Energy Community, and the European Economic Community. In the third and fourth stages, the European Community took a bold step to revitalize the integration process by the finalization of a single market based on The Single European Act and then developed a single economy in the EU with the Maastricht Treaty. This Treaty intensified the coordination on policy affair and customs at the EU level since it allowed the movement of people, goods and capital which is important for technological

conversion and productivity growth. Even though the five stage of integration in Bella Balassa can be a reference, the Free Trade Area (FTA) did not evolve into Customs Union, and supra national institutes were established in the EU. This is different from the five stages of Balassa as argued that supra national institutes would be established at the stage of a completed economic integration. The EU used an alternative method of economic as it used the political agreement of member countries to create technological conversion. There are reasons why this method can provide a reference for the Korean peninsula to establish a technology transfer system.

2.1 The Demand of Integration for technological conversion

From the perspectives of the logic of demand, informal integration⁴⁷ creates pressures to deepen the formal structures of rules and institutions to control their impact (Wallace, 1994). The logic of demand came from the pressure of the important private firms, who brought about legal integration in Europe and the constitutionalization of the Treaty of Rome (Burley and Mattli, 1993: 41-76; Mattli and Slaughter, 1995: 183-190). The Treaty, a set of legal arrangements binding upon sovereign states, regulated all legal persons, and groups, public, and private in the EU, and influenced the deepening of integration of technological spillover and transfer within a large scale market and innovation system. Demand is provided by the corporate actor, but assisted by the commitment institutions on the supply side such as the European Court of Justice. Articles in the Treaty of Rome provide authorization for the Court to issue preliminary rulings on any question involving the interpretation of the Treaty of Rome at a national court, which is lower than the

⁴⁷ Formal integration refers to the institutional framework established by the various treaties of European integration such as Treaty of Rome, the Single European Act, and the Maastricht Treaty. Informal integration means the patterns of interactions and exchange driven by the formal framework and magnified by technological advance and market dynamics. (Wallace, 1994).

European Court of Justice in interpreting European Community law. Article 177 provided for the deepening of integration by establishing linkages between the Court and subnational actors and further framed the constitutionalization of the Treaty for technological conversion. The existence or importance of Article 177 relies on the action of actors who want to deepen integration for technological conversion. Conflicts on interpretation of issues between national and European Community law forced the national law to be put aside. The recent study by Alec Stone and James Caporaso examines whether the pressure by private litigants for supranational rule increases as the number of cross-national transactions rises (Stone, A. and Caporaso, 1996). The data shows that there were 2,978 Article 177 references by national courts to the European Court of Justice. Also they found that the relationship is positive and significant, suggesting that reference led to legislation. The conflict over interpretation of Treaty of Rome and national law started from the famous Van Gend & Loos case⁴⁸ of 1963. The Court proclaimed that

The Community constitutes a new legal order... for the benefit of which the states have limited their sovereign rights, albeit within limited fields, and the subjects of which comprise not only member states but also their nationals... Community law therefore not only imposes obligations on individuals but it also intended to confer upon them rights which became part of their legal heritage (Ibid: 12).

Another major example of a corporate actor pushing for legal integration for technological conversion was made by a French firm to force the Conseil d'Etat, the politically influential supreme administrative court in France, to accept the supremacy of Community (Mattli and Slaughter, 1998: 177-209). Import and export-oriented corporations in France launched systematic attacks on governmental decisions which were not consistent with Community law and the conflict was over the direct effect of Community directives in France (Plotner, 1996: 24-29; Claes and Witte, 1995: 7). In those

⁴⁸ Case 26/62, N. V. (1963). Algemene Transport & Expeditie Onderneming Van Gend & Loos v. Nederlandse Administratie der Belastingen, ECR: I.

cases, the government behaved reactively and corporations acted to transfer the limited extent of government sovereignty on business from the national to the supranational level, that is, this behavior can be seen as a response to demand of integration for technological conversion at the subnational level.

The rapid development of technology and innovation in the 1970s and 1980s transformed the economy of Europe. Innovation put pressure on governments to adjust the scale of political and economic organization to match new technologies such as computers, microelectronics, fibre optics, satellites, cable television, digital switches, lasers, electronic production and other technologically innovated materials. The impediments to the European economy did not guarantee further economic gains to compete with American and Japanese rivals. The solution was to promote a single European market (Wallace, 22; Pelkmans, Winters, and Wallace, 1988: 22). The malfunctioning economic performance in Europe caused groups of big business, such as the Round Table of European Industrialists (RTEI)⁴⁹, to apply strong pressure in the 1970s and 1980s. RTEI lobbied all political bodies and politicians. In the words of Lodlow that, “ Business advocacy was... a central factor in propelling to the top of the Community’s agenda, and in clarifying the range of measures involved and the need for a comprehensive, time-tabled strategy” (Ludlow, 1989: 29). Because the big business group played an important role in Europe as a

⁴⁹ The Round Table of European Industrialists consist of big business including Philips, Siemens, Olivetti, GEC, Daimler Benz, Volvo, Fiat, Bosch, ASEA, and Ciba-Geigy (Cowles, 1994; Tulder and Junne, 1988: 214-216). In their first meeting they criticized the situation of Europe in the point that Europe still remained as a separated national markets with separated national policies and industrial structures and European business could not compete (Cowles, 1995: 506). RTEI demanded following policy steps to political leaders: 1) revamp public policies to improve the risk and return relationship for European private investment like allowing tax allowances for incremental research and development expenditures; 2) harmonize economic and monetary policies; 3) end subsidies to obsolete industries; 4) integrate the European market by allowing for the development of common standards; 5) promote the free flow of people, information, and ideas; 6) facilitate the emergence of transnational industrial structures by eliminating fiscal impediments to mergers and restructuring and subsidiaries; and ‘9 redefine EC regional and social policies (Cowles, 1994: 513). Delors cabinet said that “these men are very powerful and dynamic... when necessary they ring up their own prime ministers and make

revitalizer across borders, the political leaders should promote integration for technological conversion and productivity growth to optimize re-election chance, at the expense of sacrificing national sovereignty. In the 1980s, the pressure from the business sector became so strong that the CEO of the Dutch multinational Philips said

There were not so many reasons why...Philips should stay in the Netherlands... I am European enough to wait until the last possible moment...but if Europe is neither able nor willing to develop its economic structure, then the consequence...must be drawn (Carr, 1985).

When there was a final vote for Single European Act, CEOs of major European firms pressured their governments and member states signed the Single European Act in February 1986 (Cowles, 1994: 517).

Supply of integration for technological conversion and productivity growth is very important to generate a successful technology spillover and transformation for demand of integration in the case of Europe.

2.2 The Supply of Integration for technological conversion

Two important supply conditions for technological conversion and productivity growth are vital to generate deepening and widening of integration in the EU. First, institutions play a role to monitor and force the actor to act in a certain way toward economic integration for technological conversion, when there are insufficient conditions in countries to help themselves. Second, the vital role of the undisputed leader is essential as a coordinator of rules, regulations, and policies, and as a distributor for the interest of member countries. These two conditions were met in the case of the EU. Two EU institutions such as the Commission⁵⁰ and the European Court of Justice⁵¹ drive

their case" (Krause, 1988: 24-25; Mazey and Richardson, 1993; Pedler and Schendelen, 1994; Jordan and Maloney, 1993: 191-211).

⁵⁰ The Commission was designed as a guardian of common interest of member countries and EU, when there is decision, made by the member countries, the council, corporations, and people, and realize the common interest within the system of institution.; therefore, the characteristics of the Commission is very distinctive on the supra national and federalistic aspect of EU economy. The role of the Commission is to check if the

individuals, companies, and member states to act in a way that meets the conditions of the treaties. The European Court of Justice plays the role as a constraint to improve the effectiveness of the EU enforcement mechanism, based on two doctrines: supremacy and direct effect (Burley and Mattli, 1993). The doctrine of supremacy provides that the law of the EU has primacy over national legislation and the doctrine of direct effect prescribes that citizens of member states are subject to EU law without prior intervention by their governments. Direct effect provides authorization for private parties such as firms and individuals to drive the governments (vertical enforcement) and other private parties (horizontal enforcement) to apply treaty obligations⁵². The power of individuals has grown

activities of the members in the EU are legal, manage the financial issues of the EU, negotiate international agreement, represent the EU internationally and domestically, and exercise the rights of decision making, entrusted by the Treaty and the Council. The concept of independence is most important to distinguish the Commission from the Council, and the Parliament. The Commission has a responsibility to expand its role as a representative of common interest. The term, supranational relates to independence of members in the Commission for the common interest of EU; therefore, the Treaty emphasizes that the member countries should not put pressure on the activities of members in the Commission and respect the principle of independence. However, the Commission is regulated by the European Court of Justice with demand of the Council and Commission. The Commission has rights of planning the own budget and integrates the draft of preparatory budget of the other institute. As a process to execute budget, the Commission have to submit the report on the execution of budget and financial certificate of debt and asset of EU annually. The Commission has rights to borrow capital from world financial market, rent capital for the nuclear energy plan, and support the plan of industry financially. Also, the Commission participates in law making process by preparing the draft on regulation, order, and resolution for the Council. The Commission has the initiatives of amendments of the constitution and leadership in the process of law making. In terms of international relation, the Commission can make international treaty and publicize the order for the Treaty with authorization of the Council. As well, when the Council orders to make the Treaty, the Commission can request the opinion of European Court of Justice, if there is discrepancy with the regulation of the Treaty. The Commission maintains the proper relationship with international organization such as UN, WTO, and OECD. See Treaty on EC Article 115, 139.3.1, 155, 157.1, 157.2.3, 158.1 and 229.2.

⁵¹ The duty of European Court of Justice is to protect the EU through the interpretation and application of the Treaty on European Communities. The Treaty authorizes the ECJ as the machinery of law which has a responsibility to make the member countries and the institutes of the EU keep the law. A natural man and corporation are also controlled by the law. In terms of the application and interpretation of the Treaty, the prescribed content of the Treaty about the duty and jurisdiction for the law observance is: 1) the judgement of acceptance and rejection about the execution of duty of the member countries in the Treaty; 2) execution of jurisdiction about prescribed fine in the law; 3) examination on statute of EU which has binding force; 4) preliminary judgement; 5) approval of compensation, caused by the institute and public officer; 6) sentence of conflict between the EU and the public officers; 7) sentence of issues about the duty of the member countries under European Investment Bank or statute, adopted by the organization of European Investment Bank and the duty of all central bank of all member countries; 8) the judgement of arbitration articles on agreement concluded by EU itself or representative; 9) the judgment of conflict, submitted under the specific agreement between the person concerned; 10) the judgment of unsuitableness about regulation in the process of lawsuit in the Court; 11) the enactment of necessary temporary statute and 12) the appeal decision about the judgement. See Treaty on EC Article 164, 229.2, and also Single European Act Article 11.11.

⁵² See case 36/74, B. N. O (1974). Walrave and L. F. N. Koch v. Association Union Cycliste Internationale.

in the pursuit legal action against any government which fails to apply community directives⁵³, that is, the EU allows space for people and their decision making in the process of integration for technological conversion and productivity growth. These legal disputes under national and community law reinforce the role of the Court as the central monitoring agent. With the overriding of cases, the EU added a new institution, the Court of First Instance⁵⁴ in 1988. The European Court of Justice has been empowered by the EU to put binding and legal obligations on member states to force them to comply with the European Community Law.

The second supply condition of integration, an undisputed leader, was met by the leadership of Germany with its strong economic performance and benevolent side payment for underdeveloped areas (Bulmer, 1993: 88; Wallace, 1988: 276-285). The strong German economy politically influenced other member states in the EU. Germany played the roles as a policy and institutional agenda maker since it was the biggest creditor of the European Monetary System⁵⁵ and led Europe toward further strengthening of common macroeconomic, social and environmental policies. As well, German influence led to the introduction of concepts such as subsidiarity⁵⁶ and multitiered governance (Bulmer and

European Court Reports (ECR): 1405; and case 149/77 (1978). *Gacrielle Defrenne v. Societe Anonyme Belge de Navigation Aeriennne Sabena*, ECR: 1365.

⁵³ See case 152/84 (1986). *Marshall v. Southampton and South West Hampshire Area Health Authority*. Common Market Law Review 1: 688.

⁵⁴ The self regulation of the Court of First Instance can be enacted with the agreement of the Council under the arrangement of the ECJ. The rights of the Court of First Instance is: first, lawsuit of employee; second, an action for nullity and forbearance lawsuit of the enterprise against the Commission; third, and action for nullity and forbearance lawsuit of a natural man or enterprise against EU institute about execution of competition rule; fourth, the lawsuit of compensation demand of a natural man or enterprise against previous object pf lawsuit about damage by intention and forbearance. The Court of First Instance is managed with some principle. The Court of First Instance is under the European Court of Justice and in case of lawsuit in the Court of First Instance, the ECJ examine an appeal as a higher court. Otherwise, the Commission has rights to examine and decide lawsuit and procedure which is decided by unanimity after the asking the opinion of the ECJ and the Parliament and Commission. See Treaty on EC

⁵⁵ Ludlow, P. (1982). The making of the European Monetary System. London: Butterworth: 290.

⁵⁶ Subsidiarity means that the Community should take action when the objective of a proposed action cannot be sufficiently achieved by the member states at the domestic level.

Parterson, 1996: 9-32). Germany also played a role as a provider of the model of statute for the European Central Bank and the model of capitalism with strong provisions for social policy cushioning (Bulmer and Parterson, 1987: 12). In addition, Germany influences the member countries in the field of technical standards. The German national standards setting organization, Deutsches Institut für Normen (DIN) directly influenced European standards by setting out guidelines for a wide range of European industries (Woolcock, 1991: 48-49). The adoption of German institutional arrangement raises the issue of redistribution, and the leadership of Germany expressed the ease of redistributive concerns as a regional leader. Germany is the biggest contributor to the EU budget including support for the European Regional Development Fund, the European Social Fund, and the Cohesion Fund. The contribution of Germany to redistribution reached two-thirds of the net income of the Union in 1996 (Shackleton, 1989: 129-147). As a regional leader, the important thing is that Germany acts out of economic self-interest, even though the economic measures of Germany create serious risks. Also, Germany has been deeply promoting human and social rights at the supranational level.

2.3 The Issue of Widening and Externalities

The widening of the EU is mainly derived from the economic difficulties in European Countries and the externalities of the European Union against non-member countries. Within non-member countries in Europe, their economies are not performing well and trade suffers from the damage caused by trade diversion because new cost-saving production techniques require larger markets to allow for frontier technology implementation. Corporations seek favorable state jurisdictions and locate where the institutional environment is most conducive to profitable trade and investment. Also

foreign investors prefer the well-integrated market of a community country to the functionally insufficiently integrated economy of non-members. The economic difficulties of non-member countries, owing mainly to a lack of technological edge, drive the political leader to change course and embrace a pro-integration agenda to improve their chances for political survival. The more benefits of technological transformation in large scale of economy that rise from integration, the deeper the rational to be an insider of the European Community (Heston and Summer, 1991). Empirical analysis shows that the economic performance became better after becoming a member of the EU (Mattli, 1994). The potential growth rate influences the decision to join the EU since productivity growth depends on technological development and this develops with larger scale markets and innovation systems.

Another reason why the European countries had to join the EU is the externalization of technology with competitive products and discrimination in the process of technological conversion and innovation by the EU. The division of Europe between EEC and EFTA (European Free Trade Association) was a form of evidence that externalities exist. EFTA was established to protect the interest from the EEC in 1961. However, the existence of the EFTA withered under the preference of foreign investors for the EEC (Yannopoulos, 1990: 237). Investment diversion worsened the economy in the UK and it finally joined the EC as a member to prevent discrimination from the EEC. However, other countries, such as Norway, which had good economic performance, did not join until their economies faltered (Anderson and Reichert, 1995: 246). A joint EC-EFTA ministerial meeting in Luxemburg on April 9, 1984, publicized a declaration to continue, deepen, and extend cooperation between the EC and the EFTA with the aim of creating a dynamic European

Economic Area (Nell, 1990: 327-358). However, with the economic decline in the late 1980s and early 1990s, and despite rapid progress towards EEA, corporate pressure on governments grew because of the uncertainty and lack of transparency of many of the measures taken by their governments to bridge the institutional gap with the EU. Also, they criticized the fact that governments had not implemented the EC policies they wanted and that such measures did not provide favorable conditions for them to compete successfully with the big common market (Stalvant and Hamilton, 1991: 208; Buthe, 1995: 22). The EEA could not ensure economic growth and corporations felt that they were vulnerable to discriminatory treatment by the EC in several domains such as research and development and public procurement (Luif, 1991: 135). Multinationals invested in the EU, but trade diversion increased in the EEA.

On the contrary, there were also negative externalities, which disrupted EU stability, security, and prosperity. Mismanagement in Eastern European countries caused migration, political instability or social unrest triggered social tension or xenophobia in the EU. Initially, EU offered technical assistance and advice in areas such as food distribution, privatization, banking, civil service reform, education, environment and energy through the PHARE (Pologne, Hongrie: Activite pour la Restructuration Economique) and the TACIS (Technical Assistance to the Commonwealth of Independent States)⁵⁷. Also the European Investment Bank (EIB) provided economic loans and The European Bank for

⁵⁷ PHARE (Aid for the Economic Restructuring of Poland and Hungary) program includes ten countries in Eastern and Central Europe (Poland, Hungary, Rumania, Bulgaria, Albania, Slovenia, former Czechoslovakia, and Yugoslavia, and three countries in Baltic. It is funded by EU budget and money is given by way of grants. EU provides 4.284 billion ECU between 1990 and 1994. It extended until 1997, because of participation of Central and Eastern European Countries which is in transition of system. TACIS has generally supported transition economy to introduce technical know-how, development of private sector, and reform of public sector. The aid has been utilized to build infrastructure and reached 1.36 billion ECU (Song, 1997).

Reconstruction and Development (EBRD)⁵⁸ provided capital to the private sector. However, those traditional aids were not sufficient to avert chaos (Mortimer, 1992: 21). Instead, the EU decided on gradual integration with Czechoslovakia, Hungary, and Poland. Each of these states decided to take concrete steps towards a market economy and pluralist democracy and agreed to follow the laws of the Community (Commission of the EC, 1990). In 1995, The White Paper on Eastern Europe concluded Poland, Hungary, the Czech Republic, Slovakia, Bulgaria, and Romania should be included in membership of the EU. It is clear that the economic difficulties and lack of technology in Eastern European countries and externalities of EU caused an accelerated widening of the EC.

2.4 The Introduction of EU Statute

The procedure to introduce the EU statute involved four steps as figure 3.1 illustrates.

1) agenda preparation by the European Council; 2) consultation; 3) decision; and 4) Council authorization of administrative law to execute the EU statute.

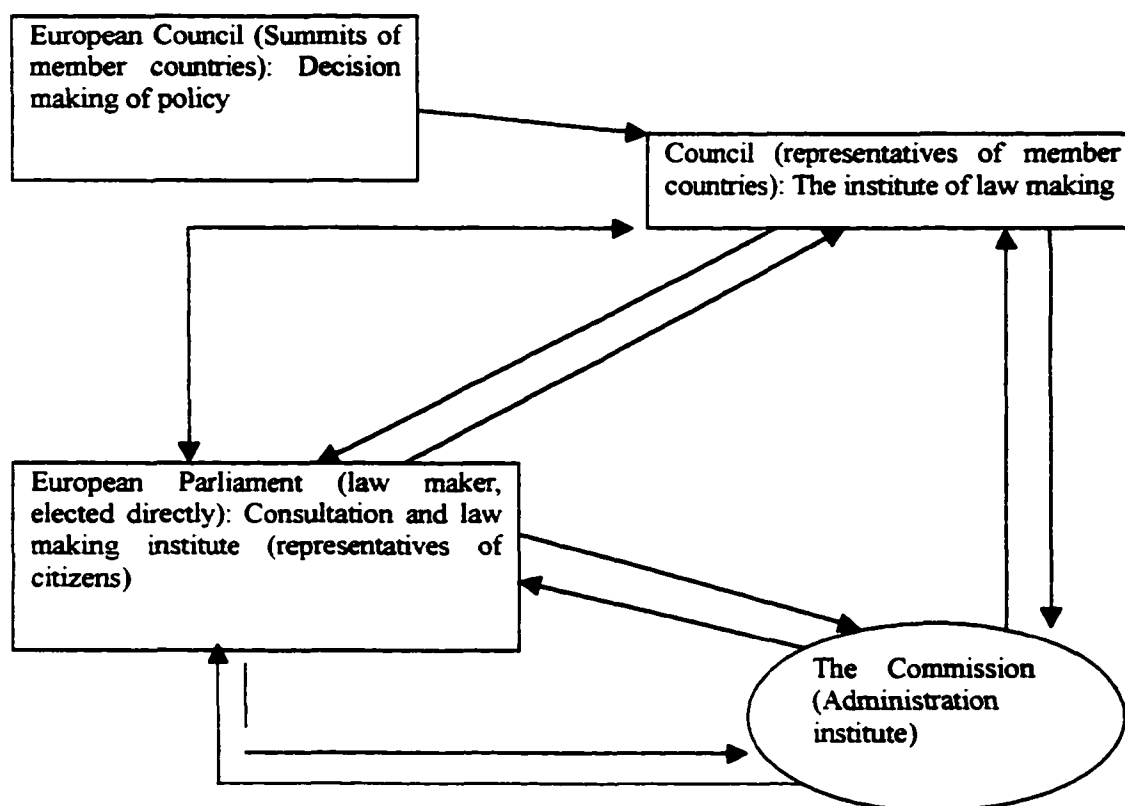
The EU statute is divided into regulation, decision, directive, consultation, and opinion. Regulation applies directly to member countries. Decision is effective on designated country, enterprise, or individual. Directive is a binding force on member countries, but member countries authorize the method of execution and must enact domestic law to execute the directive. Consultation and opinion have not binding force.

The new supra national institutes in the EU are established to fulfill needs of integration including technological conversion and productivity growth. Economic integration needed political integration as well and further institutions may be established.

⁵⁸ EBRD also called as Easteuropebank or Eastern European Bank. This bank was established to support Eastern European Countries which is in transition of system. 51 percent of capital in this bank is supported by non European Countries. It started work in April 1994 with principle capital of \$10 billion. The objective of Bank is to promote the process of transition and aid transition economy to overcome the difficulties of transition from planned socialist economy to competitive market economy. This bank also promotes the investment from foreign capital and consults on privatization of state corporation. (Song, 1997).

Institutionalization of economic integration in EU is proceeding to include the former socialist countries in Eastern Europe.

Figure. 3.1 The Introduction of EU Statute



Source: Tanaka, S. et al. (2001). Contemporary European Economy, Tokyo: ARMA: 32.

3. Institutional Economic Integration and Federal Aspect for technology transfer system.

During periods of economic difficulty caused by a lack of competitive technological edge, limited market size and a lack of resources for technological innovation, institutionalization of need for productivity growth and technological requirements can be the answer. This drove the EU to establish institutions, which enlarged the market and allowed free movement of capital, labor, goods and service in the single market model of the EU. Supra national institutes do not develop automatically. The integration of the EU

is unique in the point that the rights of member countries are ceded to supra national institutes. The structure of the EU is similar to that of a single state which executes the rights in justice, law making, and administration. The EU is supra national with a single market and currency, its function is similar to that of a federal state whose rights are regulating its member provinces. However, it differs from a single state in terms of its rights and common concept: the function as a state institute is confined. In the current stage of the EU, federation is in the economic sector and confederation is in the political sector. Therefore, the EU needs political cooperation of member countries. In the EU, supra national institutes suggest an integration statute, and manage and operate the integration statute and policy (Burley and Mattli, 1993). The integration statute and policy are interpreted by the European Court of Justice which can punish the criminal and demand correction.

In this point, integration of the EU is a type of institutional integration⁵⁹. The enterprise follows institutional reform and concretes the interrelationship among enterprises. The establishment of the Common Market of the EU through fiscal, industrial, and labor market federation is important to allow market scale which permits technology spill over, the free movement of production factors and development of underdeveloped area in the EU.

3.1 Common Market of EU

The Common Market is totally different from Customs Union in terms of level of integration for technology transfer. A single market is generated by the abolishment of

⁵⁹ In the theory, state led integration is called as an institutional integration, while enterprise led is called functional integration (Burley and Mattli, 1993: 99-101). Functional integration is that state reforms the institution, after regional network of enterprise formulate and reform of institution is requested by enterprise. Liberalization and facilitation is functional integration and ASEAN and APEC is belong to functional

tariff and non tariff barriers. While Customs Union abolishes the tariff on goods, the Common Market, through law, institution and the breakdown of national boundary, lifts non-tariff barriers that are obstacles to free movement of goods, service, capital, and people, which in turn allow technological spillover. A White Paper by the European Committee on completing a regional market recommended the abolishment of all non-tariff barriers⁶⁰ between 1985 and 1992. The Common Market was accelerated by Single European Act, as Table. 3.1 shows. The Qualified Majority Institution of SEA⁶¹ was applied to enact market integration for free movement of production factors. Obtaining unanimous consent for a single European Market could not be established if there was objection from member countries on specific interest issues such as tax system for revenue which is an important support for productivity growth in industries and labor. The directive became legally effective in member countries. Most of the directives from the EC were converted to a working statute. The European Commission took countries to court if they did not convert the directive to a working statute. Because the revision of the law in member countries took a long time, the EU introduced a new method of division of labor, economic federalism.

The Market Integration Directive of the EU was confined to only one important part. In other parts, member countries admitted each other's laws and regulations.

integration.

⁶⁰ Non tariff barrier includes physical, technical, and financial barriers. Physical barrier is administrative procedure, customs control, and bacteriological examination. Technical barrier is generated by the difference of standard size, technical standard. Technical barrier increase the cost of R&D to change the size of goods. Financial barrier is generated by the factors in financial institution and management which influence the price. A tax on value added is direct cause to differentiate the price and became artificial barrier.

⁶¹ SEA has a crucial meaning as an agreement of member countries to change unanimity to majority rule. Majority rule made decision quicker than unanimity. In 1993, majority rule was applied to abolish the barriers to free movement of goods, service, capital, and people.

Table. 3.1 An Economic Classification of the Single Market

Measures	Goods	Services	Persons	Capital
Market Access	<ul style="list-style-type: none"> . Abolition of intra EC frontier controls . Approximation of <ul style="list-style-type: none"> -Technological regulation -VAT rates and excises -food health standard . implications for trade policy (unspecified) 	<ul style="list-style-type: none"> . Dismantling tracking quotas . Access to inter regional air travel markets . Mutual recognition and home country control in financial services 	<ul style="list-style-type: none"> . Abolition of intra EC frontier controls . Relaxation of residence requirements . Rights of establishment for professionals 	<ul style="list-style-type: none"> . Abolition of exchange controls . Admission of securities listed in other member states . Industrial cooperation
Competitive Conditions	<ul style="list-style-type: none"> . Liberalization of public procurement . Merger control . Review of state aid to industry 	<ul style="list-style-type: none"> . Increased competition in air transport . Approximation of fiscal and regulatory aspects in services markets 	<ul style="list-style-type: none"> . European vocational training card 	<ul style="list-style-type: none"> . Harmonization of take over and holding regulations . Fiscal approximation of parent subsidiary relations
Market Function	<ul style="list-style-type: none"> . Research programs in telecommunications and information technology . Proposals on standards, trade marks, company law, etc 	<ul style="list-style-type: none"> . Approximation of banking and insurance regulations . EC system of permits for road haulage . EC standard for electronic payments 	<ul style="list-style-type: none"> . Approximation of training programs . Mutual recognition of diplomas (especially for professionals) 	<ul style="list-style-type: none"> . European company statute . Harmonization of intellectual property rights . Common bankruptcy provisions
Sectoral policy	<ul style="list-style-type: none"> . Agriculture: elimination of MCAs . Steel: reduction in subsidies 	<ul style="list-style-type: none"> . Common air transport policy on access, capacity and prices . Common rules on mass risks insurance 	<ul style="list-style-type: none"> . Deferred to European Political Union Treaty 	<ul style="list-style-type: none"> . Deferred to European Monetary Union Treaty

Source: Pohl, G and Sorsa, P. (January 1992). European Integration and the Developing World, the World Bank, Geneva Office

The EU and member countries developed a federal method of market integration, which systematically divides the duty and decentralizes power. The member countries also introduced the principle of subsidiary, which prevents enlargement of the EU supra national institutes and excessive use of rights. While the EU consists of EU member countries, provinces, and cities, the principle of subsidiary⁶² guaranteed a bottom up

⁶² The theory of fiscal federalism is based on the principle of subsidiarity and financial equilibrium. The principle of subsidiarity become a basic principle to distribute the rights of economic policy to federal area,

approach on deciding the efficiency of policy. The EU established the first free movement of goods, service, capital, and people by 1993.

The Berner report⁶³ in 1970 suggested currency union to conclude the common market and provide economic strength and currency union. Discussions following the report concluded with the execution of currency union in the Maastricht Treaty and the European Monetary System (EMS)⁶⁴ in the Treaty of Amsterdam⁶⁵ (Moravcsik, A. and

that is, upper decision making body and sub regional society distribute the rights of establishment of policy and execution and divide the common issues and problems to realize the supra national federalism. The principle of subsidiarity based on the ideas that the regional society is most efficient to maximize the welfare of citizens. The principle of subsidiarity is justified that division of labor for execution of rights is suitable to reflect the preference of citizen more carefully, solve the regionally specified issues, and decrease the cost by reducing the time consuming for decision making. Adjustment required the principle which can be the norm of allotment of duty and rights. The principle of subsidiarity in economic aspect provides the norm to act and the distributional principle to be applied for distribution of fiscal measures between upper and sub regional society. In public policy, standard of welfare of resource allocation and distribution target is considered, and financial equilibrium among regional societies is required for distributional target in the social and ethical aspect. The agreement sphere is extended to state level rather than subregional level owing to obligatory characteristics: therefore, the distributional target is divided and executed at the level of upper and sub regional society in the basis of the agreement in state level. In terms of the financial rights, the principle of subsidiarity is applied for relationship between Community and member states, and regulate the limit of rights for EU, supra national organization. The principle of subsidiarity is mainly applied to final principle, but can be extended to general relationship, based on finance. The principle of subsidiarity is classified as a general principle which can be applied for issues that is not in the Treaty (Song, 1997: 162-165; Treaty on EC article 3b).

⁶³ Berner report was suggested by the prime minister of Ruxemberk, Berner to protect Europe from the instability of foreign currency, but could not success because of oil shock and break down of USA dollar. Berner suggested liberalization of capital trade to guarantee exchange of currency and reduce the range of fluctuation for stable exchange rate. As well, the Berner report demanded the establishment of the European Central Bank System to harmonize foreign currency of EU member countries and suggested to establish a economic policy planning committee as a supra national institute. Berner report provides chance of moving from common market to currency union (Song, 1997, p. 62). The result of Berner report made Snake System which allow fluctuation of currency with $\pm 2.25\%$.

⁶⁴ EMS was established to stabilize foreign currency and consumer price in EC. The Exchange Rate Mechanism of EMS has a member countries comparing to Snake System. ERM has a more consultation about foreign currency fluctuation and includes credit facilities. The currency of member countries has central rates marked as European Currency Unit (ECU) and the price of it was calculated by basket of price of member countries' currency. The central rates determined the grid of central rates of each members and permits fluctuation with $\pm 2.25\%$. All central bank of member countries are belong to it from a mere sense of duty without limitation (Robson, 1998).

⁶⁵ The Inter Governmental Conference (IGC) that produced the Treaty of Amsterdam was from the start a negotiation in search of a purpose. Large-Scale negotiations in EU history- from the Treaty of Rome to Maastricht- have usually centred on a major substantive agenda, normally either trade liberalization or exchange- rate stabilization, with secondary issues and institutional changes dragged in its wake. In the Amsterdam IGC, by contrast, there was no compelling reason to negotiate these particular issues at this particular time. The member states considered no major expansions in EU competences and ignored core economic concerns almost entirely. With their primary focus clearly on managing the transition to EMU, they were extremely cautious, seeking above all not to provoke domestic debates that might upset this goal. The Amsterdam IGC arose in stead out of three considerations. First, in the Maastricht Treaty the more federalist governments, notably that of Germany, had been promised rapid reconsideration of the political union issues on which no agreement could be reached. The unfinished business of Maastricht included the need to revisit Pillar II, on Common Foreign and Security Policy and, to a lesser extent, Pillar III on Justice and Home Affairs.

Nicolaidis, K, 1998: 13-24). Currency Union has been executed in three stages including the completion of internal market⁶⁶, regulation of economic policy, and establishment of a currency system.

3.2 Fiscal Federalization⁶⁷

3.2.1 Fiscal Harmonization⁶⁸ and Regulation for Region

EU budgets have played an important role in supporting successful economic innovation. In the EU, fiscal centralization to a supra national institute gave credibility to integration as a means for productivity growth by efficiently allocating responsibility to many levels of government. However, the EU budget⁶⁹ is considered a measure to provide

Second, the national debates following the Danish and French referendums on the Maastricht Treaty, as well as the accession of Scandinavian Countries, led to widespread calls to redress the democratic deficit. Bringing Europe closer to its citizens' - increased powers for the European Parliament and a desire to upgrade Community competences from human rights to employment policy- became a core aim of the new Treaty. Third, in 1993 European chief executives officially endorsed negotiations on an EU enlargement to countries in Central and Eastern Europe. By raising the prospect of eventually doubling EU membership, they called into question existing EU decision- making procedures. It was agreed that decision- making would eventually have to become more efficient. In addition, larger governments sought a serious of modest adjustments to institutional structure, notably a reweighting of votes and integration of the Schengen arrangement into the EU, in advance of enlargement. After appearing in successive summarized in the 1995 report of the inter governmental Reflection Group chaired by Carlos Westendorp enlisted to frame the conference agenda (Ludlow, 1997; Moravcsik and Nicolaidis, 1998: 13-24)

⁶⁶ The juridical decision of European Court of Justice on guaranteeing the freedom of living and moving concluded that member countries have to support the free movement of human capital in the structure of language, culture, society by lifting barriers and different labor policy. This decision gave a change to EU to complete internal market.

⁶⁷ Fiscal federalism is supported by fiscal harmonization and fiscal coordination (Robson, 1998: 174). On the one hand, fiscal harmonization is agreement about utilization method of state fiscal measures, on the other hand, fiscal coordination is to required spontaneous cooperation of state fiscal measures.

⁶⁸ Fiscal harmonization was introduced by public choice theory. A budget is reflected as important measure for the management of state economy, and the size and structure represent the political, social, and economic objective for cross over spillover (Gatsios and Seabright, 1998). The function of budget is divided into the function of resource distribution, income distribution, and stabilization (Robson, 1998: 175). By Robson, public choice theory is that the reduction of jurisdiction or potential power to be developed by interest group generates the competition between jurisdictions. Therefore, the division of responsibility between the Community and member countries should reflect the trade-off between the benefit of integration and cost. The theory talks about optimum allocation of public function among a large number of state systems. Even though the policy integration depends on political decision, all areas to try economic integration pursue efficiency and interest (Robson, 1998: 174-175).

⁶⁹ Robson argued that the budget of EU is different from the it of member countries: 1) the scale of budget is very small to the scale of EU economy; 2) EU does not have rights to collect the tax, that is, the rights of tax is at the member countries; 3) revenue and expenditure should met equilibrium by the Treaty of Rome; 4) even though there is a function for redistribution of resource, crucially planned redistribution function does not exist; and 5) the budget does not have a function of stabilization (1998: 191-192). The base of expenditure started with CAP and related price guarantee fund and structural fund in 1962. The social fund was established by the Treaty of Rome in 1971 and the role was enforced. The expansion of U required the establishment of European

financial support decided by degree of importance in the EU agreement of in the fields of Common Agricultural Policy (CAP), regional, social, cohesion, and foreign aid policy, and industry, technology and research and development.

Revenue was generated from the tariff, agricultural levies, and 1 percent of revenue from member countries on the base of value added tax (VAT) (Robinson, 1998: 193). Because, the scale of revenue was regulated by the principle of unanimity among member countries⁷⁰, in the Fontainebleau summit (Edwards and Wiessala, 1999: 28-30), the lack of revenue led to a conclusion to increase the VAT source of capital to 1.4 percent for revenue. At the same time they decided to regulate the price support for agricultural products under an increased rate based on revenue resources. The necessity of revenue to actualize the Single European Act induced members to adopt the new budget agreement, Delors I⁷¹ and at the Edinburgh summit meeting in 1992, the regressive nature of the distribution system was dealt with to enforce social and economic cohesion of under developed countries. Also, in the expenditure agenda, the EU Structural Fund was increased and a new Cohesion Fund was also established to support under developed

Regional Development in 1975. The general budget of EU came from the share of fund from the member countries until 1970.

⁷⁰ The rights to process budget procedure are in the European Council and Parliament. Even though there was expanding of expenditure with the increase in social and regional fund, the revenue could not increase, because the expenditure of agricultural fund was not decreased drastically.

⁷¹ This agreement generate two important changes: first, the reduction of agricultural expenditure is determined not to surpass the 3/4 of annual increase rate of community GDP; and second, the expenditure limit was introduced to support long term financial vision. With the expansion of EU to southern Europe. The regional unbalance increased and became obstacle to integration. Southern European NICs such as Spain, Greece, Ireland, and Portugal are underdeveloped and concentrated in agricultural industries. EU required to develop underdeveloped area to increase regional equality. The regional policy of EU is mainly capital transfer of structural funds to underdeveloped area. However, with problems of the effectiveness in capital transfer to underdeveloped area owing to lack of plan, Delors, the chairman of European Commission, publicized Delors Package which contain reform of management methods and expansion of regional policy budget in 1987. The principle of new structural funds is to increase concentration and efficiency of capital use, to enhance partnership, to maintain consistency, to improve fund management, and to generate simplicity, monitoring, and elasticity (Kassim, 2000). The principle of concentration and efficiency was determined to develop poorest area at first for strengthening accomplishment of priority in regional development and efficiency of policy management. Regional development fund has been used to investment, building infrastructure, modernization and development of borderline area. Social fund has been used to vocational education and agricultural fund

countries in EU. The expenditure for CAP changed to support income, not price of agricultural products. The expenditure structure of EU budget is shown in table.3.2. The revised budget of the EU should have solved the problems in equality, the meaning of single economy and currency union, and provided support for the enlargement to Central and Eastern Europe.

Table. 3.2 The Expenditure of EU⁷² Unit (ECU: million)

Contents	Fiscal Year									
	1988		1993		1995		1996		1997	
	ECU	%	ECU	%	ECU	%	ECU	%	ECU	%
General Budget	27,635.2	65.0	34,678.4	52.4	34,451.1	50.6	41,328.0	49.5	42,305.0	48.9
EAGGF										
Guarantee										
Section										
Structural Fund	6,419.3	15.1	20,478.5	31.0	19,223.3	28.2	26,005.6	31.1	27,564.8	31.9
EAGGF										
Guidance	1,140.9	2.7	2,914.2	4.4	2,530.6	3.7	3,859.4	4.6	3,709.8	4.3
Section										
ERDF	2,979.8	7.0	9,545.6	14.4	8,373.6	12.3	10,663.1	12.8	11,377.7	13.2
ESF	2,298.6	5.4	5,382.6	8.1	4,546.9	6.7	6,031.6	7.2	6,453.2	7.5
Cohesion Fund			795.0	1.2	1,699.3	2.5	1,919.3	2.3	2,326.0	2.7
FIFG					248.1	0.4	314.0	0.4	381.0	0.4
Research	1,129.5	2.7	2,240.8	3.4	2,544.8	3.7	3,096.6	3.7	3,220.0	3.7
External Activity	768.1	1.8	2,857.3	4.3	3,412.9	5.0	4,718.2	5.6	4,775.5	5.5
Administrative										
Cost	1,915.7	4.5	2,988.3	4.5	3,560.4	5.2	4,128.6	4.9	4,292.7	5.0
Other cost and etc.	3,153.9	7.4	961.2	1.5	3,085.0	4.5	2,611.4	3.1	2,246.6	2.6
Total of General Budget	41,021.7	96.5	64,204.5	97.1	66,277.5	97.3	81,888.4	98.0	84,444.6	97.6
EDF	1,196.3	2.8	1,353.6	2.0	1,563.7	2.3	1,434.0	1.7	1,810.0	2.1
ECSC	277.2	0.7	596.4	0.9	297.5	0.4	247.0	0.3	265.5	0.3
Total		100		100		100		100		100

Note: FIFG (Financial Instrument for Fisheries Guidance); ESF (European Social Fund); EAGGF (European Agricultural Guidance and Guarantee Fund; EDF (European Development Fund); ERDF (European Regional Development Fund); and ECSC (European Coal and Steel Community).

Source: Commission of the European Communities (1996). The Community Budget: the Facts in Figures, Luxembourg: the Commission.

In accordance with the changes agreed as Agenda 2000 for problem solutions, the budgetary authority adopted a regulation on budgetary discipline and a decision on

has been used to improve and develop agricultural industry.

⁷² The expenditure of EAGGF has been decreased with new need of expenditure for structural and regional policy. Second biggest expenditure is occupied by ERDF, ESF, EAGGF, FIFG, and Cohesion Fund. Cap has a redistribution function from consumer and tax payer to farmer, while Structural Fund has a redistribution

resources. The first key objective is to ensure that agricultural expenditure remains below the agreed ceiling. The second objective increases the proportion of traditional resources kept by the member states to cover collection costs from 1 to 0.75 per cent from January 1, 2000 and then to 0.5 per cent from January 1, 2004. This will be a corresponding increase in the proportion of the GNP resource, which better reflects member states capacity to contribute than the VAT resource (Edwards and Wiessala, 2001).

The principal redistribution function at the EU level⁷³ is regulation rather than expenditure on goods and service supply. The Commission continued its effort to improve budgetary arrangements, financial control, and the fight against fraud. It adopted a comprehensive plan aimed at recasting and simplifying the financial regulations. These included an internal audit service; modification of existing internal monitoring systems within individual countries so that each has its own internal audit capacity; a charter identifying the responsibilities of authorizing officers; standards for internal monitoring; and creation of general guidelines on financial circuits and the role of financial units. As well, a central finance department was set up in the Directorate General for the Budget as an advisory service for the other services. The Commission also adopted a resolution that set out a general strategy for combating fraud and identified four challenges that confront the Community and the member states. These challenges included developing a coherent framework of anti-fraud legislation; defining a new culture of operational cooperation with the member states, adopting an inter-institutional approach to prevent and combat corruption; and enhancing the judicial dimension. In 1999, the member states identified a

function among member countries.

⁷³ For redistribution function, the budget of EU is too small to redistribute properly in the point that agricultural share in budget is too big and the VAT revenue of EU is supported by member countries. Also, the intervention of government in geographical concentration of structural funds increase the redistribution issue.

total of 1,235 cases of fraud and 4,912 irregularities (Ibid, 2001). Monitoring by the European Commission is required to check funds use, and the suitability of aid in order to share the burden of additional aid between the EU and member countries.

One of the characteristics of the EU is to introduce new methods of developing and monitoring policy through multidimensional cooperation between the EU, member countries, and regional administration. The Maastricht Treat included the establishment of a Cohesion Fund to reduce regional economic gaps and the development of Trans European Networks. Three important innovations in the EU's policy towards the countries of Central and Eastern Europe (CCEE) and the former Soviet Union occurred in 1993. They were announced at the Copenhagen Summit, which devoted considerable time to clarifying and developing the EU's policy in this sphere. The first innovation was to concede, for the first time, that the CCEE could anticipate future EU membership. In the Worlds of the Summit's communiqué, the European Council agreed that the associated countries in Central and Eastern Europe that so desire shall become members of the European Union. (European Council, 1993: 12; Nugent, 1994: 7-8). The second innovation, which followed up on the first innovation, was to make provisions for an increasingly structured and multilateral relationship, an acceleration of the opening up of Community markets, and the offering to associated countries of participation in Community programmes. The third innovation was to launch the idea of a pact on Stability in Europe, which would act to promote preventive diplomacy and thus contribute to stability by averting tensions and potential conflicts. Since this focused primarily on ethnic and border problems, the Special October European Council meeting in Brussels decided

In addition, the budget of EU can not play the important role on stability: 1) budget is too small; 2) fiscal deficit is prohibited; and 3) lack of flexibility in supporting expenditure for long term programme.

that the Stability Pact would be one of the EU's first joint actions under the policy of TEU(Treaty of EU) (Nugent, 1994: 7-8). The reform of regional policy⁷⁴ has generated regional growth and accelerated integration of EU. The integration power of the EU has been successful because it supported underdeveloped areas in the EU. From year 2000, the European Council publicized plans to spend two hundred thirteen billion Euro on structural cohesion funds for seven year, as table 3.3 shows.

Table.3.3 Long Term Financial Perspective

	2000	2001	2002	2003	2004	2005	2006
Agriculture	41,738	43,656	44,778	44,646	43,615	42,768	42,493
Structural policy	32,678	32,076	31,474	30,882	30,180	30,180	29,746
Internal policy	6,031	6,143	6,255	6,366	6,478	6,590	6,712
Foreign policy	4,627	4,638	4,648	4,658	4,668	4,678	4,688
Administration cost	4,638	4,678	4,780	4,882	4,983	5,085	5,187
Preliminary cost	906	906	656	40	406	406	406
Support cost for New member	3,174	3,174	3,174	3,174	3,174	3,174	3,174
Total expenditure	93,792	95,271	95,765	95,014	93,504	92,881	92,406
Total/GDP	1.13	1.12	1.13	1.11	1.05	1.01	0.98
Expenditure for New member			4,221	6,842	9,065	11,666	14,501
Fiscal marginal Cost rate/ GDP	0.14	0.15	0.09	0.08	0.11	0.13	0.14
Own resource/ GDP	1.27	1.27	1.27	1.27	1.27	1.27	1.27

Source: European Commission; quoted from Tanaka, S et al. (2001). Contemporary European Economy, Tokyo: ARMA: 346.

The capital to support the enlargement to Central and Eastern Europe will increase

⁷⁴ European Investment Bank (EBI) established five targets to use the capital with efficiency. As a first target, three funds such as regional development fund, social fund, and agricultural funds is used to develop underdeveloped area and reform the malfunctioning structure of region. Eighty percents of regional development fund is used in developing underdeveloped area. Second, regional development fund and social fund are used to improve the restructuring of fading industries and rehabilitate industry. Thrid, social fund is used to reduce long term unemployment. Fourth, social fund is also used to promote employment for the young, the old, female, and the disabled. Sixth, agricultural fund is used to improve the structure of agricultural industry and three funds are also used to develop agricultural area. Second target is to promote employment in fading industry like steel, fabric, and ship building industry. The method is to change infrastructure and educate the labor. The target area is changed in three years. Third and fourth target are to educate long term unemployed labor and who handicapped persons. The methods are vocational education for at most 6 months and help to return work place. Fifth target is to develop the area which is highly relying on agricultural industry.

The operation of EU regional policy has a series of process: 1) the presentation of regional development plan of member countries in EU and regional administration, and negotiate with European Commission; 2) making decision of Community Support Frameworks (CSFs) by European Commission; 3) execution of aids; and 4) monitoring and evaluation of aids. This process prescribed the guideline for action of member cuntries and

from 4.2 billion Euro to 14.5 billion Euro. However, there are still issues in EU with the expansion of EU to Central and East European countries and new regional policy regulation is required to expand further with effective institutionalization.

3.2.2 Fiscal Coordination⁷⁵

Tax is an important source of crucial revenue needed for financial support of integration and productivity growth. Fiscal coordination for tax is important, because revenue is crucial for financial support of integration. When the EC was established, member countries had large differences in five crucial taxes including sales tax, commodity tax, corporate tax, and personal tax. An indirect tax, the general sales tax, was in the form of VAT in France, progressive or terraced tax in West Germany, and a single stage tax in Italy. The EU coordinated sales, commodity, and corporation taxes to increase distribution efficiency. The Treaty of Rome addressed indirect tax harmonization in Article 99 and corporate tax harmonization in Article 100. The plan to implement taxation harmonization has been supported by a series of important reports such as Tinbergen Report (ECSC, 1953), Neumark Report (CEEC, 1963), Van de Tempel Report (1969), Ruding Report (CEC, 1992). The process of institutional tax harmonization is very slow, because the agreement requires council unanimity. The currency union became important in fiscal policy as stressed by the principle of subsidiarity⁷⁶ in the Maastricht Treaty.

Member countries applied VAT, based on destination principle, as an EC sales Tax following the recommendation of the Neumark Report. However, the new recommendation of Neumark to change the destination principle to the origin principle

regional administration to solve regional issues of underdevelopment in EU.

⁷⁵ The analysis on fiscal coordination is focused on tax harmonization in indirect tax and direct tax.

⁷⁶ See footnote 64.

was not followed. The Commodity Tax has not been harmonized because of argument over a minimum tax rate. Coordination of corporate taxes created tax neutrality. The execution committee submitted a directive for corporate harmonization in 1975. The plan of the execution committee was to reduce double taxation and establish a common input tax credit system to reduce the difference in taxation rates and tax deductions from profit. The Ruding Committee (1992) examined the complex problems in taxation harmonization. This report concluded that the tax burden on national corporations is clearly different among member countries; there was discrimination against foreign corporations; and investors in the EU have to face different tax burdens when they invest in other member countries. Actually, the tax differences drove the investor to invest in low tax area for production and financial activity. Special measures at the EU level were required to improve conditions caused by tax distortion. However, Devereux and Pearson (1989) argued that to achieve economic efficiency, a single EU corporate tax is ideal, but will face political problems.

EU driven fiscal coordination actualized resource distribution and management to allow for balanced development in region, sector, and the strategic field of productivity growth. The strategy of indirect tax was to pursue structural integration and identify a tax rate to prevent distortion in the market function of trade. Identification of a common tax rate was required to allow the abolition of fiscal boundaries and the harmonization of tax rate and integration of corporate tax structures was needed to prevent market distortion caused by tax differences among member countries.

3.3 The Industrial Federalization and Policy of EU for productivity growth with technology

The industrial policy⁷⁷ of the EU is a process from vertical industrial policy⁷⁸ to horizontal industrial policy⁷⁹ (Tanaka, 2001: 163). Industrial policy started with adjustments in the steel industry. The EC protected industry with policies such as subsidy and import control of import and applied rationalization to industrial reorganization. This policy also applied to the textile and shipbuilding industries, which were in a deep depression. The EU actualized a policy to develop a frontier industry in Airbus. The European Strategic Program for Research and Development in Information Technology (ESPRIT) and EUREKA (European Research Coordination Action) were established to develop Information Technology. However, the vertical industrial policy faced a barrier because of European pessimism in the early 1980s. In the later half of 1980s, the industrial policy of the EU changed to improve industrial competitiveness. The EU initialized horizontal industrial policy to realize a single European market and develop scale of economy, promotion of competition in Europe, and enforcement of industrial competitiveness for future growth industries (Blutschacher and Kiodt, 1991: 177; Koopman and Scharrer, 1989: 207-215). After 1990s, the horizontal industrial policy became evident in execution of policy. Industrial Policy in an Open and Competitive

⁷⁷ Industrial policy is to influence distribution of resource to realize economic growth and efficient use of resource, by regulating, controlling, and leading the economic activity of private enterprise

⁷⁸ Vertical industrial policy is to treat and protect specific industry which is important for economic strategy. It is called as interventionism. Vertical industrial policy is based on vertical integration which is integration between developed countries which export industrial products and developing countries which export primary resources. The incentives of this integration is on maintaining and utilization of complementary economic relation between countries, but the dependent of developing countries on developed country is intensified and causes the inequality of economic actors.

⁷⁹ Horizontal industrial policy is to equip infrastructure to enforce the competitiveness of all industries. IT infrastructure and education for human capital is belong to this policy. Horizontal industrial policy is based on horizontal integration which is the form of integration between countries which have similar developing stance to generate common interests. Horizontal integration has a good point in that it keeps economic independence

Environment: Guidelines for a Community Approach was introduced to develop the role of public sector: 1) intangible property like intellectual property; 2) the promotion of cooperation among enterprise; 3) modernization of public sector; and 4) establishment of competition in public sector (Tanaka, 2001: 165).

The industrial policy in the EU is to spread the benefits of integration through investment in public sector rather than picking and supporting a national champion. With the introduction of the Maastricht Treaty, the EU became a single market and legal policy supported industry and economy. The Maastricht Treaty identified the purpose of industrial policy to be the acceleration of industrial adjustment for the transformation of industrial structure. It addition it identified the need for support and maintenance of an environment to promote the development of European enterprise and venture companies; and the industrial use of technology through innovation and R&D (Ibid: 166). The actor in industrial policy became the EU itself and with the increase of economic action among member countries, the spill over effect contributed to structural change in industry.

The EU supported the maintenance of industrial infrastructure and established Trans European Networks to support transportation, information technology and the energy industry. The EU publicized an Action Programme and Timetable to cover specific action safter the introduction of an Industrial Competitiveness Policy for European Union in December 1994 (Tanaka, 2001: 166). First, the deepening of European market integration is necessary. Customs and non-customs barriers need to be lifted and legal framework to maintain a suitable environment for business is required. Second, directions to establish information society were identified. This involved liberalization of information and

and promotes economic incentives in the countries which have similar developing stages (seo, 1997: 13).

telecommunication industry, enforcement of telecommunication network and decrease in telecommunication fees. Third, the promotion of R&D is crucial for industry. The support of R&D for IT⁸⁰ and biotechnology was strengthened and guaranteed as a strategic sector. In December 1995, the EU commission publicized A Green Paper on Innovation. This paper indicated that there are three main problems in EU such as the lack of venture capital, alienated relationship between enterprise and university, and a hindrance to foreign investment because of differences in law among member countries. The report proposed solutions: 1) the enforcement of human resource development; 2) guarantee of capital for R&D; 3) maintenance of legal infrastructure to promote R&D (Ibid: 167). The current industrial policy in EU has become horizontal development in infrastructure and competitiveness rather than vertical industrial policy, which protects and raised individual industry through intervention.

After experiencing an economic cycle (high growth: 1945-1973, low growth: 1974-1996, high growth 1999- current), the economy of the European Union has started to resume growth (European Commission, 1997). The current features of the EU economy include EU and state led development of economic infrastructure and improvement of consumer confidence. In addition, the trade balance is negative owing to the increase in imports and rapid development is taking place in the Southern European countries (Tanaka, 2001: 172). The decrease of productivity and social unrest following the destruction of the socialist bloc has reversed and has increased GDP since 1997. Since 2000, the economy in Central and Eastern Europe is showing steady growth (Grimwade, 2001). Currently, the EU is moving to generate new economy based on IT and service

⁸⁰ The evaluation of industry in EU showed that the share of telecommunication and IT industry is smaller than it of USA and development of IT industry is required to developed (European Commission, 2000)

industries while developing social structures by generating venture capital and business through creation of a better business environment, and generating adaptability and flexibility in the labor market. Also, the EU is changing the financial system to take risk through direct financing from the stock and bond markets. To allow for economic improvement, there is restructuring of industries in the business sector through M&A and direct finance, of the banking sector through investment business, and of the financial sector through a new stock market (Kassim, 2001: 51-73). The new economic and social model of the EU is concentrating on the reform of the social welfare system through investment in human capital by educational discipline, life long learning, and development of educational programs. Also, the EU is strengthening the development of IT skills at school and investing to increase the employment rate. There was agreement between government, executives, and labor unions to promote life long learning, reduction of unemployment and labor participation in management. European Council decided to develop the IT industry at the Dot Com Summit⁸¹. The challenge facing the EU is in the development of the IT field, social structure, and politics. If labor productivity is increased by the promotion of IT industry, the prospect of economic growth in the EU is rosy.

⁸¹ One area on which the Portuguese sought to stamp their own imprint was that of employment. The Prime Minister, Antonio Guterres, had often made a point of presenting the Portuguese as the initiators of new European employment strategies, avoiding the traditional dichotomy between European harmonization versus national autonomy and state employment versus unlimited regulation – all positions taken up with varying degree of intensity by its EU partners. The Lisbon extraordinary European Council dedicated to Employment, Economic Reform and Social Cohesion – Towards a Europe of Innovation and Knowledge on 23- 24 March, both reflected and extended these ambitions. While past discussion can traced back to the European Employment Strategy (EES), originating in the Delors white paper in 1993 and taken further in Luxembourg in 1997, the Lisbon Council further enlarged the agenda to encompass issues such as new technologies, the information society, e Commerce, and the knowledge economy. Indicative of the Prime Minister's own commitment was the fact that the preparatory work was done less by the Portuguese Permanent Representation and the Commission than by his own shepa, Professor Rodriguez. Hailed as the dot.com Summit, the Council was also regarded by some as a milestone in defining a new method of open co-ordination in EU policy-making in this area with objectives such as the creation of 20 million jobs in a decade. Heads of State and reaffirmed these objectives at their later meeting at Feira in June (Edwards and Wiessala, 2001:44).

3.4 Federalization of the Labor Market for productivity growth

Even though mass unemployment in the EU has been chronic and problematic since the 1980s, the unemployment rate has been decreasing since 1997. Transformation of the economy and proper policy is required to decrease structural unemployment and regional imbalance. As table. 3.4 shows, purchasing power in the EU is smaller than in the USA. As well the share of employed labor in EU is 61%, while the USA has 74%. The big gap between the EU and the USA is in the service industry. The structural unemployment rate escalated from the second half of the 1970s and after 1982, recorded over 8%, except in 1990.

Since the mid 1990s, unemployment has improved (Grimwade, 2001: 161), but there were problems: First, the movement of labor between member countries is less than in a single country like the USA. Unemployed people are not moving to find jobs in other member countries. Second, there is no flexibility in the job market owing to a strict lay off system and high wages; therefore, enterprises are willing to use machines rather than people.

Even though new industries such as IT and biotechnology require much labor, the supply of skilled workers does not meet the demand and immigration law is strict with regard to absorbing foreign workers. Third, the service industry lags behind other developed countries like Japan or the USA. The labor market requires new workers who have creativity and professionalism rather than unskilled workers. With those problems, the EU agreed to execute an employment policy in 1990 to develop the labor market and systems and launched it at an employment summit in Amsterdam in 1997 (Kassim, 2000).

Table.3.4 Sectoral Total Employment of Labor in EU, its Members, and USA (Unit: %)

Sector	USA	EU	German	Holland	France	Italia	England	Ireland	Spain
GDP/ person	27.8	19.1	20.9	20.0	19.9	19.6	19.0	18.7	14.8
Agriculture	1.9	3.0	1.8	2.5	2.8	3.3	1.3	6.3	4.0
Mining	0.4	0.2	0.4	0.1	0.1	0.2	0.3	0.3	0.3
Manufacturing	11.9	12.3	14.7	10.6	11.3	11.5	13.3	11.1	9.2
Construction	4.7	4.7	5.7	4.1	4.0	4.0	5.0	4.7	4.8
Electric, gas, and Water	0.7	0.5	0.6	0.4	0.6	0.5	0.5	0.5	0.3
Wholesale, and Retail sale	12.4	9.1	8.8	11.0	8.1	8.6	11.0	8.2	8.1
Hotel and restaurant	5.1	2.5	2.0	2.2	2.0	2.3	3.3	3.2	3.0
Transportation, Warehouse, and Telecommunication	4.1	3.6	3.3	4.0	3.8	2.8	4.6	2.7	2.8
Finance service	3.4	2.1	2.2	2.4	1.9	1.7	3.1	2.1	1.3
Business service, Real estate	7.7	4.6	4.3	7.0	5.2	2.8	7.0	3.6	3.0
Government and Regional public Organization	3.3	4.6	5.5	5.3	5.6	3.9	4.2	3.0	3.2
Education	5.7	4.1	3.3	4.3	4.5	3.9	5.3	3.8	2.9
Health and social Work	8.5	5.7	5.7	9.5	6.3	3.0	7.8	5.0	2.7
Other service	4.3	3.4	3.3	3.1	4.0	2.7	4.2	3.4	3.1
Total	74.0	60.5	61.8	66.7	60.1	51.3	70.8	57.8	48.6

Source: European Commission (1999). Employment in Europe 1999, p87.

The new employment policy contains four main policies and 22 guidelines. Member countries enact national action plans for employment (NAPs), based on new employment policy and the European council evaluates the conditions of execution. Table. 3.5 explains the main policy for improving the productivity of labor.

Table. 3.5 Employment Policy

Improving employability	
Group	Contents of guideline
Prevention of Long term Unemployment	(1) support of restart for unemployed young persons within 6 months) (2) support of restart for unemployed persons of middle or advanced age (within 12 months)
Conversion to Active policy	(3) conversion to active labor market policy (over 20% of application) (4) reform of wage system and tax
Support of Cooperation	(5) cooperative approach between labor and management (6) strengthening life long learning by government, labor, and management
Support of Fluent movement From academy to work place	(7) improvement of school education (reduction of dropout) (8)provide practical education for new graduates (Internship, computer education, and internet access)
	(8) integration of labor market for handicapped person, immigrant and other disadvantaged person.

Developing entrepreneurship	
Group	Contents of guideline
Support for Enterprise and Employment	(10) Reduction of tax and administrative burden about enterprise and new employment (11) business support for an independent enterprise
Development of New opportunity	(12) development of regional new business and improvement of employment agency (13) full development of service industry (business service, information service, and service in environmental sector)
Tax system for Employment Promotion	(14)alleviation of labor taxation and a share of enterprise for welfare dues (15)reduction of value-added tax in the labor intensive service industry

Encouraging adaptability	
Group	Contents of guideline
Modernization of Labor organization	(16) flexibility of employment system for productivity and strengthening competitiveness (discipline, introduction of new technology, new form of labor, labor time, use of part time) (17) reform of labor law for flexibility of labor system (18) supporting human development system

Strengthening equal opportunity	
Group	Contents of guideline
	(19) abolishing discrimination between and female about four main policy
	(20) decreasing gender gap
	(21) completion of service for working in home and work place
	(22) harmonization for reentering labor market

Source: European Commission (1999). On the Implementation of Member States' Employment Policies (COM [99]).

Those guidelines provide the contents of institutional arrangements. Labor has to discipline itself to adapt to the new economic circumstances. Also, member states have to develop entrepreneurship, which will increase employment in existing and new enterprise. The objective of this policy is to simplify the administration process, and expand venture capital market, and alleviate the burden for business of corporate tax and social insurance. Entrepreneurship was promoted in the process of education and training to encourage risk in new business. In addition, encouraging adaptability will restructure the job market and support development of human capital and cooperation between labor and management. This policy is designed to generate flexibility in the labor market to accelerate competition and innovation. Finally, this policy is to provide equality of race and gender and remove other discrimination in job market.

Those four main policies were introduced to generate “jobs for people” and “people for jobs”. The objective of those policies is to realize full employment through reform of institution and development of human capital, the main reason for unemployment in the EU. The government enacted a system to support long term unemployed persons through aid to restart job education, to encourage life long learning and to reform school education. With the active intervention of the EU, the unemployment rate is decreasing and the economy and job market is improving.

4. The Lesson for Inter Korean Economic Integration

The effort to establish the European Union suggests a lesson in the advantage of gradual progress and stages using institutionalization for transition of and productivity growth in North Korea: The EU started with a customs union and developed to a common market and then a currency union. This provided an environment for technological conversion, transfer and on going innovation. Even though EU tried to integrate from the political sector, the effort failed and brought recognition that integration should be a gradual progress. Gradual progress from the economic sector is a valid integration method, but economic as well as political integration can not be intensified without the cooperation of pure economic and technological sector. That is to say, the neo functionalist theory in which the action of one sector spreads automatically to other sectors has limits in the EU model. The functional ripple effect in one sector is confined to limited sectors. For example, the struggle between countries in the early stages of the process and over customs union caused an integration crisis. This example provides the lesson that the neo functionalist argument, which separates economic and technological sectors from the political sector, is idealistic and is distanced from reality. Inter Korean economic integration can also be solid with the support of political cooperation, that is, the enlargement and enforcement of political decision making is one of important factors to spur Korean integration.

The federal aspect of economic integration, establishing a single market in finance, industry, currency, and labor, was made possible by institutionalization and the having supranational institutes. The European Union has satisfied demand and supply conditions of integration for technology conversion, while creating positive and negative

externalities. The establishment of Treaties such as the Treaty of Rome, the Single European Act, and the Maastricht Treaty was important structure to allow deepening and widening of economic integration. This allowed the EU to achieve economic benefits and dynamic development of technology such as reduction of goods and service price, scale of economy for technology spillover, and enlargement of competition through the movement of essential elements of production: goods and services, capital, and people. This was possible because there were supranational institutes and demand and supply of integration for productivity growth, which becomes possible with technological innovation. Fiscal federalization provides important capital support to underdeveloped areas in the European Union and incentives for integration. Also, industrial federalization allows the development of frontier technology for the development of the EU and necessary technology for underdeveloped areas in EU. In addition, the federal approach to labor developed a productive labor force with technological learning to meet the needs of industry. The labor policy did not neglect the space for the labor and their needs, which are most important for development.

The model of the EU provides the lesson that Korea needs a process to reduce the economic distance and restructure the economic structure with complementary cooperation and coordination of cost and benefit through institutionalization. Support from South Korea, with institutionalization of needs in North Korea, will make the transition of the North Korean economy smooth and integration of the Korean economy sound. Free movement of production factors and technological and capital support are necessary measures to support North Korea and expand the scale of economy to apply new technology on the Korean Peninsula. Even though partial integration from the economic

sector is limited without political agreement, the model of the EU opens the possibility of development to a common market and currency union. As the EU model suggests, Korean integration will also require cooperative development of special industries by establishing supranational institutes. Natural resources such as coal, steel, and nuclear energy, and manufacturing industries are used to develop military power, but can be converted to peaceful purposes through the creation of institutes like ECSC and EURATOM.

The most important lesson from the EU model is that the deepening and widening of economic integration with technological conversion and transfer requires the institutionalization of political coordination, and reinforces the rights of decision making institution as a form of federal government. As the model of the EU demonstrates, the development of federalization, institutionalization with common supra national institutes such as inter Korean summit meetings, cabinet meetings and a council can restrict the economic sovereignty of South and North Korea to expand the common interest of Korea. The economic union of Korea is to regulate economic sovereignty in the crucial issues in trade, currency, finance, technology, and people and gradually transfer the political sovereignty in the issues of defense, foreign policy, and security to a new federal government of Korea. The economic integration will generate confederation and develop to federation as in the political agreements in the EU, which is a lesson for the Korean Peninsula. The institutionalization with supranational institutes would provide the necessary environment for productivity growth and technology transfer as in the case of the EU. This allows space for people during a slow paced integration and participation in the decision making process.

Chapter IV

System and Structure in Manufacturing Sectors and Technology in Korea

1. Introduction

The North Korean economy has experienced a vicious economic cycle including such factors as a lack of foreign currency, lack of daily necessities for people, and lack of food and petroleum; all this following decades of mismanagement. The self-reliant economic system faced great difficulty after the destruction of the cold war system in 1980, and North Korea is struggling to change its economic system in order to fit into the current world economy. For North Korean economic development, support from South Korea is the most important factor to upgrade the out of date economic structure and attract foreign capital in the context of current world economic system. South Korea has to support North Korean reform to generate economic integration, which will benefit each nation. As well, economic integration should not generate economic dependency between South and North Korea, as the experience of Germany demonstrates that dependency will cause mass unemployment and social unrest in the course of, and after, unification. Therefore, in this chapter, the comparison between South and North Korea is discussed to analyze the need of reform in manufacturing industries and the current situation of both economies and to argue the better policy for both economies and economic integration. The lesson from EU provides the needs of institutionalization in economy by establishing political coordination structure with the function of supra national institute. South and North Korea could create a single economy in the long run using the institutional approach. Therefore, a review of the system and structure in the manufacturing sector and its technology in South and North

Korea is important to establish the environment of technological conversion through trajectory. The internal problem is the critical factor needed to analyze structural weakness in both South and North Korea. This is more important than external constraints which caused the dependent development on external markets of South Korea and provides the reason why North Koreans struggle to assure the independence of their economy through a self-reliant economic strategy. Dependency of the nation could be overcome with the dynamic technological adoption and institutionalization for needs of capital, goods and services, and labor with regulation of externalities.

Economic System of South and North Korea

1.1 North Korean Economic System (Self-reliance Economic System to Transition)

1.1.1 The System of North Korean Economy

The North Korean economy is a centrally planned economic system⁸² which is managed by an unproductive and overstaffed bureaucratic state. The numerical value between planned and real production shows a large gap and flexibility is not acceptable to cope with real productivity, because the means of production is allocated by state planning and its agency which keeps the status quo without innovation and is not flexible to deal with externality. Most economic activity is managed under Ju-Che ideology⁸³ which was

⁸² J. Wilczynski classified four types of planned economic system and pointed out that North Korean economic system belongs to the bureaucratic Centralized Model. As his argument, there are four types: 1) The Bureaucratic Centralized Model; 2) The Planometric Centralist Model; 3) The Selectively Decentralized Model; 4) The Supplement Market Model (1973: 2325).

⁸³ Ju-che ideology influenced self-reliance economy. Ju-che ideology means self-reliance or independence. Ju-che ideology was introduced by Kim, Il-Seong in the North Korean Labor Party General Meeting on Dec 28, 1955 (Hwang 1995: 3). The idea, Ju-che is an ideology in general North Korean society which advocates Woorisig (our style) Socialism. In Kyung Nam University Far Eastern Issue Studies, Cho said that, Ju-che ideology is not only a type of ideology, but also completed form of ideology and unified product of ideology which represented as main body to control forms of social constitution and a social organism (1995: 163). Kim, Jeong-Il (1982) advocated in about Ju-che ideology that the theoretical system of Ju-che is comprised of philosophical principle, social and historical principle, and guiding principle (Ibid: 162). There are several differences of Ju-che ideology from Marxism as follows (Ibid: 162-168). First issue is the question of agreement about materialism. Ju-che ideology represents that human is special product in the process of development in materialistic world, in the condition of the idea that change and development is based on

conceived by the former chairman Kim Il-Sung and continued by his son Kim Jeong-Il⁸⁴. The objective of this Socialist economic development is on self-reliance and national economic development through the strength of North Korea itself. The idea was conceived to provide economic independence from external power, therefore, the factors for production such as raw material, fuel and power should be materialized internally in North Korea. The self-reliant economic system followed an import substitution policy which imports necessary products for development. However, a self-reliant economy in North Korea is no longer valid in the national context as it is spurred by nationalistic ideals and a closed socialist economy.

All countries can not be assured of economic development without trade and

materialistic constitution of world and movement. However, the perspective, in which human is master of all existence and decide, has a weak point that Ju-che ideology does not consider a set pattern of social relation which utilize production and possession as a medium. Secondly, the question is the debate on which Ju-che ideology is the theory of class or human. Ju-che ideology explains that Ju-che ideology is not a human philosophy on one's view of life, but epistemology of social philosophy. Ju-che ideology represented that independence is not only product of social development history, but also epistemological axis, based on teleological action of mass of people with class who manipulate a creative role of social development. However, the explainable relationship between individual and mass of people is not clear and important special class in the stage of economic development is conceptualized as a mass of people, which characterized as a eclecticism between theory of class and human. Third question is axiology of Ju-che ideology. The supreme value of Ju-che ideology is independence and the value of labor is contained in Ju-che ideology. Even though the question that independence may be subjective or objective cognition is not mentioned in here, the development of independence through human and teleological and creative action of a mass of people dilute the theory of labor and surplus value in Marxist theory. The argument is that Ju-che ideology is duplication of historical and sur-historical law which exist in every time and society. As well, the axiology of Ju-che ideology was analyzed that it is alienated from Marxist theory in the point that Ju-che ideology is amalgamation of the value of use, scarcity, and efficiency. Fourth question is the relationship between Ju-che ideology and dialectic epistemology. While dialectic materialism illustrates this world as a repetition of new unified material or unity with quantity and quality which are created through explosive process of conflict in change of material movement and discrepancy of antagonistic materials, Ju-che ideology is different from objective materialism and dialectic epistemology as a new ideology. The separated human consciousness form objective materialism and dialectic epistemology could manipulate dialectic material world and the progressive aspect of social unity could be developed more by human consciousness rather than the process of conflict in antagonistic material; therefore, the expansion of independence could be realized out of binding between human, society, and nature. Fifth question is the connection between the theory of a mass of people in Ju-che ideology and Su Ryung Ron (the theory of reader). Ju-che ideology advocates that ideology, guidance, and heart of reader unifies through medium, the party of mass of people which is the master of society as a guiding principle of organization and which plays creative role for historical development. When the mass of people concentrate the energy to reader, the objective or independence of mass of people could be accomplished as a ultimate value (This are translated from Cho. Y. K.(ed)(1995) *Ju-che Ideology and the Economy of North Korea* in the Institute for Far Eastern Issue Studies (ed). *The Depression of North Korean Economy and Challenge*, Kyung Nam University, Seoul: IFEIS: 162- 168.

⁸⁴ North Korea is often criticized as a hermit kingdom or Confusianistic socialist country; owing to the inheritance of the position of chairman of North Korea.

interdependence on external economic actors and systems. The point is that internal development is a way to protect the economy from predatory external influences since power would be in the hands of managers of national, sectoral, and business and labour interest. These managers can check and balance the bureaucrats and minimize the effect of a rich minority who act against external power to protect their own interests. In North Korea, political education over economic gain is very important to integrate individuals into a collective political power; therefore the economy has to comply with political ideologies, specifically the Ju-Che ideology. Figure 4.1 and 4.2 briefly explain the centrally managed North Korean industries and manufacturing sectors.

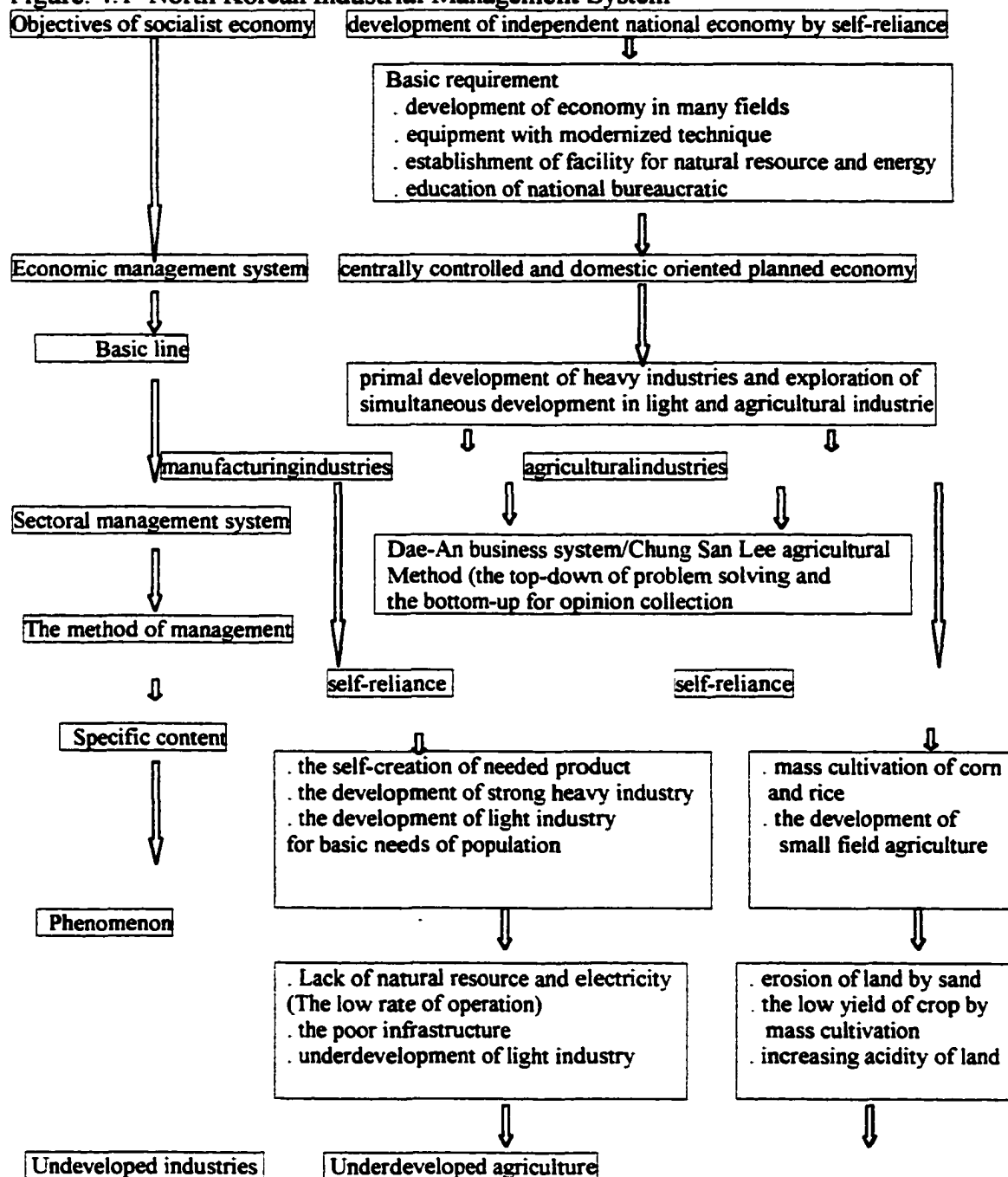
All economic activities in North Korea are conducted solely under the direction of state sponsored plans. Economic plans are drawn out, supervised and implemented under the unitary system centered around the State Plan Committee, and passed down to the provincial, municipal and district levels to the factories and small businesses. Each ministry committee has its own planning department, whose planned figures are all uniformly submitted to the State Planning Committee for its regimentation and coordination.

As Figures 4.1 and 4.2. show, there are certain limitations to the North Korean economic system, driven by Ju-Che ideology as follow.

The first limitation is the non-flexibility of a planned economy, which causes a lack of communication between bureaucrat, economic specialist, and labor. The plan is hypothetical and was established without realistic research of production facility, labor productivity and technology. Therefore, there is a lack of structure able to reflect the ideas and difficulties from the people, especially the labor and economic specialist, because the

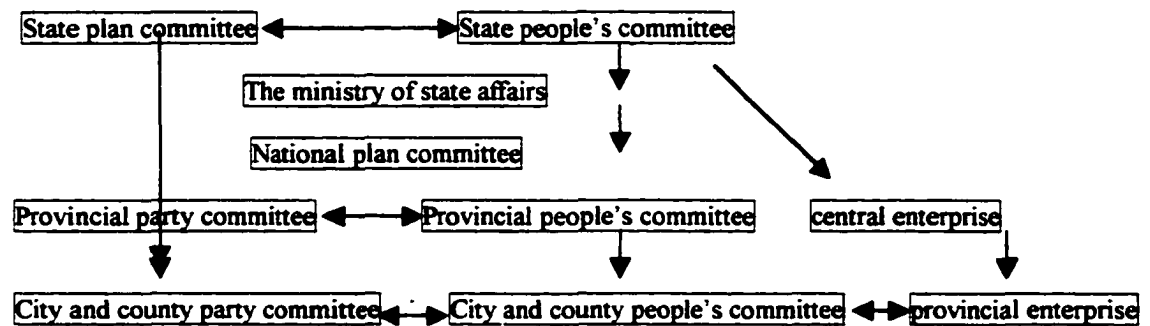
1.1.2 The Limitation of Centrally Planned-Self Reliant Economic System in North Korea

Figure. 4.1 North Korean Industrial Management System



Source: Korean Industrial Bank (1994).

Figure. 4.2 The Management System of Manufacturing



Source: Ministry of unification (1992, 1993); Korean Industrial Bank (1994).

economic plan has to comply with Ju-Che ideology, even though North Korea has a lack of natural resources, technology, and capital. The political relation and administration is much more powerful than economic analysis in North Korea. As well, quotas, allocated by national planning council, cause a falling-off in quality of goods, because labor has to fulfill quotas which government planned without the consideration of the severe circumstance in a workshop, out of date technology and facilities, coupled with a lack of electricity. The bureaucracy and politician do not want to face risk and assume a tendency to follow previous experience. There is no creativity and motivation.

The second limitation is the lack of logical propriety in plan and practice which causes the lack of efficiency, because in terms of goals, the instruction of party line and Chairman is more important than logical propriety. Hence, North Korean planners believe that ideological thought could generate creativity and motivation.

The third limitation is the lack of incentive, caused by socialized means of production. Socialized means of production could not generate the invention and incentives of the labor as North Korean authority feels that social interest, based on social ownership with socialized means of production could be integrated with individual

interest, when the socialized means of production meets the individual interest. Both individual and social group became a symbiosis in social ownership (SSP 1986)

Fourth, changes by the chairman, which are extemporary and willful, have an influence on policy and plans. The factor was planned to allow inputs in certain sectors to be transferred to another sector at the whim of chairman without consideration of the distortion of distribution of natural resources and production factors in a planned economy. These hindered planning which was conceived to generate a balanced economy.

Fifth limitation is a lack of rationality in self-reliant economy which is one of the critical causes leading to North Korean underdevelopment. Self reliant industry (Oh 1992) can be summarized: 1) minimization of dependency from foreign capital and technology; 2) minimization of import and import of machines which were impossible to produce in domestic market; 3) exports exist as tools of capital supply, not as economic development; 4) the priority in military supply production; and 5) minimization of private consumption. As a sub-division, North Korean authority explains self-reliant industry as follow: 1) persistence to keep the principle of self reliance, independence, and invention; 2) overall development to assure everything for economic development and population survival; and 3) development of industries, based on domestic natural resource to keep independence and self reliance of industries (SEP 1979). A practical scheme to accomplish independence industry would include: 1) the development of self-reliant heavy industry based on heavy manufacturing; 2) the development of advanced light industry to assure the basic product for population; 3) internal supply of capital by reducing the value of raw material and increasing productivity; 4) creation of enterprise as a producer and consumer of raw material. The enterprise should find and make things which does not exist; 5)

decentralization of small enterprise to supply needs for province (Ibid: 40)

Sixth, the corpulence of the non-productive sector such as management is increasing, owing to the planned economy and as well political spending by the chairman reduces the capital flow to the production sector.

Seventh, difficulties of constant technological development is another important factor which causes the underdevelopment of North Korean industries and lack of foreign capital, even though North Korea has pushed for an increase of production and improvement of quality through technological development. There are at least three reasons: 1) the quota system is not appropriate for investments of vast amounts of long term capital needed to improve technology; 2) punishment for the failure of R&D, instead of benefits for success; and 3) there is no certain policy to improve quality of product

Consequently, the development of self-reliant industry is far from the reality in which North Korea has had food and electricity shortages. The development of self-reliant industry became a failure which is different from its idealism: independence, self reliance, and security of economic development and improvement of life.

1.1.3 The transition of North Korean economic system

The transition of the economic system in North Korea is proceeding to change planning in the economy in order to improve productivity. The self-reliant policy of North Korea could not improve the productivity and correct economic difficulty. In the ordered economic system, side effects hindered the policy of government owing to irrational production allocation and a false report of quantity of products. Table 4.1 explains the contents of transition and it shows that North Korea is in the beginning of transition.

Table.4.1 the content of change of planning economy in North Korea

	The direction from Kim, Jeong-il, the chairman	The previous policy
Improvement Principle	<ul style="list-style-type: none"> . Guarantee of big actual profit with the extent of adhering to socialist principle . Active creativity to generate new and fearlessly change what need to be . Central organization has a responsibility for socialist party and state 	<ul style="list-style-type: none"> . Socialist system of property . centrally planned economy in the aspect of the construction of self reliance national economy
The plan for Production Management	<ul style="list-style-type: none"> . the transfer of planning rights to regional and sub regional organization . National planning council take charge of strategic and nationally important issues . The planning in detail which is fit for the reality of region, and sub-region except important index like total amount of industrial production, and amount of building infrastructure 	<ul style="list-style-type: none"> . national planning council take a charge of the plan for production management by the principle of unification of planning and planning in detail.
Price policy	<ul style="list-style-type: none"> . The price of produced goods in region is decided by regional factory . State prepares fiscal principle and standard 	National department of price decide price by the principle of price Unification
Economic life	The reduction of free distribution, national compensation, and other sector of benefit except education, medical treatment, and social insurance	National distribution of necessities of Life like food, clothing, and shelter.

Source: Joong Ang Ilbo (August 6, 2002). The contents of direction from Kim, Jeong-il on economy, available: <http://nk.joins.com/article.asp?key=2002080209342850005000>

From the news paper, Joong Ang Il Bo, we learn North Korea is slowly changing its system to overcome the ten year long economic crisis and food shortage. The newspaper states that the North Korean authority investigated all production subjects last year, and found that most of the production reports are false. That realistic investigation gave incentive to change the system of economy and in current North Korea, the transfer of power from the center to region is proceeding. The newspaper feels that changes in North Korea imply important meaning for decentralization of power and its responsibility of it. The realistic evaluation of price was an inevitable step in realizing the incentives of labor and productivity growth.

The movement of North Korean economy is heading toward Asian alternatives like

Vietnam and China while generating its own model of economic transition. There are certain efforts to cooperate with South Korea by establishing institution for joining the technological trajectory and sharing the benefit from the technological innovation

2.2 South Korean Economic System (Transitional Economy: Soft Authoritarian to Market Led)

South Korea features a capitalist system which used a soft-authoritarian system to move to a market-led economy. After its liberation from Japan, South Korea had a period of Import Substitution from 1945 to 1961. This period is interpreted as a setting stage for future development. From the 1960s to 1980s, South Korea accomplished an astonishing growth rate, averaging 9%. There were several distinctive characteristics in South Korean economic development. First, there was a strong import market in the USA and Japan willing to trade for South Korean products. Second, heavy and efficient investment from government and business sector was effective in generating a scale of economy through big conglomerates like Chae-Bols. Third, foreign capital was easy to access in both Japan and the USA. Under the Cold War umbrella, technology and management skills came from abroad, and were indigenized to secure the capitalist system against socialism. Fourth, in the name of social security and stability, wages were kept behind productivity, and with a surplus of labor, South Korea utilized labor intensive industries for export promotion. Fifth, state policy was compiled for export promotion, which is referred to as a distortion of market function and then the development of market function, which is referred to as equilibrium. There was a certain level of mixture between distortion and market function. From 1963 to 1973, South Korea was in a market-oriented phase which focused on labor-intensive exports with widespread subsidies to accumulate foreign exchange for large scale

industries. Credits were controlled by government, rather than small enterprise and given to large enterprises to generate the scale of economy. As well, high interest rates supported by governmental propaganda facilitated domestic saving for national development, while imports were prohibited to protect the market. From 1974 to 1981, ISI methods were used to promote new industries such as steel, ships, pharmaceuticals, and electronics. Interventionist policies, which have a protection measure, were followed to nurture the indigenous industries. From 1981 to 1989, South Korea complied with a neo-liberal approach, while generating and protecting infant industries like automobile and semiconductor production. Mature industries, such as labor intensive industries were opened to the international market to subsidize other immature sectors. Capital flows from affiliate to affiliate in chaebols, and from bank to big conglomerate happened often with governmental approval. From 1990 to 1996, South Korea expanded its capital to overseas markets, especially to South East Asia in the form of Foreign Direct Investments. This phenomenon resulted from wage increases between 1987 and 1989. Non-competitive labor intensive industries were transferred from the domestic market to overseas markets to find cheaper labor cost, but capital intensive and technology intensive industry could not generate new technology which had comparative advantages in international market, and these companies were caught by cheap South East Asian products. The loss of comparative advantage in labor intensive industries and slow technological development became a serious problem, followed by financial crisis and IMF Structural Adjustment Programs. In 1996, despite arguments of both interventionist and liberalisers on globalization and liberalization, South Korea determined the pace of liberalization and internationalization and became the 29th member of the OECD. This membership required a liberalization of

the economy. Liberalization without preparation of domestic industries, especially in the financial sector, made South Korea vulnerable to external financial shock. 1996 to 2001 was a period when the interconnection between government, conglomerate, and bank was uncovered and problematized into an economic crisis⁸⁵. Historically, South Korea built a development relationship between sectors such as government, conglomerate, and bank. In the process government intervened in capital flow from bank to conglomerate, corruption and financial weakness, which could be concluded as financial crisis, arose in 1997. South Korea could not avoid restructuring owing to its obligation to IMF debt, the voice of the interventionists went unheard and exposed the economy to external markets. With liquidation allowed by capital from IMF and World Bank coupled with structural adjustment of the financial sector and big conglomerates, the economy revived to sustainability. However the main reason was a high rate of economic growth and demand for South Korean products from the United States in the computer and information technology industry. On August 23, 2001, South Korea repaid all debts to IMF and could now avoid external interference. However the struggle to find the right balance between intervention and liberal approach during worldwide depression is still an important issue. Current economic performance in South Korea is focused on the domestic market and separates the economy from the external influence of USA and Japan to raise independent

⁸⁵ Scholars in IMF and other scholars such as Krugman (1998), and Folkerts-Landau et al (1995) blamed the imperfect relationship between government, business sector, and financial sector and pointed out it as a major cause of Asian Economic Crisis or financial crisis. If IMF and Krugman accused internal cause of economic crisis, there is alternative view on Asian economic crisis. Other scholars such as Radelet and Sachs (1998) and Kumar, R and Debroy, B. (1999) argued that the cause of Asian economic crisis was external influence such as market participant panic, conspiracy, and Japanese responsibility. While IMF and Krugman focused on issues of current account deficit, short-term debt, and fragility of the financial sector, alternative view argued on trade shock and slowdown in exports, and structural imperfection of globalization. As alternative view pointed out, there was trade shock and slowdown of export in South Korea, due to oversupply and over competition between countries in region. At that time, South Korea had two obstacles which caused trade shock and slowdown of export: competition from other developing countries and innovation of industries to compete with developed countries.

economic performance. Even though, presently, there is a deep depression in the USA and Japan, the prospected growth rate for this year is over 6%, while other countries in Asia have slow economic forecasts linked to the economic depression of the USA and Japan.

The South Korean economy is moving on uncertain paths of development, which are different from the Japanese and American economic models. The transition of economy from export led to balanced economy between export-led and import substitution has been met to generate the dynamic technological trajectory and innovation.

2. The Structure of Industries and Technology

3.1 The Structure of Industry between South and North Korea

3.1.1 The Structure of Industry in North Korea

3.1.1.1 the structure of industry

Since the 1950s, the heavy industry prioritized policy has caused unbalanced economic development in North Korea. The under-development of light industry and lack of investment in infrastructure became obstacles to cope with economic slowdown following the 1980s. North Korea began to feel the limitation of development without S&T, R&D, and trade with other countries. In 1984, North Korea established an economic cooperation law (Hap-Young-Peob) to improve the technological development and quality of life through emphasizing economic independence, conversion of science, and modernization. As well, a three-year plan to develop science and technology was implemented in 1988. In 1991, a second three-year plan was established, but the conversion of science and modernization was politicized as a tool to assure the economic independence. There were constraints on investment from other countries and North Korean policy could not deal with the need of external interests. Consequently, the closed

economic system became a deeper pit than ever.

From the 1990s, with its failure to attract foreign investment, North Korea instituted foreign investment and cooperation law, and publicized Na-Jin and Seon-Bong region⁸⁶ as a free trade zone. However, the result was very poor because the value of the region was devalued by poor infrastructure and insufficient commercial law to attract foreign investment. In 1993, North Korea agreed that the Third Seven Year Plan failed and made a buffer period for three years to continue the development of agricultural and light industry, and put a priority on trade with foreign market. Table. 4.2 explains that North Korean heavy industry has decreased since 1993. This phenomenon is caused by the decrease of productivity with the burden of old technology and energy shortages after the destruction of the socialist bloc, which has influenced the policy change from concentration on heavy industry to light industry and trade since 1993.

However, the growth of light industry is steady, because the North Korean policy is undermined due to poor infrastructure and insufficient laws for attracting foreign investment

⁸⁶ According to North Korea International Economic Promotion Agency (1992), Na-Jin and Seon-Bong area was established as Free Trade Zone which is an international transportation center in East Asia, export processing zone, and intermediary export processing zone with the function of trade and finance. North Korea planned to develop this area in three stages: first stage (1993-1995) was a period to prepare the function and role as a international transportation center by repairing infrastructure such as railroad, road, and harbor and establish the environment of investment; second stage (1995-2000) was a period to fortify the role as an international transportation center, while attracting foreign investment for export promotion in manufacturing sector; and third stage (2001-2010) was a period to develop the Na-Jin and Seon-Pong as an international transportation center which generally equipped trade, export processing, tour, and finance sector. In order to accomplish three stages, North Korea planned to connect road and railroad between North Korea and China and Russia, and expand the ability of cargo work by 20 million ton as first stage project. As a second project, North Korea planned to construct highway, Woongsang and Kwankog industrial park, and expand the ability of cargo work by 50 million ton. As a third project, the construction of Hoochang and Hongwi industrial park was planned, while expanding the ability of cargo work by 100 million ton. North Korea especially welcomed South Korean Industries, while reducing intergovernmental negotiation which affect the existence of North

Table. 4.2 Gross Domestic Product by Sector (% of total 100%)

		1993	1994	1995	1996	1997	1998	1999	2000
Agriculture, forestry and fishing		27.9	29.5	27.6	29.0	28.9	29.6	31.4	30.4
Mining and manufacturing		32.9	31.4	30.5	28.0	25.5	25.6	25.6	25.4
	Mining	8.2	7.8	8.0	7.1	6.7	6.6	7.3	7.7
	Manufacturing	24.7	23.6	22.5	20.9	18.8	19.0	18.3	17.7
	Heavy industry	17.9	16.6	15.7	14.0	12.3	12.6	12.2	11.2
	Light industry	6.8	7.0	6.8	6.9	6.5	6.4	6.1	6.5
Electricity, gas and water		4.8	4.8	4.8	4.3	4.3	4.2	4.5	4.8
Construction		8.5	6.3	6.7	6.4	6.3	5.1	6.1	6.9
Services		25.9	27.9	30.3	32.3	35.0	35.6	32.4	32.5
	Government	16.8	18.6	20.7	22.5	25.1	25.3	22.8	22.6
	Others	9.0	9.3	9.6	9.7	9.9	10.3	9.6	9.8

Source: The Economist Intelligence Unit (1997); The Bank of Korea (2001).

3.1.1.2 Basic economic policy and planning

3.1.1.2.1 Self-reliant National Economy

Based on the principal of self-regeneration, North Korea applied the economic policy for building a self-reliant national economy which met the domestic demands, while fulfilling the material development needed for technological renovation and expanded reproduction. However, since the 1980s, its attempts at economic development through a pure internal mobilization of the economy had reached their limits. Currently, North Korea recognizes the needs for foreign trade and economic cooperation with other nations and takes more pragmatic moves aimed at meeting utilitarian ends. Such moves are shown in its establishment of the Rajin-Seon Bong Free Economic Zone, enactment of the Law on Attraction of Foreign Investment, strong interest in the trade and economic cooperation with the South Korea, and promoting the Mt. Kumgang Tour Project⁸⁷. But North Korea

Korean system (Lee 1998: 90).

⁸⁷ Mt Kum Kang Project is managed by Hyundai Group and supplied vast amounts of capital to North Korea. Because of this project, many South Korean visited Mt. Kum Kang in North Korea.

still maintains its ideological stance in the self-reliant national economic lines, emphasizing North Korea as standing up against the invasion attempts to integrate the world economy.

3.1.1.2.2 Heavy Industry First Policy

North Korea has been promoting heavy industries⁸⁸ as the top-priority in economic development policies, and proclaimed that heavy industries are the core foundation in developing people's economy. While supporting heavy industries, there has been a deepened structural imbalance between industries resulting in failure of agriculture and a loss of social capital. However, North Korea is still emphasizing the importance of heavy industries and struggling to normalize the priority sectors of power supply, coal mining and metal production which had caused economic recession. This is because the development of heavy industry is related to the development of military strength, and North Korea can not give up its fight for the independence of economy and politics against capitalist economy.

3.1.1.2.3 The development plan and achievement

(a) The first seven-year plan (1961-1967)

The first seven-year plan was the first economic development plan in terms of concentration and quality. Table. 4.3 illustrates the major policies and performance in this period. North Korea introduced a heavy industry first policy and internalization of industries with development of defense economy.

⁸⁸ Heavy industry was considered as a fundamental sector which has linkage effect to consumer product and base development of other industries (Hwang 1995: 8).

Table.4.3 The First Seven-year Plan

Major policies	Develop heavy industries Simultaneous development in light industries and agriculture Technological innovations throughout the nation Cultural revolution and improvements in people's living qualities
Performance	Accomplished 72.2% of the industrial objective Accomplished 57-67% in agricultural products Accomplished 50-70% in marine products

Source: KOTRA (2001).

The Sino conflict between 1961 and 1962 promoted economic self-reliance and the heavy industry first policy to achieve economic independence. However, the economic plan failed due to concentration on resource allocation for defense industry and reduction of aid from the former Soviet Union and China (Hwang 1995: 6-7).

(b) Extension of the first seven year plan (1968-1970)

This period is established to complete the objectives of first seven-year plan. Table. 4.4 explains the major policies and performance.

Table. 4.4 Extension of the First Seven-year Plan

Major policies	Synchronized development in economy and military Promote technological innovation and strengthen the munitions industry
Performance	Coal and power supply

Source: KOTRA (2001).

(c) The six-year plan (1971-1976)

The six-year plan was initialized to introduce foreign capital and develop infrastructure of a self-reliant economy in terms of technology. Table. 4.5 explains the main policies and performance.

Table. 4.5 The Six-year Plan

Major policies	Modernize industrial facilities and promote technological revolution
Performance	Steel and cement sectors fell short of the target, and construction of refineries (commenced the construction of petrochemical Industry)

Source: KOTRA (2001).

The plan was imbedded in three-technology revolution business: the reduction of gap

between heavy and light industry; the reduction of income between agricultural and industrial labor; and the alleviation of women's household labor. The objective of the six-year plan was accomplished with technology introduction and capital from abroad. However, the increase of short-term balance of payment and import caused economic crisis and deepened the self-reliance economic policy. For a transition economy, the shortage of technology transfer and capital drove North Korea to the edge of economic crisis. (Hwang 1995: 7-8).

(d) Intermediate period (1977)

This period is complementary to fulfill the objective of a six-year plan. Table. 4.6 demonstrates the major policies and performance.

Table. 4.6 Intermediate Period

Major policies	Achieve production targets of steel and cement during the Six Year Plan Improve transportation
performance	Achieved unaccomplished goals of the Six Year Plan

Source: KOTRA (2001).

(e) The Second Seven Year Plan (1978-1984)

The objective of the second seven year plan was the independence and modernization of the economy; frugality drive; international trade promotion; modernization of transportation. Table.4.7 illustrates the major policies and performance in this period.

Table. 4.7 The Second Seven-year Plan

Major policies	Scientific management of economy and eradicate bureaucratic behaviors Promote technological renovation and develop petrochemical industry Reduce production cost and reinforce the frugality movement Modernize transporting means Adopt self-supporting accounting system
Performance	Announcement in ten major perspectives for 1980s Achieved grain and textile production targets Endeavored to attract foreign business in hopes to adopt advanced technologies and joint-venture system in September 1984 Electrification of 60% (2,700km) of all railroads Accomplished 50% of the goal in basic construction sector

Source: KOTRA (2001).

However, the objective was not met because of the condition of lack of technology transfer and capital. Consequently, the heavy industry first policy deepened in the circumstance of shortage of capital and technology transfer deepened economic depression. The concentration and increase of labor productivity passed the limitation without modernization of machinery and infrastructure (Hwang 1995: 8-9)

(f) Adjustment period (1985-1986)

Adjustment period was implemented to extend the object in second seven-year plan.

The major policies and performance is explained in Table. 4.8.

Table.4.8 Adjustment Period

Major policies	Promote ten major perspective objectives for the year of 1980 Initial developments in fundamental industries (such as fuel, power, and transportation) Place emphasis on construction of essential fields
Performance	Completed Grant Floodgate in West Sea Failed to announce the performance figures of industrial and agricultural production Decreased in the growth rate of national fiscal income Preparatory adjustment period for achieving higher goals in the Socialist economy development

Source: KOTRA (2001).

(g) The Third Seven Year Plan (1987-1993)

The third seven-year plan was planned with the same objective as the second seven year plan, but ended without accomplishment of its goals, due to on external shock, the destruction of the socialist bloc. Table.4.9 illustrates the major policies, but there is no release of performance, due to an unsuccessful result in North Korean industries. North Korean economic depression deepened because of a shortage of energy due to petroleum cuts from former Soviet Union and China and environmental damage (Hwang 1995: 7-8).

Table. 4.9 The Third Seven-year Plan

Major policies	Promote technological innovation and realize ten major goals Improve the living necessities of the people Expand and develop foreign trade and economic projects in cooperation with foreign countries Plan for 7.9% growth rate in annual average
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Source: KOTRA (2001).

(h) Intermediate Period (1994-1996)

North Korea established the intermediate period to recover from the economic depression as table 4.10 demonstrates, but the performance was poor. Since 1996, no economic plan has been released.

Table. 4.10 Intermediate Period

Major policies	Place priority in the people's economic sectors such as coal, power supply, railroad transportation fields, while continuing with the steel industry development Put priority on agriculture, light industry and trade
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Source: KOTRA (2001).

Consequently, even though North Korea accomplished rapid economic development until the mid 1970s, the North Korean economy experiences severe difficulties including the side effect of its closed-door policy. This led to the shortage of international experience, capital introduction, technology transfer and foreign currency coupled with an imbalance of industrial structure especially the shortage of light industry and consumer product production, inefficient use of resources, and the limitation of growth in labor productivity. North Korea realized that open-door policy is necessary to overcome economic problems, but unfortunately the destruction of the socialist bloc deepened the economic destruction in North Korea (Hwang 1995: 9-10). Now North Korea is looking for investment and technology transfer from South Korea and western industrialized countries.

3. 1. 2 The Structure of Industry in South Korea

The South Korean economy has grown rapidly in the manufacturing sectors and services sectors, while primary sectors such as agriculture, forestry, fishing, and mining decreased. There is steady increase of the manufacturing industry and financial and business service while agricultural, forestry and fishing are decreasing as table.4.11 demonstrates.

Table.4.11 Gross Domestic Product by Sector (% of total)

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Agriculture, forestry And fishing	8.1	7.4	7.0	6.6	6.4	5.7	4.9	5.1	4.6
Mining and quarrying	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.3
Manufacturing	29.6	29.3	29.8	30.3	30.3	25.7	30.9	30.7	31.5
Construction	11.5	11.8	11.4	11.3	11.3	14.6	10.1	8.7	8.2
Electricity, gas and water	2.2	2.3	2.4	2.4	2.5	2.3	2.4	2.7	2.8
Trade, hotel, restaurant	12.8	12.6	12.6	12.5	12.4	11.3	10.27	11.3	12.0
Transport, storage and communications	7.1	7.3	7.5	7.8	8.3	7.3	7.1	6.8	6.5
Financial and Business services	16.2	17.2	17.4	17.2	17.2	17.6	19.5	19.7	19.0
Government services	6.8	6.6	6.2	5.8	5.5	8.3	10.5	10.0	9.9
Total including others	100	100	100	100	100	100	100	100	100

Source: Bank of Korea, Monthly Statistical Bulletin; National Statistic Office (2001); KOTRA (2001).

As table.4.12 reveals, there was a decrease of labor intensive industries, especially in apparel and accessories, footwear, and textile industries owing to an increase of labor cost in South Korea. Companies, which had made traditional staples such as clothing, footwear and toys, moved to South East Asia countries like Thailand and Vietnam or have gone out of business since 1989. South Korean industries need innovation and development of technology to overcome two obstacles: competition from other developing countries and innovation of industries to compete with developed countries. South Korea has developed strategic development in the capital intensive and sophistication of products. For instance

computer memory chips, shipbuilding, automobile and high quality apparel became large source of foreign currency.

Table.4.12 Principal Merchandise Exports (\$ Million)

	1993	1994	1995	1996	1997	1998	1999	2000
Food and Consumer goods	2,291.1	2,573.4	2,986.7	3,083.8	3,012.8	2,744.7	2,951.0	2,791.9
Crude material And fuels	3,273.7	3,564.9	4,609.4	6,121.3	7,712.8	7,385.4	7,846.7	11,572.3
Petroleum and derivatives	1,811.0	1,697.2	2,430.2	3,858.5	5,337.1	4,584.5	5,771.2	9,330.2
Light industry Products	24,912.5	26,661.2	30,415.0	32,662.3	33,750.2	32,486.0	29,708.6	30,286.2
Fiber	944.1	1,055.0	1,330.6	1,461.7	1,735.4	1,505.6	1,390.3	1,529.8
Cloths	6,767.1	8,109.4	9,203.0	9,329.8	9,580.1	7,850.4	7,998.2	8,523.0
Clothing	6,217.9	5,680.7	4,968.9	4,226.4	4,194.4	4,653.3	4,869.0	5,024.1
Tires and tube	1,132.0	1,232.9	1,329.8	1,548.7	1,437.3	1,543.0	1,485.8	1,421.4
Apparel and accessories	6,166.0	5,653.0	4,976.0	4,221.0	4,192.0	4,653.0	4,869.0	
Foot wear	2,309.0	1,780.0	1,506.0	1,236.0	982.0			
Heavy industry Products	51,758.6	63,213.8	87,047.0	87,847.8	91,668.5	89,697.0	103,179.2	127,617.1
Chemical and Chemical Products	4,341.6	5,558.5	7,976.8	7,922.8	9,333.2	9,016.8	9,408.8	12,144.7
Metal goods	7,991.7	7,713.4	9,951.3	8,544.1	9,942.5	11,118.7	10,308.4	11,362.5
Machinery	5,037.5	6,526.0	8,682.4	9,427.7	10,189.0	10,064.0	11,593.7	11,997.0
Passenger car	3,372.2	3,838.9	6,551.2	8,254.7	8,634.6	8,167.1	9,416.7	11,101.6
Vessels	4,060.6	4,944.8	5,532.8	7,127.3	6,519.7	8,014.1	7,490.3	8,229.4
Electronic and Electric products	19,780.5	25,189.2	35,016.5	34,021.4	36,744.9	34,284.4	45,806.7	62,043.0
Electric home Appliances	5,644.6	6,355.1	6,787.8	6,766.0	5,678.6	4,652.9	5,732.6	7,033.3
Information and Communication Equipment	5,383.9	6,058.7	7,761.8	8,585.8	9,654.7	8,923.6	16,742.4	28,119.6
Semi-conductors	7,025.9	10,636.1	17,695.4	15,237.3	17,723.7	17,608.5	18,850.5	21,275.1
Total	82,235.9	96,013.2	125,058.0	129,715.1	136,164.2	132,313.1	143,685.5	172,267.5

Source: KOTRA (2001).

3.1.3 Structural Comparison of Industry in Korea

The gap of GNP between South and North Korea has widened since the 1980s as table.

4.13 illustrates. The gap of GNP represents that the economy of North Korea is twenty one times smaller than South Korea and GNP per head demonstrates that the gap is about 8 times between South and North Korea.

Table. 4.13 The Comparison of GNP

		1980	1987	1990	1993	1996	1999
GNP(\$Billion)	South Korea	60.3	128.4	237.9	328.7	484.8	406.9
	North Korea	13.5	19.4	23.1	20.5	21.4	22.6
GNP Per Head (\$)	South Korea	1,589	2,826	5,569	7,466	10,650	8,490
	North Korea	758	936	1,064	904	910	1,000

Source: Korea Statistics Office (2001); the Economist Intelligence Unit (1997). Country Profile: South Korea and North Korea, London: EIU.

As table. 4.14 indicates, agriculture and fishery industries account for about 30% of the North Korean industrial base, while service industry occupied 40%. North Korea shows the typical industrial structure of underdeveloped countries.

Table. 4.14 The Comparison of Industrial Structure (%)

	1987		1990		1993		1996		1999	
	South	North	South	North	South	North	South	North	South	North
Agriculture, forestry and fishing	10.5	20.0	9.0	26.8	7.4	27.9	5.8	29.0	5.0	31.4
Mining and Manufactur	43.3	60.0	28.9	56.0	43.0	46.2	43.0	28.0	43.5	25.6
Service and Miscellaneous	46.2	20.0	62.1	17.2	49.9	25.9	51.2	43.0	51.5	43.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: The Ministry of Unification (2001); World Bank Annual Report (2001); The Korea Development Bank (2001); The Bank of Korea (2001).

The high share of the service industry is due to expansion of the government sector in the centralized planning system. North Korea has abundant natural resources compared to South Korea. In 1999, the mining industry occupied 7.3% of the GDP compared to 0.4 % in South Korea. Light industry has been regarded as less crucial than heavy and munitions industry, and it has caused an imbalance in the North Korean economy. Table. 4.15 implies that while South Korean light industry has been decreasing, due to the maturity of light industry and heavy industry has been increasing due to investment and innovation of high tech industry, North Korean heavy industry has been slowly decreasing since 1990 and reached the 1980 level and light industry is has been slowly increasing since 1990 and

reached the 1980 level.

Table. 4.15 The Comparison of Structure in Heavy and Light Industries in Industrial production between South and North Korea

		1980	1990	1991	1992	1993	1994	1995	1996	1997	1998
South Korea	Heavy industry	51.2	62.4	65.1	65.8	69.1	70.0	73.1	73.4	75.4	77.1
	Light industry	48.8	37.6	34.9	34.2	30.9	30.0	26.9	26.6	24.6	22.9
North Korea	Heavy industry	64.8	74.1	73.3	69.1	72.5	70.3	69.8	67.0	65.4	66.3
	Light industry	35.2	25.9	26.7	30.9	27.5	29.7	30.2	33.0	34.6	33.7

Source: The ministry of Unification (2001); Korean Bank (2001).

In 1999, North Korean light industry recorded 33.3% of industrial production, while heavy industry occupied 66.7%. On the other hand, South Korean light industry recorded 21.7% of industrial production, while heavy industry occupied 78.3%. The decrease of light industry in South Korea is because the labor intensive industries are moving to other countries to take advantage of cheap labor. However, the North Korean heavy and light industries have a structural problem⁸⁹ that is represented in table. 4.15. Even though North Korea has cheap labor, its industrial structure does not show that North Korea is taking comparative advantages of its labor cost. There is underdevelopment of light industries in North Korea, which could be base of North Korean industry for comparative advantage in their cheap labor.

3.1.4 Inter Korean Trade and Cooperation

3.1.4.1 Inter Korean trade

Inter Korean trade has grown since the publication of special declaration on South and North Korean Relation and enactment of South and North Korea Trade Guide in 1988

⁸⁹ The most characteristic structure of North Korean industry is the prioritized heavy industry which is considered as a strategic sector and can show the superiority of socialism over capitalism. North Korea, like other socialist countries, assumed that the development of heavy industry would extended the proliferation of other industry and reduce the dependency of light industry on capitalist countries, because the means of production, which is provided by the heavy industry, can perpetuate the development of over all economy. As well, the heavy industry was considered as a strategic sector to develop defense industry, in the circumstance that the North has an ideological competition against South Korea, and the founders, as a actors of North Korea, who were mainly from a military background, emphasized the economic factors such as natural

as table.4.16 demonstrates.

Table.4.16 Inter Korean Annual Trade

Year	Import		Export		Total	
	Items	\$(1000 dollar)	Items	\$(dollar)	Items	\$(dollar)
1988	4	1,037	N/A	N/A	4	1,037
1989	25	18,655	1	69	26	18,724
1990	23	12,278	3	1,188	26	13,466
1991	44	105,719	17	5,547	61	111,269
1992	76	162,863	24	10,563	100	173,426
1993	67	178,167	38	8,425	101	186,592
1994	73	176,298	92	18,249	159	194,547
1995	105	222,855	174	64,436	265	287,291
1996	122	182,400	171	69,639	280	252,039
1997	140	193,069	274	115,270	385	308,339
1998	136	92,264	380	129,679	486	221,943
1999	172	121,604	398	211,832	525	333,437
2000	203	152,373	505	272,775	647	425,148

Source: Korea Trade Investment Promotion Agency (2001).

Since 1988, trade was increasing through indirect trade. When South and North Korea joined the United Nations in 1991 and publicized the Inter-Korean Basic Accords, the direct trade and processing on commission has been increased in the sector of textile, machinery and electronics. Producing products to order for South Korea mainly involves light industrial products which utilize the cheap and good quality of labor in North Korea (KIEB 1994).

From the data of Korea Trade-Investment Promotion Agency, the amount of inter Korean trade is the third largest for the North Korean economy after China and Japan, and occupied 14.2% of North Korean total trade in 1997. As well, the volume of export from North Korea to South Korea is the second largest for North Korean economy after Japan, and occupied 21.3% of total exports. Therefore, South Korean imports from North Korea has contributed to the North Korean economy and represents a source of foreign

resource, technology, and capital.

exchange for North Korea since 1988 (KOTRA,1997: 33).

Table. 4.17 Structural Percentages of Bring in Products to North Korea

Item	1995		1996		1997		fluctuation Rate(%)
	\$(thousand)	%	\$(thousand)	%	\$(thousand)	%	
Agricultural and Forestry	17,768	8.0	12,055	6.6	10,402	5.4	13.7
Fishery	2,692	1.2	9,599	5.3	14,572	7.5	- 51.8
Mineral	3,001	1.3	1,750	1.0	257	0.1	85.3
Steel and Iron	165,590	74.3	107,611	59.0	96,024	49.7	10.8
Textile	28,852	13.0	45,039	24.7	47,717	24.7	5.9
Chemical	56		73		12,644	6.5	17,220.5
Machine and electronics	15		1,800	1.0	3,449	1.8	91.6
Light water reactor for unclear plant	N/A	N/A	N/A	N/A	2,788	1.4	N/A
miscellaneous	4,881	2.2	4,472	2.5	5,216	2.7	16.6
total	222,855	100	182,399	100	193,069	100	5.8

Source: Ministry of unification (2001).

Note: chemical products occupied 0.02 % (1995), and 0.04 % (1996).

As table. 4.17 and 4.18 illustrates North Korean exports to South Korea are mainly primary products and raw material, and its imports consist mainly of secondary textile and chemical products.

Table. 4.18 Structural Percentages of Bring out Products from North Korea

Item	1995		1996		1997		fluctuation Rate(%)
	\$(thousand)	%	\$(thousand)	%	\$(thousand)	%	
Agricultural, Forestry, and fishery	865	1.3	3,165	4.5	8,004	6.9	153.1
Textile	38,793	60.2	42,396	60.9	40,219	34.9	5.1
Steel and Iron	1,559	2.4	103	0.1	586	0.5	468.9
Chemical	11,567	18.0	14,603	21.0	30,670	26.6	110
Machine, electronics	1,806	2.8	3,351	4.8	5,212	4.5	55.5
Light water reactor For unclear plant	N/A	N/A	N/A	N/A	17,842	15.5	N/A
miscellaneous	9,845	15.3	6,023	8.6	12,763	11.0	111.5
total	64,435	100	69,638	100	115,269	100	65.5

Source: Ministry of unification (2001).

The contents of North Korean Trade demonstrates that North Korea has focused on importing food and energy to maintain the North Korean economic system, and exporting

products which easily earn foreign currency rather than exporting products which have effectiveness for technology learning and high product value. Since 1992, North Korea has agreed its failure in the development of the economy is because of prioritization of heavy industry and has applied a policy to develop light, agricultural industry through prioritization of trade. In total trade, the textile industry has occupied its primary sector to earn foreign exchange, but it is decreasing, owing to the decreasing of processing trade with Japan and the lack of energy and electricity. Instead, processing trade in the production of electricity, electronics, petroleum, and computers which has involved collaboration as joint ventures is increasing. For the North Korean economy, the return to Cold War aid system from Russia and China is impossible in the aspect of scale and extent, consequently, the open door to world capitalist economy is inevitable in the current situation of food and energy shortage.

3.1.4.2 Inter Korean economic Cooperation

Since the 1990s, economic cooperation emerged and South Korea became one of the big investors in North Korea, even though there still remains political constraints. The largest investment from South Korea was Mt. Kum Kang Tour by Hyundai and has contributed to North Korean trade and economy. The second largest investment is constructing a light-water reactor in North Korea to prevent North Korea from developing nuclear weapons. Economic cooperation in year 2000 between South and North Korea contributed 57 million dollar surplus to the North Korean economy (KOTRA 2001). Since the year 2000, North Korean trade has increased and seems to be recovering from its 10 year depression. (KOTRA 2001). However, both projects are stopped for economic and political reasons. Except for these two projects, the economic cooperation is identified in the sector of labor intensive industries to assemble and manufacture the products.

Table.4.19⁹⁰ demonstrates the project and amount of investment which was performed during the 1990s.

Economic cooperation is in an initial stance mainly through South Korean investment. The investment from South Korea to North Korea is still small but will be larger in scale in the near future when North Korea decides to open its door actively to cope with external markets. There is the issue of technology transfer which increases the capacity of North Korean economy to reduce the gap of human resource between South and North Korea.

As for other economic cooperation, several projects are in process between South and North Korea. South and North Korea agreed to rail connection from Sinuju to Seoul and Kaeseong to the Unification Bridge which had been disconnected since the Korean War. This project is based on the idea to make the Korean peninsula the center of the distribution industry to connect to Siberia and China by railroad. This project is expected to reduce transportation costs and lead to the development of Siberia in Russia. As well, the railroad from Kaesung to Unification Bridge is expected to develop the Kae-Seong industrial complex which is being constructed. The Kaeseong industrial complex will be developed as a place to combine the South Korean technology and capital with North Korean labor to develop small scale business in which South Korea lost comparative advantages owing to labor cost in the fields of shoes, textile and fiber. As well, the flooding prevention project on the Imjin river will reduce the damage from flooding in demilitarized zone (DMZ) which has kept its environmental value where it was not intruded on by humans (Ministry of Unification, 2001). KOTRA (2001) have a view of North Korean recovery, when South and North Korea expand economic cooperation.

⁹⁰ See Appendix II (p. 147).

3.2 The Comparison of Industrial Technology between South and North Korea

3.2.1 The Comparison of Science and Technology Policy

The technological distance between South and North Korea was growing wider in the 1980s and North Korean economic power began to decrease; therefore, North Korea tried to change its economic policy in order to attract foreign capital and technology. In 1984, the current North Korean chairman, Kim, Jeong-Il (1984) argued that the development of self-reliant economy does not mean closing the door of the economy against externalities. This argument was different from previous technology and economic policies, which is shown in table 4.20 and generated room for open door development and innovation in North Korea. The North Korean chairman of economic planning explained that North Korea had established the base of self-reliance; therefore North Korea could cooperate with foreign countries indicating this is not a dependency on external economies (Yoon 1984). These two arguments have played the role as the base of North Korean open door and technology policy and are embodied in economic policy and law.

There was major change of North Korean policy in 1984, when North Korea concluded the Hab-Young-Peob (Business cooperation law). Hab-Young-Peob became the basic law to establish Na-Jin and Seon-Pong Free Trade Zone. This law introduces open-door and innovation policies, based on self-reliance and principles to attract foreign investment and technology.

North Korea found that indigenous economic development has limitations and requires foreign investment. The Vice Prime Minister of the North Korean government, Kim, Dal-Hyun, introduced the idea that North Korea needed to establish a free trade zone to fortify the self reliant economy system (Yoon 1984). As well, the term, imperialist was

omitted from the constitution and North Koreans justified to themselves that the enemy⁹¹ is invasion, not developed capitalist countries (Seo, 1997: 171). For Hap-Jag-Peob (joint business law) and Foreign business law, which was concluded in October of 1992, Oct 5, drastically changed the North Korean position on capitalist countries in that North Korea

Table.4.20 The Economic Development Strategy and Science and Technology Policy in South and North Korea

	South Korea	North Korea
The strategy of economic development	Export promotion mainly by large conglomerates with emphasis on inter-relationship between heavy, light and agricultural industries	The development of import substitution industries with emphasis on construction of self reliance economy and priority on development of heavy industries, while developing light and agricultural industries simultaneously
Science and technology policy	driving for development of state of art technology to acquire export competitiveness, the development of human resource by the cooperation of government and big conglomerate, and construction of horizontal administration system	The development of independent science and technology to ensure the socialist material base, the combination of popular drive for technological innovation and vertical administration system by the drive of strong party, and the cooperative system between industries and school

Source: Cho, Y. B (1992).

drastically changed the North Korean position on capitalist countries in that North Korea needed to change its trade practices from socialist to capitalist methods and had to practice trade management based on international practice (Lee 1993). Since 1992, North Korea has expressed the importance of exports, which were weak in a self-reliant economy and transformed the policy from import substitution to export driven. Vice Prime Minister, Kim emphasized the concept of trade and stressed that North Korea needed to fortify

⁹¹ North Korean National Peace Unification Committee accused the South Korean ministry of National Defense of considering North Korea as a main enemy. If there is no change, the agreement between South and North can not be processed in this condition. As well, the committee blamed the discourse of South Korean Ministry of Unification which said, "The obstacle of Unification is the system of North Korea". They added

trading with capitalist countries to increase investment in North Korea and pay its debt, during the investment period. Hap-Jag-Peob was targeting Korean Japanese and other Koreans who were living in foreign countries. In 1993, North Korea developed Hap-Jak-Beob and concluded a foreign investment law and a foreign business law which permitted South Korean investment. The policy of North Korea changed from economic cooperation with Japan to cooperation with South Korea after 1993. North Korean law on trade and investment introduced foreign technology, established a trade base, and targeted reasonable use and development of indigenous natural resources which are affluent in North Korea (Seo 1997). The United Nations Development Organization Investment Promotion Service (UNIDO)⁹² suggested that North Korea focus on development in fields which will offer comparative advantages rather than high tech industries (1990).

While North Korea is moving to attract foreign investment and technology, South Korea plans to develop the next generation of technology which will be their comparative advantage in the future. Since the 1950s, South Korean Technology policies have been readjusted to create economic advantages⁹³. When the first five year economic development was launched in 1962, the main strategy was to generate a foundation for industrialization through the development of import-substitution in heavy industries and

that this is a reckless invasion of a respectable North Korean system (Joong Ang Ilbo Dec 12, 2000).

⁹² See Appendix III.

⁹³ S&T were for the first time recognized by government policy makers as an integral part of the national development plan and a number of key institutions were created: Korean Science and Technology Information Center (1962), Korean Institute of Science and Technology (1966), Ministry of Science and Technology (1967), Korean Advanced Institute of Science (1970), Agency for Defense Development (1970), and Korean Development Institute (1971). The conceptual policy underlying the technological effort had been eloquently stated by the Ministry of Science and Technology: "We took the position that domestic R&D is a prerequisite to the sound selection, efficient digestion, and fruitful adaption of suitable foreign technologies. This is a widely recognized, but certainly hard to accept fact of life for almost any developing country. This then implies that priority lies in the sound and efficient utilization of rather readily available foreign technologies to the maximum while guarding against blindly accepting, in some instances, noble but certainly financially unrewarding exercises as reinventing the wheel" (Wallender 1979: 160-161)

expansion of light industries⁹⁴ to accumulate foreign capital and technology through export promotion.

The 1970s was an important period for South Korea to fortify a growth stage for science and technology. As the main emphasis on economic and industrial development shifted from labor intensive industries to capital and technology-intensive industries, the manufacturing sector expanded to support South Korea's rapid economic growth. In order to meet the ever-increasing demand for qualified scientists and engineers, the policy focused on expanding technical and engineering education in related fields; therefore, a number of government supported research institutes were established in such fields as machinery, shipbuilding, chemicals, marine science, electronics and electricity⁹⁵. To meet various industrial needs, efforts were made to enhance the institutional mechanism⁹⁶ for

⁹⁴ In this period, main strategy was 1) to attract the maximum amount of foreign capital; 2) while using some public foreign loans to provide industrial infrastructure, allowing the bulk of the foreign capital to gravitate to export industries, relying on abundant foreign aid to close the balance of payments gap; 3) To enable the labor intensive industries manufacturing textiles, clothing, plywood, footwear, and electronic parts, to enjoy the comparative advantage offered by Korean dexterous and low wage labor, to acquire advanced foreign tools and become highly competitive abroad ...lower labor costs and the availability of highly motivated skilled and unskilled labor were considered as the major assets of South Korea by prospective foreign investors. As well, incentives were given by the Foreign Capital Inducement Law (FCIL), which offered tax holidays, and guarantees remittance of profits, repatriation of capital, and transfer of royalties. Other attractions were expansion of internal purchasing power combined with free export zones and government export promotion, the general environment of preferential treatment for foreign investors, and availability of South Korean capital form development banks for joint ventures (Wallender 1979: 157-158).

⁹⁵ Beginning with the third five-year plan (1972-1976), New priority industries were to attain further growth of exports by gradually substituting high technology for cheap labor as the comparative advantage in exports. Toward this end, \$1 billion has been invested in the government owned Pohang Steel Company which was producing 2.6 million tons of crude steel by mid 1976, doubling Korean capacity. It was built with imported equipment and know-how from Japan. As well, shipbuilding capacity has risen from 189,000 gross tons in 1971 to 2,390,000 gross tons in 1975. The automobile industry also produced the first Korean-engineered sedan. The Ulsan petrochemical complex with its 100,000 ton naphtha-cracking center and seventeen downstream product plants was inaugurated in 1972. Another complex at Yochon with ten production plants centered on a 350,000 ton naphtha cracker was scheduled to be completed in 1979. By mid 1976 there were 2,104 machine-producing establishments, and since 1970, industry production has doubled every year on the average (Wallender 1979: 175).

⁹⁶ There was institutionalization of technology transfer to internalize the foreign technology. The institutions of higher learning had expanded rapidly along with an increase to over 90 percent literacy. Government funding for foreign equipment and technology was supported, while technology agreements had been another important source of know-how. As well, both government and industry had made considerable efforts to facilitate the diffusion of acquired technology. The policies on the availability of sophisticated technology generated a second generation of research institute: Standards Research; Shipping and Marine Research; Chemical Research; Nuclear Research; Nuclear Energy Development Corporation; Machinery and Metallurgical Research; Electronic Research; Electric Appliance Experimental Station; Energy Management; and Natural

adapting and internalizing imported technology which is expanded in 1980s.

The 1980s can be depicted as a period that the policy on science and technology sought to ensure further growth and stabilization. The policy was made to adapt structural adjustment by continuing to expand technology-intensive industries and improving the productivity of manufacturing system. To this end, efforts to internalize highly qualified scientists and engineers continued through the reinforcement of specialized graduate-level education, the expansion of overseas training programs to adapt advanced technology and the repatriation of experts from abroad, especially the USA. In addition, the National R&D Program was launched in 1982 to develop core and public technologies. This program has served as the major life line to public R&D. The Taedok science town was also initiated to facilitate research institutes and promote cooperative R&D practice. Another notable characteristics of this period was the emergence of in-company R&D investment by the

Resource Development. In addition, government policy stimulated the establishment and vigorous functioning of a number of private and public institutions serving as technology diffusion channels. Major industry associations were Federation of Korea Industries, Korean Traders Association, Korea Federation of Small Business, Korea Management Association, UNIDO-Korea Association, Korea Marketing Association, Korea Productivity Center, and Korea Standards Association. On the other hand, government-financed nonprofit institutes were Korea Scientific and Technological Information Center, Korea Institute of Science and Technology, Korea Advanced Institute of Science, Korea Development Institute, Korea Design and Packaging Center, and Korea Trade Promotion Corporation. Government funded Institutes played a major role in the transfer of technology and R&D. KIST is organized in twelve research groups and includes: Polymer engineering; Chemical engineering; Organic chemistry; Applied chemistry; Food and biotechnology; Pilot plant; Environmental engineering; Electrical engineering; Material science; Mechanical engineering; Metallurgy and metallurgical engineering; and Industrial economics. KIST maintains a number of specialized centers for: Software development; Technology transfer; Foundry technology; Precision machinery; and Electronic communication research. The services of its Technology Transfer Center includes the following: Consultation, guidance and arrangements for technology transfer; Review of relevance of technology to be transferred (includes evaluation of license agreements prior to government approval); Acting agent for technology transfer; Promotion of group technology transfer for medium industries; Analysis, evaluation, accumulation, and dissemination of technological information for appropriate technology transfer; Assimilation and improvement of imported technology; and Follow-up services for imported technology. KAIS is a graduate school of applied science and technology which offers majors in nine fields that are: Applied chemistry; Applied mathematics; Applied physics; Biological science and engineering; Chemical engineering; Electrical engineering; Industrial engineering; Material engineering; and Mechanical engineering. Furthermore, political climate for business was provided for technological learning: 1) South Korean government has provided the private sector with stable rules of the game, increasingly adept economic planning, effective monetary policies, and a system of tax incentives, support institutions, and public investment in physical and social infrastructure, rather than controls and penalties; 2) South Korean government has been strongly aided by the external threats posed by North Korea. In environment of Cold war, Japan and USA provided technologies to South Korean industries (Wallender 1979: 162-172).

industries and their endeavor to internalize the technological edge.

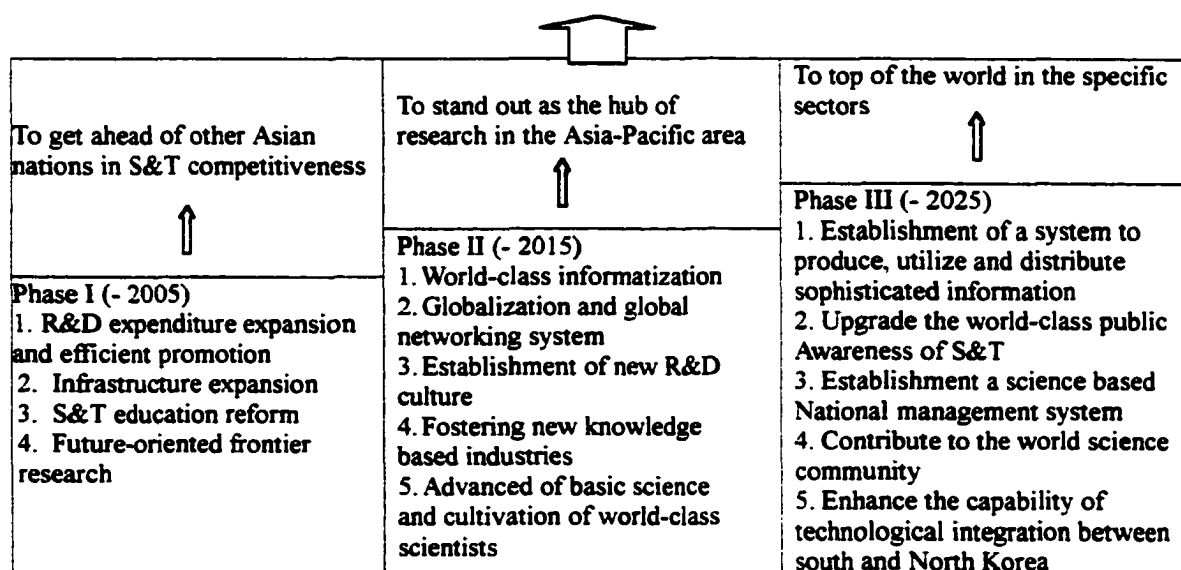
In an effort to join the technologically advanced nations, the Ministry of Science and Technology (MOST) has developed a broad range of innovative measures that include the enactment of the Special Law for Scientific and Technological Innovation, the formation of the Five-Year (1997-2002) Plan for Science and Technology Innovation⁹⁷, the Highly Advanced National Project (HAN Project) and the Creative Research Initiative (Korea Now 2000). Policy direction for the 21st century is sustainable development, concentrating more on meeting human and social needs, and pursuing the harmonization of human activities and nature. MOST will promote the establishment of a more balanced innovation system, shifting from a system that favors government-supported research institutes to one that encourages a tripartite partnership which includes industry, academia, and public research organization and in which innovation will be promoted through competition and cooperation (Korea Now 2000; MOST 2000). In June 2000, MOST publicized VISION 2025 for Korea's Long-term Plan for Science and Technology Development to establish an advanced economy and a competitive level of technology. By 2025, South Korea will attain scientific and technological competitiveness in selected areas as Figure. 4.3 illustrates. South Korea plans to achieve this goal by: creating, utilizing, and establishing a national operating system under the purview of S&T. In addition, for long term vision, MOST emphasizes: first, confidence must be acquired first to strategically cope with societal change in the 21st century; secondly, South Korea has to do its best to develop the fields of information technology, life science, materials, alternative energies, the

⁹⁷ Major components of Five Year Plan includes: 1) public R&D Investment; 2) increase of efficiency and productivity through inter-ministerial coordination, the priority of projects, and the improvement of research management; 3) the national R&D program for Critical Technologies: innovative information technologies, strategic industrial technologies, social welfare technologies, energy technologies, system technologies and

environment, mechatronics and basic science by implementing the selection and concentration strategy; third, the government should solidify the national innovation system (NIS) by changing the basic direction of S&T policy.

Figure.4.3 Long-term Plan for S&T Development toward 2025

1. Ranking 7th in S&T competitiveness. 2. Ranking 5th in the informatization index. 3. 30% in S&T's contribution to economic growth. 4. Over 1 in Technology balance payments. 5. \$80 billion for R&D expenditure. 6. 314,000 for a R&D personnel



1. Ranking 28th in S&T competitiveness. 2. Ranking 22nd in the information index
 3. 19% in S&T's contribution to economic growth. 4. 0.07 in technology balance payments. 5. \$12.8 billion for R&D expenditure. 6. 138,000 in the R&D personnel

Source: Ministry of Science and Technology (June 2000).

On Korean Unification, MOST expressed that Korea should make systematic preparations for unification at the national level. S&T which focuses on area of mutual benefit could be the important means for accelerating reunification at the national level. In this context, the government should build an inter-Korean integrated S&T innovation system in the long run (2000: 112-113).

newly emerging technologies; 4) Promotion of basic research and governmental support of science research centers, engineering research centers and regional research centers at universities.

3.2.2 Industrial Technology and Infrastructure between South and North Korea

Comparing industries between South and North Korea delineates a huge gap in both quality and quantity, as table.4.21 reveals.

Table.4.21 The Comparison of Industrial Technology Between South and North Korea

Sector	detail	North Korea	South Korea
Electronics and electric	Consumer electronics	Small color TV(260,000 unit), VCR, CDP, fridge (50,000 unit)	Large color HDTV(12,998,000 unit), Digital VCR, LDP, multi purpose fridge(4,599,000 unit)
	Telecommunication	Semi-electronic exchanger	Electronic exchanger and cellular phone
	Computer	Small computer (16 bit)	Medium and portable computer
	Semi conductor	Assemble of transistor, diode	World first class production
	Electric machines	345KV class tool, transformer	Domestication of major parts
machine	A machine tool	Self production of parts and Large size special machines	the stage of technology application
	Auto mobile	Self production of parts And new models (7300 in 1999)	the stage of technology application (2,843,000 in 1999)
	Ship building	Self production of small ship (214,000 G/T in 1999)	World first class production (9,481,000 G/T in 1999)
	Precision instrument	Self production	the stage of technology application
	Automation	The production of unit machine	Automation of production line
metal	Iron and steel	60,020 (mil ton) in 1999	486,550 (mil ton) in 1999
	Rolling steel	Serial rolling steel	Direct rolling
	Nonferrous steel refinery	Inferior than South Korea	Develped country's class
Chemical	Basic chemical	Production of ammonia, Sulfur, soda	The production of high value and basic chemical products (concentrated nitric acid, high concentrated phosphoric acid, etc)
	Petroleum Refinery	The processing ability of 80,000 barrel	The processing ability of 2,438,000 barrel
	Petrochemical	The facility for dissolution of Nafta and production(60,000 ton	The facility for dissolution of Nafta and production (3 mil ton)
Fiber	Synthetic fiber	Production of biscos rayon and vinylon (177,000 M/T in 1999)	High functional new synthetic fiber (3,030,000 M/T in 1999)
	Textile	Chemical textile(100 mil M2)	High functional textile (6,603 mil square M)
	Cloth	Middle class cloth	High quality fashion cloth
ceramics	Cement	Introduction of SP (4,100,000 M/T in 1999)	High quality product (48,157,000 M/T in 1999)
	Glasses	Diversification of products (2,500,000 boxes in 1999)	High quality product (19,668,000 boxes in 1999)
miscellaneous	Paper	The production of print paper, cardboard	High class paper (information, special function paper)
	food	Production of fish can	The production of natural and Functional foods

Source: Korean Industrial Bank (1992); The ministry of Commerce, Industry and Energy (2001); Ministry of Unification (2001); National Statistics Office (2001).

The ability of North Korean industry is shown for the 1970s and 1980s. The Korean Industrial Bank (1992) analyzed data and determined that the North Korean industrial technology remains at the levels of 1970s to 1980s⁹⁸. In the base year of 1992, the North Korean industrial technology has about a 10 years gap in heavy industries, and more than a 20-year gap in light industries. This data assumes that North Korean industries are far behind equivalent industry in South Korea. As well, the point that the North Korean economy has had negative growth since 1990 illustrates that the industrial technology gap is widening.

The comparison of education also illustrates that the gap of knowledge accumulation between South and North Korea is wide. This data explains that the knowledge gap between South and North Korea is much larger than the gap which existed in Germany. Mass unemployment and social unrest may occur in the Korean peninsula with a greater economic depression than in Germany. Table 4.22 illustrates the education gap between South and North Korea, based on quantity of schools and students. Without narrowing the knowledge gap, the prospect of economic integration and unification will cause social and economic unrest or it will be a hard blow to the economic life of all Koreans.

⁹⁸ The production ability of North Korea is as follows: consumer electronics (end of 1970s), communication (the early 1980s), computer (the middle of 1980s), Semiconductor (end of 1970s), electric machine (first of 1980s), machine tool (middle of 1980s), automobile (middle of 1970s), ship building (middle of 1970s), Precision instrument (early 1980s), automation (early 1980s), iron and steel (early 1980s), rolling steel (early 1980s), nonferrous steel (the end of 1980s), refinery (early 1980s), basic chemical (early 1980s), petroleum refinery (early 1980s), petrochemical (the end of 1970s), synthetic fiber (early 1970s), textile (early 1970s), cloth (early 1980s), cement (middle of 1970s), glasses (end of 1970s), paper (middle of 1970s), and food (early

Table. 4.22 The Comparison of Education (year 1999)

	The educational institute (number)	The student(number)
South Korea	Elementary school (5,544)	3,936,000
	Junior/High school (4,684)	4,148,000
	University (1,006)	2,673,000
North Korea	Elementary school (4,810)	1,650,000
	Junior/High school (4,840)	2,240,000
	University (280)	310,000

Source: ministry of education (2001); ministry of unification (2001); National Statistic Office (2001).

Note: in South Korean university, professional college, educational university and master include life long learning university and industrial university.

However, according to Eberstadt and Banister (1992), Korea is in a better position than the German case in terms of population structure⁹⁹. The average age of Koreans is 26.1 years old, while a Unified German shows an average age of 37.8 years old; North Koreans under 15 years old make up 29.4% of total population, while in Germany the equivalent age accounted for 19.5%. This fact implies that Korea can transform to a new system quicker than Germany; therefore, establishment of a unified education system between South and North Korea is necessary to generate a new system and structure of the economy. As well, in the Korean case, it will find it easier than Germany to adapt to the new system.

Industrial employment structure demonstrates that North Korea has a similar structure to the former East Germany. Table. 4.23 implies that North Korea will follow similar steps as the East German case, with factors such as mass unemployment and social unrest, if there is rapid unification led by South Korea. This data illustrates that North Korean primary and secondary industrial employment should be diminished and

1970s).

⁹⁹ Eberstadt and Banister (1992) in The Population of North Korea and Korea national Statistical Office (1991) classified that the North Korean work force between age 15-64 is growing faster than the South Korean. They estimated that the North Korean work force will grow by 1.6% annually, while the South Korean workforce is

transferred to tertiary industrial sectors as in the German case. This suggests that North Korea needs to develop secondary industry with technological development, because technology of North Korean industry is conventional and needs many workers to operate machine and factories. The development of tertiary industries, based on secondary industries, is healthier and will lead to rapid development of North Korea. Technology transfer is important for North Korea to increase the labor productivity and transfer the workforce to service industries.

Table. 4.23 Industrial Employment of South and North Korea (unit: thousands people)

	North Korea (1989)			South Korea	
	KDI	Eberstadt	Hwang	1989	1992
The primary Industry	35.0 %	25.3 %	37.5 %	19.5 %	16.0 %
Secondary Industry	47.0 %	57.9 %	50.5 %	28.2 %	25.5 %
Tertiary Industry	18.0 %	16.8 %	12.0 %	52.3 %	58.5 %
Total Employment		12,517		17,511	18,921

Source: Hwang (1992); Eberstad and Banister (1992); Korean Development Institute (1991).

Note: 1. While KDI and Hwang estimated industrial employment, Eberstadt and Banister's data was a report which submitted to UN Population Fund by North Korea.

2. Each data is different, because of different concept and extent of classification for occupation

As table. 4.24 explains the North Korean infrastructure for development is inferior to South Korean infrastructure. The electric power generation of South Korea is about 6 times larger than North Korea which lags because of the lack of oil and modern power plants. The underdevelopment of power generation and energy indicates the depressed state of North Korean industry. As well, the transportation system is much less developed than in South Korea, especially in the field of product delivery and in ship, road, and railroad. The quantitative comparison of North Korean infrastructure shows that the North Korean economy is in a deep depression without even considering a qualitative

drastically diminishing and total population is getting older. This fact implies that South Korea needs North Korean work force and a unified Korea will have sufficient work force in terms of labor supply.

comparison.

Table.4.24 The Comparison of Infrastructure (year 1999)

	Power generation (km)	Rail road (km)	Electric Rail (km)	Sub way (km)	Road And Highway (km)	CargoWork Capacity (thousand ton)	Ship/ auto / Airplane (10,000 G/T/Unit/Unit)
South Korea	46,978	8,333	4,132	339.5	87,534	417,561	608/ 11,163.7/259
North Korea	7,387	5,214	661	34	23,479	35,010	79/ 268,6/ 20

Source: Ministry of Unification (2001).

3.2.2.1 Industrial technology in North Korea

With the preferential promotion of heavy industry, North Korea has maintained an international level of technology in the fields of machine tools, nonferrous metals, and inorganic chemistry. However, the machinery industry has its limitation of development, owing to the lack of basic theory and limited introduction of advanced foreign technology. As well, the level of technology falls behind in electronics, petrochemistry, and light industries which are potential sectors for development by investment in science and technology. Recently, North Korea has promoted automation and mechanization, computerization of process and emphasizes the development of state of the art technology and new material, but the results have been poor.

3.2.2.1.1 Machinery Industry

The machinery industry in North Korea is the most advanced of its industries, and produces many products as table. 4.25 displays. During and following the third 7-year plan, the machinery industry focused on precision, maximization, and high speed for modernization of production. This industry has developed as a core industry in North Korea to support the production of infrastructure, construction instruments, and military equipment. However, the production system is still in the process of mass production

through mechanization rather than quality and diversity of products.

Table. 4.25 North Korea's Major Machine Tool Factories and Products

	location	Production capability	Major Products
Heechon	Jagang Province	15,000 units	Lathe, milling machine, NC processing lathe, drilling machine, shaper, boring machine, drill press, grinder
Kusung	North Pyongan Province	10,000 units	Drill, milling machine, automatic lather, pneumatic imitation lather, press rolling lathe, shaper
Kusung No. 104	North Pyongan Province	10,000 units	CNC lathe, NC processing lathe
Manggyongdae	Pyongyang	2,500 units	Table lathe, milling machine, shaper, flat-space grinding machine
Chongjin	North Hamkyung Province	2,000 units	Lathe, table-ball lather, drilling machine, press
Pyongyang	Pyongyang	1,000 units	Shaper, lather, grinder, press
Hamheung	Hamheung	1,000 units	Lathe, ball-lathe, shaper, press

Source: Korea Trade-Investment Promotion Agency (2001).

The production of precision machinery has developed lately in machinery industries. Precision machines have been produced as the table.4.26 exhibits. However, with the debt crisis in 1970s, the development stopped and now the development of precision machinery is in an underdeveloped condition, owing to the lack of technology and investment. Like other machinery product, the quality and diversity produced in North Korea is not competitive in international markets.

Table. 4.26 North Korea's Major Precision Machine Factories and Products

	Location	Major Products (unit: 10,000)
Heechon	Jagang	Rock drill (1), piston (20), fuel pump (3), Fuel distributor (3), fork lift, automatic boring press, milling press
Pyongyang	Pyongyang	Sawing machine (2), bearing (200), watch (10)
Moranbong	South Pyongan	Watch (40)
Pyongyang	Pyongyang	Pressure gauge, oil gauge etc
Yangchaek	North Pyongan	Bearing (1,300)
Yongsung	Pyongyang	Bearing (1,000)

Source: Korea Trade-Investment Promotion Agency (2001).

3.2.2.1.2 Steel Industry

The steel industry in North Korea had been developed since the colonial period, and became a basic industry with the support of heavy industry.

Table. 4.27 Steel Industry

	Location	Land Size (sq.m.)/ Number of Employee	Major Production Capability (Unit: 10,000 tons)
Kimcheak Steel Mill	Chongjin, North Hamkyung	430,000/50,000	Cast iron (240), Steel wire (216.7), Rolled steel (147)
Hwanghae Steel Mill	Songrim, North Hwanghae	3,000,000/25,000	Steel wire (113), steel making (114), rolled steel (74)
Seongjin Steel Mill	Kimchaek, North Hamkyung	990,000/25,000	Steel (48), rolled steel (41.5), crude steel (30)
Chullima Steel Mill	Nampo	1,810,000/8,000	Steel (76.4), rolled steel (55), Iron alloy (1.2)
April-13 Steel Mill	Nampo	/5,000	Steel (40)
Chongjin Steel Mill	Chongjin, North Hamkyung	/8,000	Cast iron (60), steel (100)
No.8 Steel Mill	Seonggang, jagang	240,000/	Steel (10), Steel Materials (8)
Others	Gaechon Cast Iron Mill (in South Pyungan), Shinuiju Steel Mill (in North Pyungan), Pyongyang Steel Mill (in Pyongyang), October-9 Steel Mill, Sariwon Mill (Both in North Hwanghae), Hyesan Steel Mill (in Yanggang) and Kaesung Cast Iron Mill (in South Hwanghae)		

Source: Korea Trade-Investment Promotion Agency (2001).

However, the supply of fuel became problematic to postpone and lower production and the development of special steel is difficult in the current situation, owing to a lack of capital and the time needed for development.

Table. 4.28 Steel Refinery Industry

	Location	Land Size (sq.m.)/ Number of Employees	Major Production capability (Unit: 10,000 tons)
Nampo Steel Refinery	Nampo	4,250,000/7,000	Copper (4), Zinc (5), Sulfuric (10), Tongsung phosphatic fertilizer (10)
Moonpyong Steel Refinery	Moonchon, Kangwon	N/A	Electric cooper, lead (2), Zinc (10), Gold, silver, sulfuric
Bupyong Alloy Steel Refinery	Chongjin, North Hamkyung	N/A	Alloy steel
Danchon Steel Refinery	Danchon, South Hamkyung	96,000/	Zinc (30), copper (5), sulfuric)
Others	Heungnam July-27 Steel Refinery (in South Hamkyung), Haeju October-13 Youth Steel Refinery (South Hamkyung), Bukchang Aluminum Factory (South Pyungan), Pyungbuk Steel Refinery (North Pyungan), Haeju Steel Refinery (South Hwanghae), Moonchon September-21 Steel Refinery (Kangwon)		

Source: Korea Trade-Investment Promotion Agency (2001).

3.2.2.1.3 Chemical Industry

The chemical industry in North Korea developed a strong base in the colonial period and focused on the basic chemistry of coal. After the 1970s, the industry transformed from coal based to petroleum based and petroleum became one of the important sources of chemical industry. However, the technology and machinery is out of date for increasing productivity and the finished product is simple.

Table.4.29 North Korea's Products of Chemical Industry (Unit: 10,000 tons)

	Item	Production Capability	Major Factories (Annual Production/Unit: 10,000 tons)
Inorganic Chemistry	sulfuric	110	Heungnam Chemical (45), Chongin Chemical (3), Shinuiju Chemical (3), Moonpyong Refinert (9), Haeju Refinery (10), Danchon Refinery (15)
	Ammonia	69	Heungnam (30), July-7 (7), Namheung Youth Chemical (27), Vinylon (5)
	Carbide	73	February-8 Vinylon (37.5), Chongsu Chemical (20), Soonchon Limestone (15)
	Caustic Soda	15	February-8 Vinylon (10), Shinuiji Chemical (3), Gilju Pulps (1.5)
	Sodium carbonate	20	February-8 Vinylon (7), Namheung Youth Chemical (9)
	Nitric Acid	35	Heungnam Chemical (7), July-7 (15)
	Hydrochloric Acid	7	February-8 Vinylon (3.9)
Petro chemical Industry	Basic Oil Stuffs	13	Namheung Youth Chemical (7), Seungri Chemical (6)
	Oil Refining	350	Bonghwa Chemical (150), Seungri Chemical (200)
	Agricultural Chemicals	2.7	February-8 Vinalon, Hwasung Chemical, Shinheung Chemical, Soogyo, Heungnam Chemical
Precision Chemistry	Drug manufacturing	N/A	Soonchon Pharmaceutical, Heungnam Pharmaceutical, Pyongyang Pharmaceutical (Oriental Medicine), Shinuiju
	Chemical Fertilizers	351	Heungnam Chemicals (133), Namheung Youth Chemical (40), Chongsoo Chemical (27), July-7 (14), Moonpyung Refinery (30), Nampo Refinery (30), Haeju Refinery (20), February-8 Vinylon (10)
	. Nitrogenous Fertilizers	176	
	. Phosphoric acid Fertilizers	175	

Source: Korea Trade-Investment Promotion Agency (2001).

Table 4.29 illustrates the product of North Korean chemical industries which features low productivity and simple products. The North Korea Chemical industry is based on

Coal rather than Petroleum.

As export merchandise, chemical products are increasing, but the import of chemical products surpassed the quantity of exports. This is because of decreasing import of petroleum which is needed to produce basic material for manufacturing chemical products (KOTRA 2001). As well, North Korea has concentrated on developing Vinylon¹⁰⁰, which has played the role as a self-reliant fiber for North Korean need, because North Korea has significant quantities of coal and limestone. However, the difficulty of electricity supply has reduced the Vinylon production in North Korea. For economic cooperation, North Korea needs a stable electricity supply and the South Korean marketing ability, capital, and manufacturing ability (KOTRA, 2001).

3.2.2.1.4 Light industry and Textile Industry

Light Industry in North Korea is underdeveloped, when compared to heavy industry. Usually light industry is located in a region and production is for regional consumption. Light industry has had an imbalance of supply and demand as well as problems with quality and quantity. The production quantity of the textile industry increased, but low quality and limited diversity makes it unable to meet international market demand. Even though the ability of the designer is high, the lack of technology and test facilities became a constraint for development of the textile industry (Korea Development Institute, 1996).

As table 4.30 and 4.31 demonstrates North Korea makes only small quantities of textile and cloths in factories. As well, the machines which came from the former Soviet Union, Eastern Europe, and China are so old that the improvement of production and diversity are impossible in the current situation. Technology is from the 1950s and 1960s.

¹⁰⁰ Vinylon is a fabric made from coal based chemical production

Partial introduction of new machines could not help the whole production process, and the lack of technological information causes lower labor productivity as well as low quality and limited diversity in products.

Table. 4.30 Textile Industry

	Textile Factories	Major Products (unit: 10,000 tons)
Synthetic fiber	Chongjin Synthetic Fiber	Rayon (3), Rayon yarn (0.5)
	Shinuiju Synthetic Fiber	Rayon (2)
	February-8 Vinylon	Vynylon (5)
	Soonchon Vinylon	Vynylon (5)
	Hamheung Vinylon	Mobilon (1)
	Namheung Youth Chemical	Acryl fiber (1)
Weaving	Textile Factories	Major Products (unit: billion sp. m)
	Pyongyang Textile Mill	Fiber Yarn (2.5), Woven stuff (0.138)
	Shinuiju Textile Mill	Fiber yarn (1.8), woven stuff (0.053)
	Sariwon Textile Mill	Fiber yarn (1.7), woven stuff (0.066)
	Kanggye Textile Mill	Fiber yarn (3.0), woven stuff (0.123)
	Kusung Textile Mill	Fiber yarn (1.3), woven stuff (0.067)

Source: Korea Trade-Investment Promotion Agency (2001)

With the preference for heavy industry, development of light industry was started later in the 1980s. However, the improvement of quality and mass production is still problematic. During the 1990s, North Korea started processing on a commission basis with South Korea to manufacture shoes and plans to make shoes part of an industrial complex in Kaeseong. The footwear industry is evaluated as having high manufacturing technology, especially in the field of leather shoes (KOTRA 2001).

The fiber industry has occupied about 25% of the total trade and became one sector to earn capital through the processing on a commission basis with Japanese firms, but still North Korea is mostly into the production of hand made products and has not diversified with quality.

Table.4.31 Clothes Factories

Controlling Organization	Name of factories
Eunha Trading State Orgainzation	Kangsuh, Kaesun, Kyongam, Daedonggang, Dongdaewon, Raknang, Yukpo, Sungyo, Seongchon, Shinuiju, Yumju, Jungsan, Wonsan, Pyongwon, Pihyon
Pyongyang Metropolitan State Organization	Kangnam, Kangdong, Daesung, Raknang, Mangyungdae, Botonggang, Samsuk, Susung, Soonan, Seungho, Okryu, Wesung, Pyongyang, Hadang, Hyungjesan
Others	Kaesung, Sungyo, Sungchon, Aeguk, Chungsu, Chongnam, pyongsung
Joint Ventures	Moranbong, Daedonggang, Choson, Rakwon, Nungna, Bongsun, Chindallae, Pyongyang, Aeguk, Chongjin, Kaesun, Myunghae, Chonjn

Source: Korea Trade-Investment Promotion Agency (2001)

3.2.2.1.5 IT Industry

North Korea began to assemble digital computers at the end of 1960, but after 1982, microcomputer production became industrialized. With the economic slump, however, the development of the IT industry has focused on the software sector rather than hardware, which requires capital and technology. North Korea accepted technological support and related devices from UNIDO in 1989 and established R&D institutes such as Korea Computer Center, Pyongyang Program Center, Kim Chaek Computer School and Semiconductor Research Institute, Pyongyang Computer Factory, and Pyongyang IC Factory. North Korea has the capacity to make 16 byte PC, electronics, and semiconductor materials. For the IT industry, North Korean chairman Kim said that North Korea needs foreign technology. At the COMDEX-Asia in Singapore, North Korea showed software programs in 1996 and represented the North Korean Software industry as a fast growing sector. Cho Sun Computer center developed the program for fingerprint identification system, medical care related programs, office automation program, design support program, and control and manufacturing related program. The center is using updated

information processing technology and it was found that North Korean software has competitiveness in some products, when compared to Russian products in quality and German products in price. Even though North Korea has no access to the Internet, LAN has connected for short distances and in 1996 North Korea developed a program to unify LAN. North Korea is expected to have a unified LAN system with centrally controlled database. In practice, North Korea uses developed software in banks and department stores (Korea Computer Agency, 1997). On the other hand, Pyongyang Program Center is another institute, which makes management programs for hotels, insurance agencies, cloth agencies, and Nampo Harbor, and distributes Korean editorial programs such as Dangoon, Changdeok, Myungphil, and Cheongryu (Ibid, 1997). These products received a good evaluation in international product exhibitions. Also, the center was supported by UNDP and Japanese Koreans with technological support, and produces the programs to fill orders from abroad.

The IT industry in North Korea has been developed with the support of technology from Japan and International Agencies such as UNIDO and UNDP especially in the software industry. However, the network of telecommunication and related infrastructure has not been well developed (KOTRA 2001). The general evaluation of IT industries¹⁰¹ in North Korea is in the condition of underdevelopment, even though the base of development became evident since 1990s.

3.2.2.2 Industrial technology level of South Korea

South Korean technology for industry is reaching the level of developed countries in

¹⁰¹ North Korean is eager to promote IT industry as a national strategy with the cooperation of South Korea. South and North Korea concluded development of SinuJu Valley by Hana Biz and Mt. Kumgang Valley by Hyundai. Also, North Korea is planning to develop the R&D center in Pyung Yang Area (KOTRA 2001). North Korea understood that the base of economic growth is science and technology and promotes a national

the field of electric and electronics, consumer products, computer, automobile, machinery, and ship building industries. South Korea has promoted the independence of technology through indigenous technological development in high tech industries, but still has a dependency on technology from developed countries. However, light industries in South Korea have matured and have transplanted its factories to other countries in South East Asia. Table.4.32 demonstrates that the competitiveness of South Korean industries is mainly from IT related industries and non-IT industries or traditional manufacturing industries.

Table.4.32 Year 2000 Exports by Product Type (value: 100 Mil; ration: %)

IT items	Value	Ratio	Non-IT items	Value	Ratio
Semiconductors	260.2	15.1	Automobiles	150.5	8.7
Computers	145.3	8.4	Shipbuilding	82.3	4.8
Communications	181.6	10.5	machinery	101.1	5.9
Equipment and others	81.7	4.7	Iron and steel	113.6	6.6
wireless communications equipment			Chemical products	121.4	7.0
Sub total	587.0	34.1	Sub total	1135.7	65.9

Source: The Ministry of Commerce, Industry and Energy (2001).

3.2.2.2.1 IT and electronics industries

Korean DRAM chips have ranked first in the global DRAM chip market since 1995, beating out Japan. Now chipmakers in South Korea have the world's best technology to manufacture DRAM chip. The success came from a strategic decision on investment to develop DRAM among other memory products. The South Korean firms have coped with technological difficulties and the reluctance of technology transfer from developed countries, while learning by doing and learning by research. As well, TFT-LCDs and CDMA-based mobile phone occupied top position in the world. The technological

communication network, but internet access is not available (Joong Ang Ilbo Dec 5, 2000).

development of South Korea is based on the cooperation between the research institutes of companies, government research institutes, and external institutes both abroad and domestic. The human resource or Korean scholars who studied and worked in USA and Japan, played an important role to provide knowledge and experience and cooperate in the process of R&D will catch up to developed countries. In the case of CDMA based mobile phones, the success came from the audacity of the joint R&D efforts of the Electronics and Telecommunications Research Institute, State-owned research institute, and of corporate research institute. Table. 4.33 illustrates how quickly the South Korean firm caught up to the developed world.

Table. 4.33 Gap between Advanced Countries and Korea in the Semiconductor Industry

	64k DRAM	256K DRAM	1M DRAM	4M DRAM	16 M DRAM	64 M DRAM	256 M DRAM
Development time							
Pioneer in USA And Japan	1979	1982	1985	Late 1987	Early 1990	Late 1992	Mid 1995
Pioneer in Korea	1983	1984	1986	Early 1988	Mid 1990	Late 1992	Early 1995
Gap	4 years	2 years	1 years	6 months	3 months	Same	Ahead

Source: Korean Development Bank (1994). Korean Industry in the World, Seoul: KDB.

Since 1994, Samsung became the world's most efficient manufacturer in the sector of Dynamic Memory Chip followed by two South Korean firms, as table 4.34 explains. However, South Korean chips manufacturer overcame the international technology gap, but the problem still remains that Korean firms relied on foreign suppliers for almost 90 percent of production equipment. The government launched a project to promote the semiconductor equipment industry by constructing research site and facilitating venture companies. The electronic industry has also developed well in South Korea and many companies, which do not have comparative advantage, moved out toward cheap labor cost in other countries or closed factories in South Korea.

Table. 4.34 World's Largest Semiconductor Manufactures

Semiconductor Producers(World Rank)	1994 Sales	1994 Growth Rate	Dynamic Memory Chip Makers and World Rank	1994 Market Share
Intel (1)	10,121	27	Samsung (1)	15.1
NEC (2)	7,944	29	Hitachi (2)	10.6
Toshiba (3)	7,527	31	NEC (3)	10.4
Motorola (4)	7,237	21	Toshiba (4)	9.7
Hitachi (5)	6,485	29	Texas Instruments (5)	7.1
Texas Instruments (6)	5,280	29	LG (6)	6.4
Samsung (7)	4,893	61	Hyundai (7)	6.2
Fujitsu (8)	3,858	32	Mitsubishi (8)	5.8
Mitsubishi	3,735	26	Micron Tech (9)	5.8
LG (20)	1,797	90	IBM (10)	5.8
Hyundai (21)	1,621	90		

Source: API News Paper (March 1995).

Note: quoted from N Kim, L. S. (1997). Imitation to Innovation: The Dynamics of Korea's Technological Learning, Boston: Harvard Business School Press.

Table 4.35 reveals that Samsung, one of the electronic manufacturers, has invested capital for developing technology. This table demonstrates that the level of technology is getting higher and needs more R&D to make better quality of products. South Korean companies are struggling to reach higher quality levels rather than taking advantage of cheap labor and mass production.

Table. 4.35 R&D Activities at Samsung Electronics

	1975	1980	1985	1990	1994
Total sales (W 100 million)	244	2,513	12,985	44,523	115,181
R&D investment (W 100 million)	N/A	56	388	1,862	7,133
R&D/total sales (percentage)	N/A	2.1	3.0	4.2	6.2
R&D personnel	N/A	690	1,821	6,686	8,919
Local patent applications	N/A	18	309	1,732	2,802
Local patents granted	0	4	17	640	1,413
Foreign patent applications	0	0	32	1,145	1,478
Foreign patents granted	0	0	2	128	752

Source: Kim, L. S. (1997).

Note: Quoted from Samsung Electronics Company (1989). Twenty-year history of Samsung Electronics, Seoul: Samsung Electronics: 335.

3.2.2.2.2 Non IT items

The South Korean automobile industry was one of the first strategic sectors to develop since the 1960s along with shipbuilding, steel manufacturing, and chemical industry. South Korean automobile industry became No. 5 in production and No.6 in export in the world. The development of indigenous technology for automobiles reached international levels and South Korea became a major car exporter. Korean car manufacturers are now concerned with promoting technology toward an environment-friendly society.

Table. 4.36 expounds that the process of indigenous technology acquisition through technological learning from research and strategic cooperation with foreign firm and technology since 1970s.

Table. 4.36 Increasing Localization of Technology for Indigenous Models

	Developed Year	Styling	Body design	Power Train	Chasis Layout	Total
subcompact						
Pony	1975	1	1	1	1	4
Excel	1985	1	3	1	2	7
Scoupe	1990	3	3	3	2	11
Accent	1994	3	3	3	3	12
Compact						
Stella	1983	1	3	1	2	7
Elantra	1990	3	3	1	2	9
Avante	1995	3	3	3	3	12
Medium Size						
Sonata	1988	3	3	1	2	9
Sonata II	1993	3	3	1	2	9
Marcis	1995	3	3	2	3	11

Source: Hyun, Y. S. (1995).

The Korean steel industry played the role as a backbone for the national growth. The production system is quickly changing from high volume to high value product and more diversification toward other business areas. Korean manufactured cold

steel plates rank first in the world in cost competitiveness and fourth in production amount.

On the other hand, the Korean ship building industry has become a major industry since 1970s. Until the 1970s, Korean shipbuilders for the most part had built bulk cargo vessels such as crude oil tankers and dry bulk carriers, but in the early 1980s, shipbuilders developed technologies for building high value added ships including container ships, roll-on roll-off ship, oil drilling rigs, and oil-bulk-ore carriers. Currently, exporting of LNG carriers occupies 64% of the total orders of the global market. The Korea Shipbuilding Research Association was established in March 1994 with other shipbuilders to enhance mutual cooperation in research and development of shipbuilding technology. With the increase of Japanese labor costs, South Korea became the top exporter in total shipbuilding, but latecomers like China are emerging to catch up.

4. Conclusion

The technology gap between South and North Korea is too wide to cope with in the short term, as economic system and political system is. The system of North Korea is at a point where it must change toward the international arena and play a regulation game on externalities. The self-reliant system and centrally managed economic system in North Korea has a limitation in international market in that there is no socialist bloc with which trade, and the system itself is so rigid that it can not allow flexibility in manufacturing sectors and technological development without the distribution of interest to its people. Fortunately, the North Korean economy is moving toward open door and innovation with trade and foreign investment in the sectors where South Korea currently has comparative advantages. On the other hand, South Korea plans to spur technical edges through institutionalization of S&T and publicized a long-term plan to cope with future

unemployment, where the gap between South and North Korea is much larger in technology. The establishment of university and institute for high technology or next generation technology for both South and North Korea is desirable to reduce the technological gap in the future. As well, the free movement of production factors and supporting North Korean industry from South Korea is necessary environment. This required the institutionalization of both Koreas' need and constitutionalization to provides necessary environment or infrastructure of development in Korea.

V

Conclusion

This thesis is comprised of four main arguments, one advanced in each chapter, and concludes with the implication of technology for future economic integration on the Korean peninsula and institutionalization of needs for economy, society, and politics. Theories of evolutionary change and the new growth theorists explain the role of technology and its transfer as they relate to the German unification experience. However, the rapid integration without institutionalization showed the serious impact on both economies. From this Korea can determine the best choice related to a division of labor on the market or the institutionalization of technology transfer through action and reaction of actors on policy implementation. Economic cooperation, which is not institutionalized and left to the private sector, will cause social unrest with mass unemployment and greater economic depression. This is demonstrated by the German experience with shock therapy or Washington Consensus.

Unlike Eastern Europe, rapid transformation of the economy using a liberal approach did not happen in Vietnam. Economic development, institutionalized through government policy in the context of particular economic and social circumstance in Vietnam, has resulted in economic development with an accumulation of technology, human capital, and internal economic growth. The evidence from the German and Vietnamese experience suggests that the argument of neoliberal approach is inappropriate for integrating two different economies when it is vertical, not horizontal. Also, the result of the neoliberal approach, involving the facilitating of TNCs, and considering externalities and the division

of labor without integrating population through education and the establishment of agency, institute and academia in the environment of S&T institutionalization will end up as a deep economic depression and increased social unrest. The point is that in the S&T policy, institutionalization of technology transfer suggests that the best way of development for North and South Korean cooperation is to meet the offsetting side-effects of future unification. Also, the experience of the European Union provides the paths and challenges for Korean Peninsula with institutionalization of integration. Technology transfer is more possible in the framework of institutionalization by generating the factors of mobility of production and fiscal coordination to support under developed region. The European Union, in its quest for further enlargement to Central and Eastern Europe, has shown the lesson to Korea in terms of institutional paths and future challenges for the Korean Peninsula.

The first chapter argued that neoclassical theory, which focuses on capital and labor productivity, has limitations for generating indigenous technology when technology is not free and secular at the national level. The radical approach of technology transfer through the institutionalization of technology learning and internalizing technology through R&D is essential for generating indigenous technological capability in latecomer countries. Also, as New Growth Theorists have argued, education and R&D are important for generating the human capital for future development. Economic development is not only economic growth but has a social and culture of dimension, including the institutionalization of people's basic needs. Also, this chapter argued that institutionalization is necessary to generate integration of different economies and transition for productivity growth. The institutional school provides the major contribution on necessary environment of

innovation of nation while arguing the limitation of neoliberalism and static approach which does not allow the movement of actor and its importance. The institutional school also argues that the coordination game is important to generate the space of political arrangement for economic development and innovation. The institute and its political impact on economy became a basis of integration which can provide the innovation of system by developing, introducing, and diffusing the technology and can generate the institutionalization of deepening and widening of free movement for production factors.

Chapter II argued that rapid German integration, which lacked the institutionalizing of required technology transfer through a variety of market processes and institutions that exist in the economy, caused a deep depression in the world's third largest economy. The division of labor, and trade also existed, but the diffusion of technology between East and West Germany, with market function or equilibrium between labor and capital was not sufficient to reduce the shock of economic integration. Also, the German experience shows that the paths of economic integration in Korea is currently following the example of German failure from trade to economic cooperation with dependence of the North Korean economy on South Korean cooperation. The institutionalization of integration with a gradual approach could have been a necessary environment for integration of the German economy and could be considered a path to dependency rather than one day built system in fast structural change, based on neo-liberal approach.

On the contrary, the Vietnamese challenge to cope with externality to generate institutionalization of R&D was appropriate to create a slow movement toward an open door policy and joining technological trajectory, and the economic actors have understood the policy implementation and moved with the intention of not undermining the whole

economy to build solid preparation against externality. Resulting from built-in limitations to the Vietnamese economy, technology and capital were based upon overseas investments rather than an expansion of the domestic market. There is no high technology transfer, but the Vietnamese continue to facilitate technological capability with institutionalization. Most technology transferred to Vietnam has been labor intensive and needed to be innovative for the next stage of growth or be transferred to other countries in the search for lower labor costs. When the Vietnamese economy can not reward foreign investment, this investment will be reduced radically. There is a limitation to capitalist development dependent on other advanced economies. The bilateral or multilateral integration will be necessary to provide the necessary technology for Vietnamese economy and development.

Chapter III demonstrates the experience of European institutionalization to draw their own need against external influence in economy, society and politics. The EU showed the paths and its implication of integration in the global and European context for the integration of the Korean Peninsula to generate independence of economy and politics. Also it provides the fast, present, and future challenge for solid integration. The free movement of factors of production and federal fiscal policy with Single European Act provides the lesson to the Korean Peninsula to nurture the institutionalization of integration. The integration is not coming without effort and political decision making to share the cost and benefit. The EU also suggested a share of the benefits should support the underdeveloped region and people in poverty for the welfare of society. This should happen even though its ability to deal with those issues is still constrained by the coordination of political and economic benefits in member countries which can be solved by its widening to include the Central and Eastern European Countries. The slow

movement toward generating the needs of industry and technology in the EU has been possible with institutionalization and coordination game to share the cost and benefit rather than competing to interest. The supply and demand conditions of integration are also important to develop the integration, which is the necessary environment for technological development and productivity growth. The supply side in EU has been playing a more important role than demand side and provides the guiding light to the demand side of actor to innovate the system of EU and enter the technological trajectory with enlarged and deepened market.

Chapter IV argued that the Korean experience will follow a similar path to the German process of economic integration with neo-liberal approach, such as trade cooperation and rapid integration or shock therapy, if there is no institutional consideration between South and North Korea. The lesson from EU was good example to institutionalize the needs of industry, supra national institute, and people.

The technology gap between South and North Korea is huge and will not be reduced without certain institutionalization of S&T. Economic integration is an on going process starting from customs union, common market, currency union and fiscal federation and provides the scale of economy which is necessary environment for technological development. The system of North Korea is at a point where it must change toward the international arena with regulating external interest. The self-reliant system and centrally managed economic system in North Korea has a limitation in international market in that there is no socialist bloc with which integration is possible and North Korea take advantage from technology transfer or important factor for productivity growth. Protecting the economic, social, and political interest creates a system that is so rigid that it can not

allow flexibility in manufacturing sectors and technological development which is necessary to increase productivity of nation. Fortunately, the North Korean economy is moving toward opening doors through innovations in economic system and structure by distributing the power to region and allowing flexible price system. On the other hand, South Korea plans to spur technical innovation for advance technology which is in developed countries. There are points that South Korea needs to supply technology transfer and capital to North Korea industries as a unification cost, and that North Korea should be active in learning from South Korea. The major area for technology transfer may be possible with the institutionalization of need in both Koreas such as the customs union and further establishment of legal agreement like common market and currency union to develop research institutes, agency, academia, organization, and supra national institutes for both South and North Korea. This could be developed to become the major strategy to generate future technology in order to meet the needs of further integration which is better preserved in large scale of economy and free movement of factors for production.

Economic cooperation between South and North Korea is possible to generate certain economic gain with division of labor using allocation of capital and labor; therefore, the vertical integration of the unified economy will be possible in the near future, if the current paths of economic cooperation continue. Alternatively, the vertical economic integration is not appropriate to reduce the economic gap between South and North Korea. In addition, Korea will end up with mass unemployment and social unrest as in the case of Germany. There are needs for technology transfer with institutionalizing laws, education and policy, facilitating more economic actors through the exchange of people's needs and ideas, and establishing the environment of technology transfer system in Korean peninsula.

The North Korean management system to develop industry has a limitation of application in the point that there is no existing socialist bloc to aid and nurture the needs of North Korea, and continues to fail to generate productivity growth with current economic policy. The vertical order of its bureaucracy is not appropriate to meet the needs of people and deepens the economic crisis. Innovation in the North Korean economy is required to utilize externality rather than closing the door against a global economy. The important point is that the strategy to generate indigenous technology internally and reduce the gap between South and North Korea must be built on the needs of people.

South Korea also needs to institutionalize the technology transfer to reduce unification cost and prevent future social unrest and economic depression. The first point might be technology transfer in light industry which has matured and been transferred to South East Asian countries. As well, using joint venture and R&D institutes in the environment of technology transfer system and coordination to generate new technology for both countries is viable to reconsolidate the mutual understanding about the difference of political and social systems. Mutual exchange of people and ideas is a critical factor to reduce the gap, while maintaining the political and social system. Keeping the system of both South and North Korea will be the most challenging task which needs a legalized structure to prevent radical integration of economies.

South Korea has to learn from both the triumph and failure of Germany and rapid integration. Economic integration is most appropriate when both economies are similar in size, but not in their industrial structures. Preparation and prevention is a crucial factor for easing future challenges and economic development through technology transfer could be institutionalized by the needs of the people and the mutual interests of the countries. The

German model shows that South and North Korea need to separate rapid political integration from those that are economic and institutional, because rapid political integration would cause an economic and social impact without long term adjustment. Only will economic integration through the process of institutionalization assure a self-reliance system to regenerate future needs in South and North Korea. However, the economic cooperation between South and North Korea should not generate the dependency of North Korean industries on South Korea, but interdependency. This is possible, when both countries enter into future generation of technology to specialize in each country's need. The challenge to develop and decide type of industries is based on the decision of each government and action and reaction of people during the process of economic coordination and institutionalization. This process may take more than one or two generations. As well, the system of unified Korea is not predictable in current stage, but it should be for the people's basic needs and development of dynamic system to diffuse, adapt, and digest advanced technology which is most important factor in development of country.

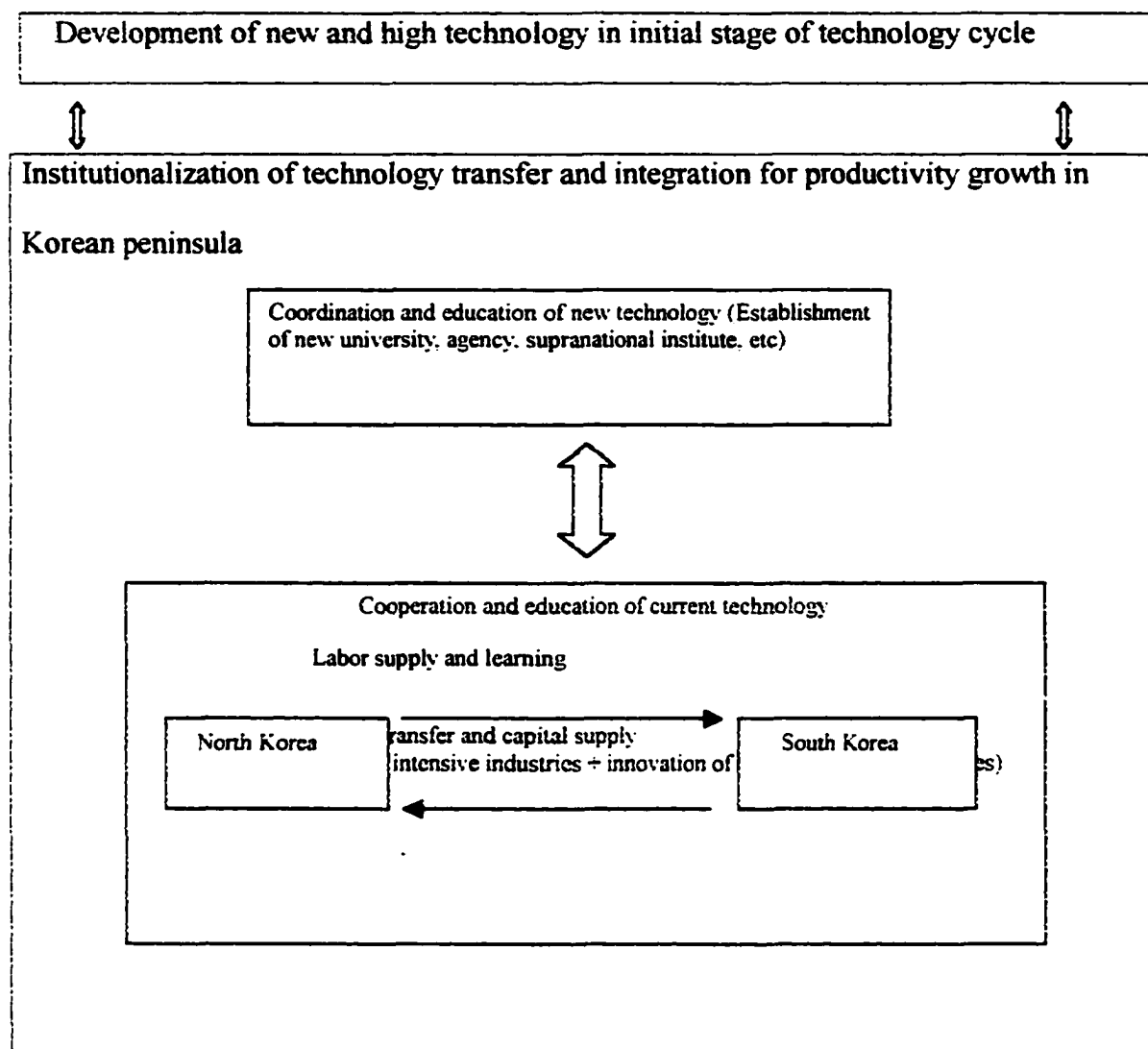
The Vietnamese model proves that North Korea has to challenge externalities and establish institutionalization of needs in industries through government policy, which shape the system of countries. These two issues seem to be difficult to deal with, because both issues are like zero sum game. However, the experience of South Korea provided that manipulation of needs in the economy was possible in the Korean peninsula, when there is effective government policies. For example, the South Korean government manipulated the prevention of inflation and increase of consumer price in the past. As well, South Korea adapted technology from other countries and diffused it inside of industries, even

though there is issue of dependent development and low popular participation on decision making. In the current post modern era, there is no certain theory and best model of development without interdependency on other advanced industries, because the trajectory of technology can not be reversed without certain building of capability to generate further industrial development. The issue for further development is to build up the internal capability and externalities for development, not for colonization. Without time to adapt and diffuse technology, there is no future. The sacrifice of the current generation will bring the wealth of next generation. In fact, North Korea has to learn that the Vietnamese model is not a best model for development in the point that Vietnamese economy is dependent on external economies. This point implied that North Korea has to cope with and will be one of tough obstacles and issues in the process of economic cooperation and integration. These issues will cause the problems of integration on the Korean peninsula in the future. However, if South and North Korea are willing to politicize and economize with coordination for the needs of technology transfer and institutionalization, the issues will be minimized while the two countries keep their own system of society and economy. This is main lesson we can learn from the Vietnamese and German experience. Also, there may be Asian Economic Integration like EU to protect the need of people, economic actors and states. The Asian Union should promote the development of under developed area and welfare of people while checking and balancing the Washington Consensus and vicious attack from neo liberal approach or self interest capitalism. The lesson from the EU provides a model of where the Korean industry and economy should go and the challenges it will face. The institutionalization in the EU will be the best model in historical experience for economic integration with technological development.

From these three models, Korea learned that integration of different systems is extremely difficult. If the two Koreas agree to specified issues of technology transfer and institutionalization of industrial needs that are not detrimental to their economies and societies, the integration will bring alternative social and economic system in the future Korea. In the point that integration is a process from confederation to federation within the Korean context and a process from free trade zone to customs union, common market, and economic union, the current needs of Korea is to build up certain institutionalization of technology transfer functions for integration and coordination of cost and benefit as figure 5.1 demonstrated to develop North Korea and South Korea. Economic integration is possible without rapid political integration and liberalization first. A future challenge for both Koreas is to shape and organize people's needs for further development of the Korean economy and society which should be studied further. There is alternative social system in Korea with the institutionalization to generate productivity growth.

This thesis provides the possible conceptualization of current needs and future needs in industries and specified in institutionalization of technology transfer and integration as follows. Figure 5.1 illustrates the need to institutionalize of technology and the system of technology transfer and integration that has been developed in this thesis.

Figure. 5.1 Institutionalization of technology and technology transfer



Consequently, coordination of cost and benefit and technological transfer is a means of reducing the knowledge gap between South and North Korea, and making the Korean economy sustainable in the future. Knowledge grows in people who have institutionalized their needs. The states, institutions, enterprises, and people have to cooperate for horizontal economic integration which is optimized in economies of similar size. The market is not perfect in meeting the needs of people and Korea. Both Koreas themselves

have to institutionalize their needs with policy implementation by supranational institutes and their diffusion effect to people to format the national ethos or informal institution..

To develop the conceptual framework suggested by figure 3.31 the following recommendations are suggested.

Recommendation 1. Establish supra nation institute to negotiate the need of Korean Peninsula and transfer the power to it

Recommendation 2. Establish the inter-Korean S&T transfer system or institution to meet the future demand of technology for unified Korea.

Recommendation 3. Promote public awareness on the importance of technology integration and technology transfer to allow for stabilized unification.

Recommendation 4. Establish inter-Korean public research institutes, agency, and academia possibly in Free Trade Zone and DMZ and develop the customs union, common market and economic union to nurture further development of technology in public and private.

Recommendation 5. Promote future high technology to meet the needs of unified Korea.

Recommendation 6. Expand South and North Korean government R&D investment and induce R&D expansion for the future Korea.

Recommendation 7. Produce a new generation of Koreans to favor united Korea and allow the free movement of people.

Recommendation 8. Establish an institution specialized in international collaboration and Korean economic integration with further regional integration.

Recommendation 9. Simultaneously push the current needs of inter Korean Economic development and future needs of a Unified Korea.

Recommendation 10. Prepare for the future through constant allocation of labor, capital, goods and services and technology.

Recommendation 11. Cultivate a new R&D environment to foster industry.

Recommendation 12. Unify the norms and standards of S&T.

Recommendation 13. Promote more socially available technology to allow for diffusion in South and North Korea.

Recommendation 14. Incorporate the overseas sector in the national S&T innovation system.

Recommendation 15. Promote S&T personnel to adapt advanced technology in abroad.

Recommendation 16. Tighten cooperation between government, private and academic sectors in current, mid, and long-term fundamental technology.

Recommendation 17. Decrease the possibility of rapid unification without long-term economic integration.

Recommendation 18. The selection of system of politics and society should be decided by the future generation of Korea to meet their needs.

Appendix I

Table.4.19 Companies Approved for South-North Korean Economic Cooperation (41 in Total)

Company	Business Specifics	Region	Amount (\$ Mil)	Date of approval
# Daewoo	9 projects including jackets and bags	Nampo	5.12	Oct 5, 1992
Kohap Trading	4 projects including clothes and textiles	Nampo, Rajin-Seonbong, Pyongyang	6.86	May 17, 1995
Hanil Synthetic Fiber	4 projects including sweaters, textiles, and sewing	Nampo, Rajin-Seonbong, Pyongyang	9.80	June 26, 1995
Kukje group	Footwear	Nampo, Rajin-Seonbong, Pyongyang	3.50	June 26, 1995
# Green Cross co	Medicine	Pyongyang	3.00	Sept 15, 1995
Dongyang Cement	Cement silos	Rajin-Seonbong	3.00	Sept 15, 1995
Dongyong Shipping	Stevedoring facilities (cranes, etc)	Rajin-Seonbong	5.00	Sept 15, 1995
Samsung Electronics	The construction of Communication center	Rajin-Seonbong	7.00	Apr 27, 1996
# Taechang	Develops spring water	Mt. Kum Kang, Kosung-gun	5.80	Apr 27, 1996
Daewoo Electronics	TV sets, and other electronic appliances	Nampo	6.40	Apr 27, 1996
# KEPCO	The light-water reactor project	Shinpo	45.0-114.3	Jul 19, 1996
# Mihung Food Processing	Collect and process of marine products	Cheongjin, Hamhung, Wonsan, Nampo	0.15	May 22, 1997
Hanhwa	PVC floor sheets	Pyongyang Nampo	0.9	May 22, 1997
LG	Assembling of color TV sets	Pyongyang	4.50	May 22, 1997 Oct 14, 1997

				(newly signed)
# Korea Telecom	Telecommunication program to support the KEDO program	Shinpo		Aug 1, 1997
Samsung Electronics	Electronic switchboard	Rajin-Seonbong	5.0	Aug 1, 1997
Kolon	Produce and process textile and textile products	Pongyang Nampo	4.0	Aug 1, 1997
Shinwon	Clothes and sewing	Pongyang	1.0	Aug 1, 1997
Parawoo Fishery	Produce and process marine products	Wonsan, Haeju	3.0	Aug 1, 1997
Kumo Food Processing	Cold noodle, sweet Potato and starch	Pongyang	0.4	Aug 1, 1997
Korea Land Corporation	Build a model Industrial complex	Rajin-Seonbong		Oct 14, 1997
Daesang Logistics	Develop and operate Logistics center	Rajin-Seonbong	4.2	Oct 14, 1997
Samcholi Bicycle/ LG international	Assembly and produce bicycles	Rajin-Seonbong	8.0	Oct 14, 1997
# Taeyoung Fisheries/ LG international	Farm and process scallop	Rajin wonsan	2.0	Oct 14, 1997
# Korea Exchange Bank	Run a branch in the Light water reactor site	Sinpo		Nov 6, 1997
Aja Communication	Produce printed Materials and TV ads	Pongyang	0.2	Nov 14, 1997
Ace Bed co.	Manufacture and sell Beds and furniture	Pongyang	4.25	Jan 9, 1998
Lotte Confectionery	Produce and sell Sweets (Choco pie)	Pongyang	5.75	Jan 9, 1998
Kwangjin Inc	Outdoor advertisement	Pongyang Rajin-Seonbong	2.50	Feb 18, 1998
Ansung Development	Establish a sesame oil Processing factory	Nampo	0.5	Mar 13, 1998
# Dooray Village Farming Management Association	Establish a jointly Operated farm	Rajin-Seonbong	8.0	April 8, 1998

# International Corn Foundation	Pursue joint research For the development of A new variety of super corn	Pongyang	0.3-1.1	June 18, 1998-Jun 20, 2001
# Hyundai Merchant Marine/Hyundai Engineering and Construction/ Kum Kang Development Ind./ Hyundai Asan	Engage in the Kum Kang Mountain Tour and development	Mt. Kum Kang	100.33	Aug 6, 1998
# Korean Land	Develop real estate and run a department store	Pongyang	0.6	Aug 28, 1998
# Baeksan Industry	Produce mushroom	Rajin-Seonbong	0.208	Oct 28, 1998
# Hyundai Electronics Ind./ Korea Telecom/ Onsei Telecom	Joint communication Business for Mt Kum Kang Tour	Mt. Kum Kang	0.13 (first stage)	Nov 11, 1998
Haeju co.	Produce and sell marine products from North Korea	Near the Yellow sea	2.99	Jan 8, 1999
# Pyonghwa Motor co.	Auto-repair and assembly	Nampo	300 (first stage:5.8	Aug 31, 1999
# Samsung Electronics	Joint development of S/W	Beijing China	0.727	Mar 13, 2000 - Jun 16, 2001
Hanabiz.com	Joint development of S/W	Dandong China	2	Apr 28, 2001
Ntrak	Construction of joint Industrial complex	Pongyang	2	Apr 30, 2001

Source: Korea Trade-Investment Promotion Agency (2001).

Note: # means business projects approved (18 in total).

Appendix II Expected sector of Foreign Investment in North Korea

Sector	Investment sector	Investment scale		Item No.
		total	Foreign Investment	
1. Mining	Bronze, graphite, marble, granite	67.1	46.3	5
2. Foods and Agricultural products	Health food, fishery product processing, bean oil, juice	32.9	17.1	4
3. Textile and Cloths	Silk fabric goods, cotton fabrics	293.9	217.2	7
4. Woods and processing	Plywood board	3.0	2.5	1
5. Chemical products	Perfume, oil refining, citric acid, Vinyl chloride, caustic soda, Aldehyde resin, ethyl benzene, Stylen, moosf deoxidization	276.6	139.9	11
6. Glass and ceramics	Kaoline, diatomite, clay, schist Glass tray, glass fiber, crystal	55.6	30.4	7
7. Metal industries	Zinc, cadmium, titanium, chrome steel, Electric bronze, magnesium	156.2	97.4	12
8. Assembly Metal products	Bolt, nut	0.8	0.3	1
9. Machinery	Machine tool, oli pressure gauge, Cutting tool, industrial sewing machine, Electrolysis machine, oil pressure pump and valve. fuel pump and spray machine	192.1	95.2	8
10. electric and electronics	Battery, black TV, electric tools, Electric motor, color TV, permanent magnet, relay, current transformer, elevator, small computer, calculator, recording machine, fridge, anode integrated circuit	334.2	165.1	25
11. ship building	Fishing vessel building and ship repair	148.9	75.6	2
Total		1,561.3	887.0	83

Source: United Nations Industrial Development Organization Investment Promotion Service (1990). List of Project Profile from the Democratic People's Republic of Korea, Seoul: UNIDO.

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