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## **THE DIAMOND APPROACH TO THE COMPETITIVENESS OF KOREA'S DEFENSE INDUSTRY: FROM THE PARK, CHUNG HEE TO LEE, MYUNG BAK ERA**

### **ABSTRACT**

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Despite the control of U.S. and poor domestic infrastructures, the Korean defense industry has been advanced at relatively faster trajectory owing to the multiple circumstantial factors such as enthusiastic policy of the president's concrete will, expertise of technocrats, drastic increase of scientists, efficient interrelationship with the heavy chemical industry, and systematic government support. However, this sector's competitiveness is controversial for various reasons. Changes in the internal and external environment are calling for strategic developments of a new framework for competitive factors. The purpose of this study is to explore what constitutes sources of competitiveness of Korea's defense industry and how it could be achieved effectively in a relatively short period of time. This study adopts Porter's Diamond Model as a theoretical framework to evaluate competitiveness of the defense industry in a more comprehensive and strategic way. Along with this model, this study uses mainly extensive literature reviews due to limitations in reliable examples of successful firms and interviews with field practitioners in the Korean defense industry.

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*Key Words: defense industry, competitiveness, Korea, Porter's Diamond model*

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## INTRODUCTION

Over the last two decades, a growing number of developing countries, including Brazil, Taiwan have emerged as conventional arms manufacturers and exporters, bringing about impact on the structure of the international arms market (Baek, McLaurin, and, Moon, 1989; Ross 1989; Bitzinger, 2003).

Since the early 1970s, South Korea (Korea, hereafter) has pursued ambitious defense industrialization in order to enhance its military self-reliance capabilities. This has led to impressive results (Moon, 1986, 1991). Currently, however, the Korean defense industry is facing a new path. The industry is being forced to act as a new engine for future economic prosperity. To attain this goal, the Korea's defense industry is urged to conduct more comprehensive and strategic studies to revamp existing theoretical structures.

Most of the government-sponsored institutes' papers, including studies by the Korea Institute for Defense Analyses (KDIA), the Agency for Defense Development (ADD), the Korea Defense Industry Association (KIDA), the Defense Acquisition Program Administration (DAPA), and the Security Management Institute (SMI), have primarily focused on the policies-related approaches. Previous studies have shown the tendency to focusing on either the specific administrations' defense industry policy and development strategy (Moon, 1991; CIS, 1992; Kim, 2008; Lee, 2009) or issues and fields as export promotion (Joo and Park, 2009; Kwon, 2009; Yang, 2009), improvement of efficiency in defense industry (Jeong and Heshmati, 2009; Rim and Lee, 2009). In addition, there are not many international journals and papers concentrating on the Korea's defense industry (Ha, 1984; Ross, 1984; Nolan, 1986; Moon, 1991; Hwang, 1996; Bitzinger and Kim, 2005; Lee, 2009; Jeong and Heshmati, 2009). Furthermore, these studies have mainly dealt with a comparative study between Korean and other developing countries' defense industry (Ha, 1984; Neuman, 1984; Nolan, 1986; Moon, 1991; Hartley, 1995; Moon and Lee, 2008). This has resulted in a lack of comprehensive structural and theoretical appraisements on the Industry.

In addition, the research of Korea's defense industry has lacked the systematic and academic assessments since it pursued the manner to compensate the practical defects and suggest the alternatives based on the existing researches rather than theoretical analysis.

Furthermore, since the Cold War, the defense industry has become a vital component of each country's national political and economical interests rather than a separate

development. The defense industry is a controversial and complicated subject (McGillicuddy, 1993; Dunne, 1995; Hartley, 2007).

The defense industry related to the national budget and spending, manufacturing and transferring of weaponry and advanced-technology proliferation has been a major issue in the international community since it brings substantial impacts on the global politics, economy, industrial and technical matters as a whole not just one specific state (Kim, 2005; Hartley, 2007; Kim, 2008).

Over all, the two main methods of research are political military perspectives (Hartley, 1995) and economic technological perspectives (Kubbig, 1986). These conditions require concrete compendious and multidisciplinary approaches to measure a country's development strategy for its defense industry.

Contemplating these all circumstantial factors, the defense industry, which is affiliated with the international politics, military and socioeconomic matters, conveys very complicated and eclectic peculiarity. Thus, evaluating one specific aspect of the industry may not provide the comprehensive assessment on the industry. Given these conditions, this paper elects the Porter's diamond model to scrutinize the competitiveness of the defense industry more comprehensively (Cho and Moon, 2000).

Previously, research has been conducted largely by focusing on the studies obtained during the Park, Jung hee administration. Recently, however, encyclopedic studies have started to review the research conducted under the previous administrations of Kim, Dae jung, Rho, Moo hyun, and Lee, Myung bak (Moon and Lee, 2008; Lee, 2009; Choi, Ko, and Lee, 2010).

Defense industrialization in Korea has undergone several stages of industrial development. Based on the framework of the Poter's diamond model, this paper aims at elucidating the evolutionary dynamics of defense industrial growth in Korea in chronological order by tracing its developmental trajectory, examining patterns of production and demand(including international demand), and by analyzing government roles and the defense industrial complex.

Our findings are meant to address managers in the defense industry and aid policy makers in continued support and action.

## **PORTER'S DIAMOND MODEL AND KOREA'S DEFENSE INDUSTRY**

### **Porter's Diamond Model**

To investigate why nations gain competitive advantage in particular industries, Porter (1990) conducted a four-year study of ten important trading nations and proposed the "Diamond Model." Porter concluded that a nation succeeds in a particular industry if it possesses a competitive advantage over the worldwide competitors. The Diamond Model consists of four determinants: factor conditions; demand conditions; related and supporting industries; and firm strategy, structure, and rivalry.

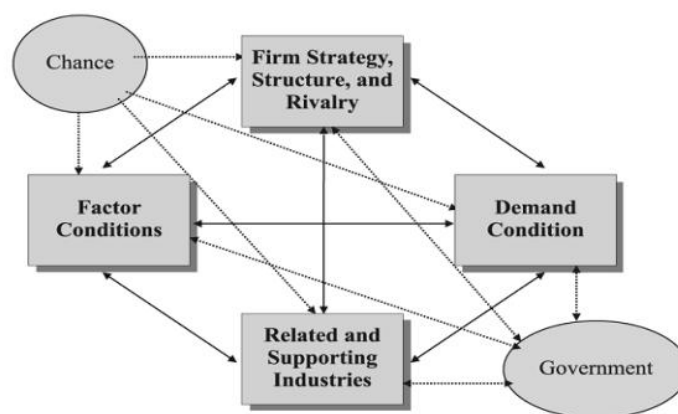
During recent years, many researchers have discussed competitive advantages of nations, industries, and firms from various perspectives. In general, there are two conflicting perspectives on the determinants of competitive advantage. While researchers, such as Barney (1991) and Grant (1991) focus on resource-based explanations for competitive advantage, industrial economists such as Porter (1980) propose industry-based explanations. According to Porter, competitive advantage in a given industry is a combination of the ability to innovate, to improve processes and products as well as to compete (Porter 1990: 69). For determining national competitive advantage in different industries, Porter (1990) developed a conceptual framework which he labeled diamond that consists of four interrelated determinants: Factor conditions represent a country's factor endowment and can be distinguished in basic factors and advanced factors. Natural resources, physical resources, unskilled labor as well as capital resources belong to the basic factors, whereas modern digital data communication infrastructure and highly educated personnel represent the advanced factors. Demand conditions describe the nature of domestic demand for products or services in a certain industry. Three broad attributes are significant: the composition, the size and pattern of growth as well as the internationalization of domestic demand. Related and supporting industries are industries, in which firms can share activities intersectorally in the value chain, e.g., technology development, suppliers, distribution, and marketing. Firm strategy, structure and rivalry describe the conditions of a country that determine how firms are organized and run. In addition, goals (i.e. firm objectives, goals of individuals), domestic rivalry, and new business formation determine this factor.

Two exogenous factors - chance and government - may also impact competitive advantage. Chance includes events that cannot be influenced by firms, e.g., acts of pure

inventions, major technological discontinuities, and surges of world or regional demand. Finally, the government can influence each of the four determinants in a positive or negative way.

The complete diamond system is presented in Figure 1 (Porter, 1990).

**Figure 1: The complete diamond system**



Source: Porter (1990)

### **Korea's Defense Industry Competitiveness Determinants**

This study selects the following assessment standards from Porter's model : Factor conditions represent factor endowment, which is closely related with R&D infrastructure, R&D Budget, and R&D cooperation system in the development process of the Korea's defense industry. Especially in Korea, demand conditions in defense industry are heavily dependent upon the government's domestic demand. Recently internationalization of domestic demand is emerging as an important factors. Related and supporting sectors could be explained through linkage plan, dual-use technology (spin-on & spin off). Strategy, structure and rivalry factors might be elucidated with management strategy and competition strategy. Two exogenous factors - government and chance might influence each of the four determinants mainly by the government role and policy.

Considering the theoretical notion of internationalization should be used to analyze the Korean Defense industry. But this study selects these factors implicitly, including demand determinants for example, rather than explicitly due to some limitations.

## AN EVALUATION OF KOREA'S DEFENSE INDUSTRY COMPETITIVENESS

### Overview

Since the early 1970s, Korea has pursued ambitious defense industrialization in order to enhance its military self-reliance capabilities (See Table 1). This has led to impressive results.

**Table 1: Transformation of the Korean Defense Industry**

Administration	Military construction Program / security policy	Modernization Policy Goals	Defense Industry Policy/ Acts and Organizations
<b>Park, Chung hee (1963-1979)</b>	1 <sup>st</sup> Yulgok (1974-1981)/ Self-reliant defense	Secure Minimum level defense forces	Actively foster defense industry/ ADD establishment (1970.8.16) Regulations on R&D system (1972.9) Act on special measures for defense industry (1973.2) Defense tax law (1975.7) Regulations on military materials prime cost standard (1978)
<b>Chun, Doo hwan (1980-1988.2)</b>	2 <sup>nd</sup> Yulgok (1982-1986)	Compliment defense forces	Early military build-up Foster defense industry/ Regulations on defense procurement contract procedure(1982.8) Planning programming and budgeting system (1983.7)
<b>Roh, Tae woo (1988-1993)</b>	3 <sup>rd</sup> Yulgok (1987-1991)/ US-ROK Alliance, Cooperation security	Lay the foundation for future forces	Early military build-up Maintain defense industry/ Enforcement of decree on special measures for defense industry(89.12) Abolition of defense tax law(90.12)
<b>Kim, Young sam (1993-1998)</b>	4 <sup>th</sup> Juluk Jungbi saup (1992-1996)		Regulations on offset program procedure (1992.1) Regulations on Specialization and Systematization Legislations (1993.12) Regulations on defense industry prime cost (1994.2)
<b>Kim Dae jung (1998-2003)</b>	Force construction program (1997-2001)	Secure self-reliant deterrent capabilities	Early military build-up Maintain defense industry/ Regulations on military acquisition management (199.1) Five year defense reform plan
<b>Roh, Moo hyun (2003-2008)</b>	Force investment program (2002-2006)/ Cooperative self-reliant security	Secure self-reliant deterrent capabilities	Early military build-up Vitalize defense industry/ Law on defense procurement(2006.1) Abolition of act on special measures for defense industry(2006.1)
<b>Lee Myung bak (2008.2- )</b>	Defense Industry program (2007- )	Revitalize the export of defense industry New Economic Growth Engine	Early military build-up Vitalize defense industry/ Regulations on defense industry management(2007.10) Abolition of Regulations on Specialization and Systematization system(2009.1)

\* 1st Yulgok is the first phase of the armed force modernization project; \*\* 2nd Yulgok is the second phase of the armed force modernization project; \*\*\* 3rd Yulgok is the third phase of the armed force modernization.; \*\*\*\* 4th Juluk Jungbi saup is the armed force alignment.; Source : Moon (2008), Choi, Ko, and Lee (2010).

Park, Jung hee administration pursued the military self-reliance policy during the 1970s and the Korean defense industry has been advanced at relatively faster trajectory. Yet, Chun, Doo hwan administration could not apply the comprehensive de facto national policy to the defense industry. After the cold war in the late of 1980s, Roh, Tae woo administration articulated the malleable military policy to adjust swiftly changing regional security matters more practically. President Kim, Young sam's primary goal was to depoliticize the Korean military and consequently lower the priority of innovating military strategy, force structure, and new weapons systems.

President Kim, Dae jung's assertive pursuit of engagement with North Korea and the new zeitgeist for peaceful co-existence erode public support for defense-sector spending. As a result, the government tried to enhance the efficiency and capabilities of its weapon procurement institutions and procedures through military modernization plan from 1998 to 2002. The progressive Roh, Moo hyun administration made an effort to reduce dependence on the U.S. The government established DAPA which has been assigned the task of raising the transparency and effectiveness of the arms trade, formerly handled by a defense procurement office under the Defense Ministry.

Lee, Myung bak administration has been vehemently enforcing the growth policy of its defense industry to establish global competitiveness. The "Defense Industry as the New Economic Growth Engine" was designated as one of the 100 tasks of the current government.

### **The Park, Chung hee Administration (1963-1979)**

#### *Factor Conditions*

Following a series of military provocations by North Korea in the late 1960s and 1970s (including the North Korean Commandos raid on the Blue House in January 1968, the seizure of the U.S. intelligence ship *Pueblo* in June 1970), the declaration of the Nixon Doctrine in July 1969, and weakened U.S. security commitment to Seoul (including President Carter's announcement to withdraw U.S. ground troops from Korea in 1977), the Korean government decided to develop its own weapon production capability (Baek and Moon, 1989; Hwang, 1996; O, 2009). This perceived threat itself did not drive Korean leaders to search for self-reliance in defense issues. Korea sensed more of an extreme threat, and thus a greater need or impetus for defense industrialization, particularly with its perception of a rapidly weakening U.S. security commitment, detected in the U.S. response

to the North Korean provocation. Finally President Park Chung hee emphasized the need to develop Korea's defense industry in his 1970 New Year's Day Speech (O, 2009; Kim, 2008).

On April 27, 1970, President Park, Chung hee launched the Directive Memo on a Defense Industry Program focusing on getting the utmost out of the civilian industry to search for self-reliance in defense matters. The memo provided that the government provided research and development support, as well as informational infrastructure by establishing the Agency for Defense Development (ADD) and other government agencies relating to the defense industry. The ADD was commissioned not only to serve as a defense-related technical data center and assist the private sector's defense-related R&D, but also acquire foreign defense technology and defense product development (Hwang, 1996; Kim, 2008; O, 2009). Since then, the ADD has played an important role in shaping the performance of the defense industry and has secured a powerful independency and autonomy especially in defense-related R&D.

In the course of defense industrialization, Korea depended heavily on three types of U.S. military technology transfer: the acquisition of technical data packages, manufacturing license, and co-production (O, 1995; Baek and Moon, 1989; McLaurin and Moon, 1993; O, 1995; Koo, 1998). U.S. involvement in facilitating defense industrialization has been extensive, ranging from technical and logistic support to providing ADD's manpower training and mobilization, as well as the transfer of military technology. The U.S. transferred a wide range of defense-related technologies to Korea by means of technical data packages (TDP), manufacturing license agreements, exchanging of scientist and engineers, and co-production in the framework of security technical assistance. However, dependence on the U.S. was a mixed blessing. In the late 1970s, the allegations related to the development of long-range surface-to-surface guided missiles and nuclear weapons became a critical issue. Along with these allegations, the U.S. government enhanced the monitoring of ADD and the defense industry's research activities (Kim, Moon, Baek, and Kim, 1993; Koo, 1998; O, 2009).

From 1971 to 1979, the average fraction of the defense budget devoted to R&D was 3.4 percent. These defense-related R&D investments contributed to a foundation for Korea's defense industry (see Table 2).

During the early stages of the defense industry, President Park instructed ADD to devote itself to research, development, and trial assessments and the defense industry to



become a major manufacturer. He also managed the institution in efforts to establish cooperative relationships with Korea Institute for Science and technology (KIST) (Hwang, 1996; Koo, 1998).

**Table 2: Defense Budget Devoted to R & D From 1971 to 1979 (in percentage)**

Year	1971	1972	1973	1974	1975	1976	1977	1978	1979
Rate (%)	0.2	0.8	1.2	1.7	9.3	5.3	4.7	3.4	3.8

Source: Lee (2006)

### *Demand Conditions*

Self-sufficient production in the areas of ammunition and basic infantry weapons were heavily underscored, followed by comprehensive policy support. The Korean defense industry began to shift from import technology based production to that based on local research and development. The government came up with a comprehensive demand. Corporate survival of defense contractors was virtually guaranteed through long-term procurement contracts and the promise to rescue defense contractors operating at a loss. Monopoly and oligopoly were more than tolerated (Moon, 1991; Kim, Moon, Baek, and Kim, 1993).

Modernization policies created enormous demand for the defense industry. In some cases, up to 90percent advance payment was provided to mitigate financial bottlenecks (Kim, Moon, Baek, and Kim, 1993; Lee, 2009).

The government continued to create demand through the expansion of defense budgets and aggressive procurement policies. To achieve this, three government decrees put Seoul's policy into motion: a 1973 Law on the Defense Industry, a 1974 Force Improvement Plan for the buildup of Korea's armed forces (the First *Yulgoke* Project), and a 1975 Defense Tax Law that was designed to finance the development of the defense industry. The National Defense Tax imposed a 10 percent income and sales tax surcharge. At the same time, a nationwide fund-raising campaign was launched (Moon, 1991).

Until 1975, the dollar value of military exports was minimal. Moreover, most military exports were comprised of military software, like uniforms and other non-lethal equipment. Since 1976, however, Korea has not only increased the dollar value of military exports, but has also shifted its exports from labor-intensive software, like the above

military software to conventional weapons systems, like infantry weapons and munitions (Baek and Moon, 1989; Moon, 1991).

#### *Related and Supporting Sectors*

Korea's economic situation was too marginal and its industrial capability was primitive to develop and produce sophisticated weapons in the early 1970s. In the 1970s, the defense industry imitated the U.S. defense industry system using U.S. technical assistance, including the inflow of defense articles and equipments to Korea. Defense industries distinguished from other industrial sectors in that they require a synchronized combination of defense technology, heavy capital investment, industrial infrastructure, and qualified manpower (O, 2009).

Given the high industrial linkage with the defense industry and limitations of Korea's economy and industry, the Korean government assumed direct control of the whole range of tasks for the industry's development, from planning to enforcement. This also fostered the development of chemical and heavy industries (Hwang, 1996; O, 2009). Park seemed to consider weapons development policies as means to help develop commercial technologies from the beginning (Hwang, 1996; Koo, 1998; O, 2009). Heavy machinery, electronics, shipbuilding, and steel industries were singled out as key strategic sectors and received almost 75 percent of available investment funds from 1974 to 1979 (Baek and Moon, 1989; Kim, Moon, Baek, and Kim, 1993).

The basic direction of Korea's defense industry build-up was established in the First committee on the development of the defense industry in February 1972. And the second committee on the development of the defense industry in October 1972 discussed issues related to the defense industry designation system, cost accounting, and engineering education (O, 1996; Koo, 1998). Highly qualified manpower was an essential contributor to the rapid build-up of a viable defense industry. Emphasizing education training in engineering, coupled with the government's aggressive recruiting of Korean national scientists and engineers from abroad through lucrative incentives helped provide the technical manpower needed for defense industrialization (Baek and Moon, 1989; Moon, 1991).

Technological spin-off effects of government-subsidized defense R&D made significant contributions to the commercial sector (Moon, 1991; Koo, 1998). Major ticket items, such as aircraft, missiles, communication, and naval vessels were heavily

concentrated in a few large business conglomerates. Perhaps the most important contribution of the military technology investment of the 1970s was the experience gained by scientific and engineering manpower, both in ADD and KIST. In the early 1980s, many of the project managers who obtained their experience in ADD found their way into the commercial industry and played salient roles in the development and commercialization of R&D (Hwang, 1996).

### *Strategy, Structure, and Rivalry*

The role of the Office of the Second Senior Presidential Secretary of the Economy was significant. The successful implementation of the entire project was mainly contingent upon the intervening, coordinating, and facilitating role of the office (Baek and Moon, 1989; Kim, 2005; O, 2009). President Park's plan was based on five principles: 1) The incremental development of the industry for the sake of long-term efficiency, competitiveness and safety; 2) The Establishment of a long-term plan for defense demand and government support due to the role of the government as a singled-out buyer; 3) Promoting second-source firms among the civilian industry; 4) Matching the defense industry plan with the overall economic and heavy-industry development plan; and 5) Limiting the concentration of defense production to no more than thirty percent in any one firm (Hwang, 1996).

Technocrats from the Ministry of Commerce and Industry (MCI) who played a key role in South Korea's economic development since the 1960s led the defense industry development strategy through an Engineering Approach. The "Engineering Approach" had been elected in Korea to promote industry put top priority to those export industries that had a multiplier effect on the economy. The process of promoting each industry passed through direct protection to attaining internationally competitive status. Development proceeded in timed and sequential stages (O, 1995; 1996).

Thus, the export industry was established first, followed by industries based on processed primary materials and heavy industry. The direction of development was, therefore, the reverse of socialism, which aimed for autarky and the production of quantity irrespective of efficiency. This approach required the development of skilled human resources and could only have succeeded with the cooperation of the industrialists. The long term goal was designed to meet market responsiveness (O, 1995; 1996; 2009). The government's defense industry strategy was pursued as part of the heavy and

chemical industrialization policy from the third 5-year economic plan period (Koo, 1998; O, 2009).

### *Government*

President Park in his 1971 New Year's Day speech warned that the following two to three years were to mark a pivotal transitional period for Korea. He declared full confidence on his military strategies and development of Korea's own defense industry (O, 2009). The political leadership demonstrated a strong commitment to the defense industry, which increased its capacity to implement the industry. From the outset, the Korean defense industry was removed from conflicting political pressure. Korea, however, did not take the path of direct state management of the defense industry, but pursued an assertive defense industrial policy by using the private sector as an agent of defense industrialization (Moon, 1991).

President Park demanded immediate development of his hand-picked weapons. He convened the High-Level Meetings for Defense Industry Promotion and founded the Second Presidential Secretariat for Economic Affairs in November 1971, which presided over both the civilian heavy and chemical industry and the defense industry development until 1979. It received top priority in resource allocation and was removed from bureaucratic infighting. The insulation of defense industrialization relating to competing political claims resulted from a highly centralized decision-making system (Kim, Moon, Baek, and Kim, 1993; Hwang, 1996).

The Special Law on the Promotion of the Defense Industry was enacted to provide the legal basis for defense industrialization. The National Investment Fund followed by The Defense Industrial Promotion Fund was established to direct increasing financial resources toward the defense industry. The government created a special fund in the form of tax incentives and extended concessional financing to the defense industry, introducing the Defense Tax. Special provisions for tax credits and military draft exemption for employees in the defense industry were enacted. Through the enactment of a special law on labor disputes, the government banned labor disputes at defense industrial firms (Baek and Moon, 1989; Moon, 1991; O, 1996).

The government set a two-stage goal to develop the defense industry. The Third Five-Year Economic Development Plan (1971-1976) focused on reverse engineering of imported weapons, basic model development, and licensed production in support of

conventional weapons development. The second stage (1977-1981) was to complete a firm foundation for the production of high precision weapons by the end of the Fourth Five-Year Economic Development Plan. Then Korea would produce a wide range of conventional weapons, aircraft, armored vehicles, missiles, and naval vessels. The Special Law for Measures on Defense Industrial Supply was promulgated in February 1973. Under this law, defense firms were granted loans from the citizens' investment fund, long-term and low-interest capital, exemption from corporate income tax, special consumption taxes, tariffs, and value-added taxes to finance the defense industry products (Hwang, 1996). The defense Force Improvement Plan laid the foundation for weapons development and the defense industry. In accordance with President Park's order on April 19, 1973, the Eight Year Defense Plan (1974-1981) termed the First *Yulgoek* Project, was formulated to reduce foreign dependence through domestic production of conventional weapons (Hwang, 1996; O, 2009).

**Table 3: Major Defense Articles Produced in Korea (1970s-1980s)**

Type	Articles
<b>Weapons</b>	M101A1 (105mm Howitzer), M114A2 (155mm Howitzer), M67 (90mm RR), M40A2 (106mm RR), M19 (60mm Mortar), M29A1 (81mm Mortar), M30 (4.2" Mortar), 20mm Vulcan AOS, M16 Rifle, M60 Machine Gun, K1(5.56mm Submachine Gun), K2 (5.56mm Rifle), K5 (9mm Pistol), K3 Machine Gun
<b>Ammunition</b>	Artillery Ammunition (M107, M1, M444E1, M314A3, M106), Mortars Ammunition (M374, M329A1, M49A4), Gun & Recoilless Rifle Ammunition(M371A1, M431A2, M344A1, MK-51, K241, M456A1), Anti-Aircraft Ammunition (M246, M56A3, M220, M55A2, K154, K155, K156, K202, K203), Small Arms Ammunition (M1, M2, M193, M200, M196, M80, M62, M82), Ammunition WP Smoke (KM302A1, KM375, KM328A1, KM602A2, KM110A2, KM34), Hand Grenades (K400, K401, K409)
<b>Communications</b>	TA-312-PT, AN/PRC-77, AN/GRC-122/142, AN/VRC-12, AN/URC-87, TCC-15K (Delta Muk), TCC-7K
<b>Aircraft</b>	Hughes 500MD Helicopter, Hughes 500 MC Scout, Northrop F-5E/F fighter, F-16 engine and fuselage
<b>Naval Vessels</b>	Patrol Ship, Battle Ship, Destroyer, Landing Craft, Land Ship Tank, Munitions Supply Ship, Troop/Vehicle Transport, Submarine
<b>Missiles</b>	Nike Hercules surface to surface missile, Honest John unguided tactical missile, Hawk missile system, Anti-Ship missiles, Hyunmoo medium-range guided missile
<b>Missiles/Vehicles</b>	US M48 (Tank), M-113 Tank, ROKIT ('88 Tank), K-2000 APC, K900 APC
<b>Miscellaneous</b>	M79 (Grenade Lau), M203 (Grenade Lau), AN/TVS-5, AN/PVS-5, AN/PVS-4, M9A1 (Protective Mask), M-2 Aiming Circle, 69mm Mortar Sight, 81mm Mortar Sight, Telescope Pan, 105mm HOW Carriage, Military Trucks, Heavy Machinery Equipment

Source: Moon and Lee (2008)

From 1970 to 1978, the period that massive defense industrialization occurred, it was an era of capital abundance in Korea. Apart from U.S. aid and FMS credit, the country's excellent economic performance and good credit ratings, combined with the Middle East construction boom provided the capital need for defense industrialization (Baek and Moon, 1989). Thanks to the industrial promotion policy and its rapid expansion, Korea's defense industrial sectors were able to make tremendous progress in the 1970s marked by the domestic production of most conventional weapons and the establishment of foundation for the production of advanced precision weapons (see Table 3).

### **The Chun, Doo hwan Administration (1981-1988)**

#### *Factor Conditions*

After the assassination of President Park and the inauguration of the Fifth Republic, the policy on the defense industry and the promotion of defense technology experienced a variety of changes. Along with the inauguration of Chun, Doo hwan administration in 1981, it made an effort to obtain the support from the Regan administration to preserve the legitimacy of the Fifth Republic. One of the efforts was that the administration elected the defense policy which highlighted the dependence on U.S. (Choi, Ko, and Lee, 2010).

Chun, Doo hwan Administration encountered a dilemma. On the one hand, his government was obliged to spend 6 percent of GNP in order to comply with the defense burden sharing formula with the U.S. On the other hand, it was under immense pressure from the IMF to implement macroeconomic stabilization through tight fiscal and monetary policy. The administration began to trim its defense budget by adhering to IMF's call for macroeconomic stabilization (Moon and Lee, 2010).

The ADD merged or abolished divisions with overlapping functions and dismissed about 800 researchers in April 1981. Several core members of guided-weapons teams, *Baggom project*, and other high-tech systems R&D teams lost their jobs. Few R&D accomplishments were achieved since the mid-1980s (Hwang, 1996; Kim, 2008).

Since 1980, however, the U.S. suspended the supply of free TDPs securing the intellectual property rights of U.S. manufacturers (Hwang, 1996; Koo, 1998). Korea's defense R&D was in the doldrums. It has been led, coordinated, and controlled by ADD, but ADD's leadership seemed to have reached its limit since the 1980s.

As shown in Table 4, the rates of defense R&D expenditure in the 1980s were low compared to those in the 1970s (see Table 4)

**Table 4: Defense Budget Devoted to R & D From 1981 to 1988 (in percentage)**

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988
Rate (%)	3	1.4	2.2	1.2	1.9	1.98	2.1	2	1.4

Source: MND (1990)

There was insufficient cooperation among the industry, academia, institutes, and the government (Kim, Moon, Baek, and Kim, 1993; Hwang, 1996). Multiple regulations and a dramatic decline in R&D investment led to negative consequences in the development of the defense industry.

#### *Demand Conditions*

While purchases of new weapons from overseas and defense production technology increased, investment in domestic R&D, which could provide access to precision weaponry that mostly required state-of-the-art technology not yet available under president Park's program, had been reduced.

After the 1980s, the government relied on direct overseas acquisition rather than domestic acquisition or co-production. As domestic acquisition encountered various problems, such as delayed delivery, cost overrun and performance defects, the Chun, Doo hwan administration shifted its acquisition policy from domestic acquisition to overseas direct acquisition, which in turn depressed the domestic defense industry (MND, 2006). The government continues to maintain a case-by-case approach to weapons system acquisitions, frequently shifting its mid- and long-term demand, taking into little account the qualitative upgrading of the defense technology base (Koo, 1998).

To overcome saturation of the domestic market and resulting under-utilization of defense production capacity, the government tried to export military hardware with the help of civilian sectors. Korea had some advantages over military exports due to price competitiveness, low transportation cost, aggressive market penetration, standardization and interchangeability, excellent quality control, coordination between the government and defense contractors, as well as having no political strings attached (Ross, 1984; Baek and Moon, 1989).

However, the more visible Korean military exports, the heavier the constraints and pressures are. The most critical obstacle has been the tightened U.S. regulation, the Arms Export Control Act, the International Traffic in Arms Regulation, and Korea's 3CS (third-country sales). U.S. regulation has had a devastating impact not only on defense exports, but also on the defense industry as a whole (Moon, 1991; Kim, Moon, Baek, and Kim, 1993). Korean military exports have seen a relatively high level of annual fluctuation from 1975 to 1983 and a gradual decrease since 1984. The sharp decline in export volume since 1984 is partly a consequence of these growing pressures and constraints. Between 1981 and 1984, only 8 percent was approved of which Korea requested for the 3CS approval. The U.S. government is imposing an eight percent royalty on those export items of U.S. origin. In lieu of requiring intellectual property rights compliance, the U.S. strictly controlled the request for technical transfers of advanced weapon systems, such as missiles and submarines.

The value of Korean military exports was minimal before 1979. Since 1980, however, Korea has not only increased the dollar value of military exports, but has also shifted its exports from labor-intensive software to conventional weapons systems (Moon, 1991; Lee 2009). In the late 1970s and early 1980s, the world witnessed increasing regional instability in the form of inter-state conflicts and domestic insurgencies, such as the Iran-Iraq war and the conflict in Lebanon. The effective export promotion strategy implemented in concert between the Korean government and private sector has allowed the country to exploit this expanding market. In addition, the shift in the government's policy from control and coordination to support and facilitation has contributed to promoting military exports.

#### *Related and Supporting Sectors*

From the mid-1980s, the Korean defense industry began to face a different environment. While domestic market saturation and declining defense procurement lowered capacity utilization, the implementation of market-conforming defense industrial policy deprived defense contractors from the extra-market incentives and production that they enjoyed in the previous decade (Moon, 1991). President Park endeavored to achieve the combined goal of economic development and self-sufficient defense through a master plan focusing on fundamentals of both industries. This combination plan, however, did not survive in the advent of the Fifth Republic (Hwang, 1996). President Chun



promulgated the Special Law. This law introduced the defense industry and defense product designation system to promote the development and protection of the defense industry. It also encouraged the systematic enhancement of the industry.

However, under the Fifth Republic, utilization of the defense production line was low and defense firms were financially exposed, causing them to lose their preference for the defense industry. Some Korean defense manufacturers reached the point of diminishing returns with the saturation of the domestic market (Moon, 1991).

### *Strategy, Structure and Rivalry*

Rapid military industrialization began without due attention to technical engineering and financial capacities, nor medium and long-term industrial consequences taken into consideration. The results were the economic crisis of the late 1970s and the early 1980s. Economic crisis and regime change from 1979 to 1980 brought about major changes in the defense industrial policy in which assertive state intervention was replaced by a more cautious and prudent market-conforming policy. The manpower and budget of the ADD were cut by one third overnight in 1981. Cost factors have gradually dictated the nature of defense industrialization. The transition from assertive to market-conforming industrial policy began to compress the hyper-growth of the defense industry (Moon, 1991).

Doubts about the economic efficiency of domestic weapons production led the government to pursue a policy based on the economic principles of comparative advantage. The government enforced investment readjustment on the heavy chemical industry, introducing limited competition. The defense industry was expected to cultivate the ability to survive on its own, based on economic principles; it no longer enjoyed a privileged position in targeting industrial development. As a ramification of these political and economic environments, in the late 1980s, defense contractors began to move away from defense industrial production to commercial production (Kim, Moon, Baek, and Kim, 1993; Hwang, 1996).

### *Government*

The government began realigning the direction of defense industrialization toward the Koreanization of defense products and technologies, the production of more high-tech, cutting-edge defense industrial items and diversification of the sources of defense technology. The Fifth Republic, however, confronted the conventional systematic

problems. The High-Level Defense Industry Promotion Meeting, which President Park resolved defense industry issues and encouraged research and development, was rescinded. Also, the responsibility for promoting defense industrial policy was shifted from the Blue House to the Ministry of National Defense and the Ministry of Trade and Industry (MTI). After the inauguration of the Fifth Republic, the government's tightened fiscal policy resulted in the reduction of the budget of the defense industry. Even worse, there was a lack of research coordination among the ADD, defense contractors, government-sponsored research institutions, and the Ministry of national Defense (Hwang, 1996; Koo, 1998).

Since the mid 1970s, there have been continued tensions between indigenous development and cost-effective acquisition. Some economists contended that Korea should support only those defense firms that can demonstrate competitiveness and efficiency as measured by civil markets. These economists would have the military rely primarily on weapons purchased abroad (Kim, Moon, Baek, and Kim, 1993; Hwang, 1996).

### The Roh, Tae woo Administration (1988-1993)

#### *Factor Conditions*

From the late 1980s, South Korea encountered new internal and external changes. The end of the Cold War, realignment of American Security posture in East Asia, and South Korea's democratic transition paved the way for a new discourse on military strategy, construction of military power, force structure and weapons systems (Moon and Lee, 2008).

President Roh championed a self-reliant defense posture and had interested in the domestic development of military technology. For instance, the trend of the policy, defense-related R&D investment increased from 1.4 percent in 1988 to 3 percent in 1993 (see Table 5).

**Table 5: Defense Budget Devoted to R&D from 1989 to 1999 (in percentage)**

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Rate (%)	1.2	2.09	2.44	2.78	3.02	2.97	3.01	3.06	3.12	3.47	5.34

Source: MND (1999)

Yet, Korea's R&D budget is minuscule compared to that of the advanced countries. In the U.S., England, and France, defense R&D exceeds 11-15percent percent of defense expenditures (MND, 1999).

The administration drove the drastic project to resolve the problems relating to the decline of the research productivity of ADD and bureaucratic loopholes. It also amalgamated sectors of civilian and military research centers and universities to expand the horizon of the defense industry to general and reserve the greater efficiency of the industry (Koo, 1998).

*Demand Conditions*

The Korean defense industry began to shift production based on imported technology to that based on local research and development. The core of this self-reliance strategy is the development and production of indigenous weapons systems (MND, 1994-1995). Since the end of Cold War, most nations have curtailed their defense expenditures and Korea is no exception (Hwang, 1996; The International Institute for Strategic Studies, 1999) (see Table 6).

**Table 6: The International Arms trade (Billion)**

Year	1987	1992	1993	1994	1995	1996	1997	1998	1999
Amount	89.9	51.5	46.9	42.8	46.9	51.0	56.0	55.8	40.5

Source: IISS (1999)

The decrease in demand of the global arms market had a profound impact on Korean defense industry's weaponry exports. Furthermore, Korea's defense industry could not follow the trajectory that demands highly advanced weapons after the Gulf War of the early 1990s. At that time, the industry was not capable of supplying this type of weaponry. Therefore, this further exacerbated weaponry exports (DAPA, 2008).

*Related and Supporting Sectors*

Since the late 1980s, the Korean government began to take more assertive measures to enhance coordination by rationalizing and systemizing the defense industry. Given the high priority of economic and social development in the post-Cold War years, a defense program with positive "spin-off" contribution to the economy would help justify defense investments that might otherwise be foregone. Furthermore, defense R&D policy was

shifting from spin-off to dual-use, involving both spin-off and spin-on. The application of a dual-use paradigm in Korea serves as a policy direction to counter such changes in the international environment as the shift in technological development priorities from the Cold War military stand against a rise in unbridled technological competition (Koo, 1998; Hwang, 1996).

Dual-use strategy for defense rests on the very rapid growth of Korea's commercial technology capability. Heavy and chemical industries including machinery, electronics and shipbuilding, have grown from 52.1 percent of the industrial economy in 1981 to 64.9 percent in 1991 (Hwang, 1996; Moon, 1991).

### *Strategy, Structure, and Rivalry*

Since the end of the Cold War, however, most defense contractors have suffered severe financial difficulties due to defense budget reductions. Companies producing rifles and guns, for example, are operating at 40 percent of capacity, far short of the optimal rate for maintaining economic productivity. The termination of the national defense tax in 1990 epitomizes this scenario. Moreover, the reform of the defense sector and the scrutiny of the Board of Audit and Inspection concerning Yulgok led to inadequate conditions of the defense industry (Hwang, 1996; Koo, 1998).

Through the first revision of the Specialization and Systematization Legislations in 1990, the government changed the competitive policy from monopoly to competition system (Kim, 2005).

### *Government*

Upon his election, President Roh proposed the "Koreanization of Korean defense" slogan, signaling a departure from Korea's excessive dependence on the United States. As part of its new defense policy, the Roh, Tae woo administration announced a "development of a long-term defense posture plan" on 18 August 1988, which is often referred to as "the August 18 plan." The plan set three major objectives: ① To establish a more self-reliant military strategy for national survival, prosperity, and Korean unification; ② To build military power coherent with the goal of a self-reliant defense strategy; ③ To develop a force structure that not only enhances combat readiness, but also assures a balanced development of the armed services. Although the administration's push for defense reform failed to meet the requirements of the Revolution in Military Affairs

(RMA), the August 18 plan set a new standard and direction for innovation in the South Korean defense sector (Institute of Defense and Military Studies, 1995: 312-318; MND, 1989). The end of the Cold War entailed profound changes in U.S. security commitment to South Korea. U.S. Congress passed the Nunn-Warner Amendment in August 1988, which mandated the three-phase reduction of forward deployed American forces in East Asia. American forces in South Korea were also subject to a phased reduction (Moon and Lee, 2008). South Korea's transition to democracy and demand for a more transparent defense policy were closely related to the publication of the *Gukbang baek soh*, the National Defense White Paper, which began in 1988.

In the 1990s, the defense industry experienced a transition due to changes in the president's perspective on the national self-reliance defense system. Rather than the direct involvement of president, the government amplified the defense industry, along with academies and civilian research centers in order for them to play a pivotal role in the defense industry through substantially increased R&D investments.

### **The Kim, Young sam Administration (1993-1998)**

#### *Factor Conditions*

On 25 February 1993, President Kim, Young sam was inaugurated, but Kim administration chose not to continue Roh's policy. President Kim considered Roh, Tae woo administration as a continuation of the military regime and undertook measures to depoliticize the military, including the dissolution of *Hanaboe*, the dominant faction in the Korean military. Thus, the Kim administration's primary goal was to depoliticize the Korean military and consequently lower the priority of innovating military strategy, force structure, and new weapons systems (Moon and Lee, 2008).

The democratic opening and the advent of the post-cold war era further facilitated a downsizing of the defense budget. The Ministry of National Defense planned to increase the ratio of defense-related R&D investment to 5 percent by 1998 (MND, 1996). However, plans failed due to fiscal rigidity that led to lower interest in the defense industry owing to the financial crisis from 1997 to 1998.

To promote vital research and development of the domestic defense industry, the government itself operated five specialized research centers in the universities and government-sponsored laboratories (Koo, 1998).

### *Demand Conditions*

The reduction of weapons transaction and defense expenditures following the end of the Cold War and a paradigm change in the RMA following the 1991 Gulf War brought about sophisticated and technology-driven changes in the weapons demand system (Morgan, 2000). Until the mid-1990s, military innovation in South Korea had generally entailed reactive adjustments to changes in the security environment (Moon and Lee, 2008).

During the 1970s and the 1980s, South Korea's defense procurement needs were framed mostly around conventional weaponry (see Table 3).

Very little attention was given to assets related to RMA, a situation exacerbated by the South Korean military's excessive dependence on American C4IRS assets within the framework of the Republic of Korea (ROK)-U.S. Combined Forces Command (CFC). The South Korean military was also relying on American forces for its tactical data link system, tactical information communication networks, and tactical command system (Kim, 2007).

During the 1990s, the defense industry aimed at manufacturing weapons based on its own technology, thus avoiding breaches in intellectual property rights while securing domestic research developments (Bitzinger and Kim, 2005; DAPA, 2008).

Although the export was minimal relative to the domestic demand, the development of the weapons system in 1990s paved the way to the competitiveness of the export in 2000s (DAPA, 2008).

### *Related and Supporting Sectors*

As of the end of 1995, 85 defense contractors produced some 260 types of defense products and supplied 48 percent of defense investment. Domestic development and production of high-tech and high-precision weapons were under way (Hwang, 1996). In this RMA-driven restructuring of South Korea's defense sector, cutting-edge defense industrial firms have been major beneficiaries. Nevertheless, overall corporate performance of the defense industry produced mixed results. The operation rate of the defense industry remained at 50 percent between 1999 and 2004, which was quite low compared to the average operation rate (80.3 percent in 2004) of the manufacturing sector. Although defense industrial firms met improvements in their ordinary profits since 2002, they suffered huge deficits in the 1990s (KIDA, 2006).

To ensure the comprehensive research for the civilian-military jointly operating technology, the government stipulated the term “a dual-use technology”, which was equivalent to the civilian-military jointly operating technology, under the Special Act on Scientific -Technology Innovation which was enacted in 1997 (Koo, 1998).

### *Strategy, Structure and Rivalry*

In 1999, the policy direction of the defense industry evolved and became more sophisticated. The government prioritized regulating the defense industry and restructuring businesses. The government also boosted business partnerships between the defense science and civilian science sectors (MND, 1999).

Through the second revision of the Specialization and Systematization Legislations in 1993, the government changed the competitive policy from competition to restricted competition system which only one or two firms can compete (Kim, 2005).

### *Government*

Compared to previous presidents, President Kim maintained a neutral position between the military and government. As a result, the defense industry policy placed top priority on domestic research development (Han, 2002).

National security could no longer be justified as a *deus ex machina* under the post-cold war template, and democratization created greater public demand for welfare and education. Noteworthy is a sharp drop in absolute defense spending from \$14.5 billion in 1997 to \$9.87 billion in 1998 (Moon and Lee, 2010).

## **The Kim, Dae jung Administration (1998-2003)**

### *Factor Conditions*

President Kim, Dae jung’s assertive pursuit of engagement with North Korea and the new zeitgeist for peaceful co-existence following the first Korean summit in 2000 further erode public support for defense-sector spending (Moon and Lee, 2010).

Compared to the developed countries, however, the military technology level of Korea contributed 40-50% of the conventional military sector overall and 60-70% for specialized sectors. Kim, Dae jung administration concluded that there is an urgent need to employ the policy to buttress the efficiency of the defense industry primarily concentrating on new technologies. As a result, the administration restructured the ADD

to a specialized research center in 1999 and launched the civilian-military jointly operating technology center to encourage salutary domestic research capabilities. Furthermore, the administration maintained the defense-related R&D investment around 5 percent and established the goal which secures the 10% by 2015 (MND, 1999).

Korea has acquired most of its defense articles by means of domestic research and development. Acquisition of advanced armored vehicles, precision guidance missiles, UAVs, and naval and air assets also came by way of domestic R&D. In addition, the government consolidated the fundamental framework for the export of the domestic-manufactured weaponry through the augmentation of the domestic R&D (MND, 1999; 2000; 2004; 2006a).

#### *Demand Conditions*

Kim, Dae jung administration could enhance the capabilities of its weapon procurement institutions and procedures through military modernization plan from 1998 to 2002. Especially C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance) project de facto increased the defense procurement needs. And most of the defense procurements in 2000s were fulfilled by domestic R&D acquisition except some of air force and precision guidance weapons system (Choi, Ko, and, Lee, 2010).

The sharp rise in export volume since 2000s was partly a consequence of the development of the big-ticket items, including K-9 and KT-1 and international exchange for export promotion (Lee, 2009).

Some defense industrial firms—in cooperation with the Korean government—have been developing indigenous weapons in order to cope with restrictions on third country arms sales by the United States. For example, Samsung Techwin has been successful in developing and exporting K-9's on an indigenous basis. Production and export of the KT-1 training aircraft is another successful case. Korea has also been able to evade U.S. restriction on exports of the KT-50 training aircraft by reaching an agreement with Lockheed Martin. Samsung Thales has also successfully exported RMA-related software through the upgrading of indigenous technology (Kim, Moon, Baek, and Kim, 1993).



*Related and Supporting Sectors*

Enhancing the autonomy of weapons production can be attributed to an assertive government policy that encourages domestic procurement of advanced weapons system, as well as a government's improved industrial capabilities in the areas of information technology, heavy machinery and shipbuilding, mobile vehicles and aerospace technology, along with dual-use technology (MND, 1999, 2000, 2002, 2004, 2006a).

Despite a relatively high dependence on foreign direct acquisition of big-ticket items, Korea has been trying to increase the local content of its defense articles. Commensurate with South Korea's comparative advantage in information technology and telecommunication, the communication and electronics sector have substantially increased its localization rate from 72 percent in 2001 to 85 percent in 2007. A slight improvement was also made in the category of precision guidance weapons, where the localization rate has risen from 56 percent in 2001 to 74 percent in 2007. Although South Korea still relies on U.S. software in the supply and support of both C4ISR and precision weapons, a growing number of South Korean firms, such as Samsung-Thales, have been developing their own software to support cutting-edge weapons and equipments. Yet, the localization rate in the aerospace sector decreased from 59 percent in 2001 to 49 percent in 2007, while both armored vehicles and naval vessels have shown localization rates fluctuating above the 60 percent level (Lee, 2009).

The RMA began to draw the attention of Korean defense planners and the C4ISR emerged as a top priority in budget allocation. During this period, the army, navy, and air force acquired the C4I system, which transformed their communication network system from analogue to digital mode through the introduction of the Spider network system (Lyu, 2000; Moon and Lee, 2008). In 1998, however, the Korean government introduced a law for the promotion of civilian-military dual use technology in order to facilitate domestic R&D acquisition, especially for RMA. In January 1999, the government amended the existing 'Special Law on the Defense Industry' to encourage participation in the defense industry by technologically more specialized firms (Koo, 1998; MND, 2006a).

*Strategy, Structure and Rivalry*

Kim's administration brought about disparities between military reform and defense policies in the larger paradigm. As a result, the conventional development of the defense

industry could have operated on a nation level rather than one specific sector of the Industry (Lee, 2009).

Through the third revision of the Specialization and Systematization Legislations in 1998, the government changed the competitive policy toward securing more objectivity and fairness by making the evaluation criteria and public methodology (Kim, 2005).

### *Government*

The RMA was more systematically introduced and implemented through the installment of the Kim Dae jung administration. On 15 April 1998, immediately after inauguration, Kim, Dae jung administration launched the Committee for the Promotion of Defense Reform and established the Five-Year Defense Reform Plan. In order to execute the plan vigorously, the Committee set up the Planning Unit for Military Innovation and identified three goals: ① The creation of the most capable standing army; ② The expansion of an information and technology-intensive military armed with cutting-edge weapons; and ③ The construction of a rational, effective and economical military (MND, 2002).

The administration introduced several initiatives in order to realize these goals. First, it pushed for organizational reforms by creating newly unified national command systems in the fields of transportation, bio-chemical, and nuclear defense, as well as improving acquisition systems in JCS (Joint Chiefs of Staff). Second, a greater emphasis was placed on the informatisation of the defense sector. Finally, the administration began to expedite the acquisition of defense assets closely related to network-centric warfare and surveillance and strike capabilities. Meanwhile, the army, navy, and air force began to concurrently acquire future-oriented, cutting-edge weapons systems (Moon and Lee, 2008).

Korea's interests in the RMA rather than in military modernization became more pronounced only after the late 1990s, profoundly affecting the nature of the overall defense sector and particularly the defense industry.

## **The Roh, Moo hyun Administration (2003-2008)**

### *Factor Conditions*

The progressive Roh, Moo hyun administration, which championed a self-reliant defense posture, reversed the former government's trend. The Roh administration increased the share of defense spending in GDP from 2.42 percent to 2.72 percent in

2007. The move can be attributed to President Roh's efforts to reduce dependence on the U.S. in critical weapons and equipment, as well as to prepare for strategic uncertainty in the region going beyond North Korea (Moon and Lee, 2010)

On June 1, 2005, the administration established the Committee on Defense Reform, which drafted the "Defense Reform 2020" plan. The "Defense Reform 2020" plan aims to ensure a self-reliant, advanced national defense system through the creation of a technology-intensive military structure and future-oriented defense capability (MND, 2006a; MND, 2006b).

The administration generated the project with an emphasis on domestic R&D and allocating 20 percent of arms buildup expenditures to improve domestic defense technology and defense industry development (Lee, 2009).

The Ministry of National Defense (MND) plans to steadily increase defense spending to 2.89 percent of Gross Domestic Product (GDP) from the current level by 2011. From 2007 to 2011, the military plans to invest approximately USD 156 billion in force improvement programs to acquire advanced weapons and equipment, as well as change the command structure. The Roh administration increased investment in domestic R&D from 4 percent of defense expenditure in 2003 to 6.7 percent in 2007 (MND, 2006a).

The government established the Defense Agency for Technology and Quality (DTaQ) under the Defense Acquisition Program Administration (DAPA) to conduct the planning, research, analysis, and evaluation of defense science & technology. DTaQ also manages defense technology information and conducts quality management duties for the acquisition of excellent military supplies. And it restructured the function of the ADD, focusing on the more strategic and core technology R&D (Choi, Ko, and, Lee, 2010).

### *Demand Conditions*

By 2007, Korea's defense industry was rapidly growing to match that of other economic powers. Having secured the capacity to supply all of the conventional weapons needed for its own self-defense, Korea was aiming to become a global market leader in arms sales. The news that Korea has won contracts with Turkey sounded an upbeat note for the burgeoning defense industry. Turkey announced in June 2007 that it had signed a deal worth about USD 450 million with Korea's aerospace giant, Korea Aerospace Industries (KAI), to acquire dozens of KT-1 basic trainer jets.

The enactment of the Law on Defense Procurement on January 1, 2006 granted additional incentives to domestic defense contractors. The Defense Acquisition Program Administration (DAPA) founded in the early 2006, an independent government agency, is in charge of Korea's procurement and sales of military equipment. DAPA has been assigned the task of raising the transparency and effectiveness of the arms trade, formerly handled by a defense procurement office under the Defense Ministry (Moon and Lee, 2008).

Military exports rose from USD147 million in 1998 to USD 255 million in 2006. In cumulative terms from 1998 to 2006, exports of military aircrafts and related services have accounted for about 24 percent of total military exports, followed by naval vessels (23 percent), ammunition (21 percent), and off-set based exports (14 percent) (See Table 7).

**Table 7: Korean Defence Exports by Year and Items (by Permit) (in millions)**

	1998	1999	2000	2001	2002	2003	2004	2005	2006
<b>Total</b>	147.2	196.6	100.2	237.2	143.9	266.8	417.8	262.3	255.2
<b>Ammunition</b>	37.2	46.5	19.1	43.7	24.3	27.1	80.6	26.1	50.7
<b>Fire Power</b>	3.7	4.5	5.2	66.5	65.2	44.4	52.7	27.9	63.2
<b>Mobile</b>	0.11	81.8	2.52	35.9	10.4	24.2	4.17	23.6	22.2
<b>Naval Vessel</b>	99.9	59.2	11.0	35.3	0	75.9	151.0	1.26	0
<b>Communication</b>	0.9	1.6	2.8	5.4	2.3	3.1	17.4	0.57	6.52
<b>Aircraft</b>	3.0	2.5	0.3	0.9	33.6	63.1	66.9	152.3	93.1
<b>Service</b>	0	0	9.54	39.1	8.18	0	36.6	11.8	6.37
<b>Others</b>	2.33	0.67	49.8	10.4	0.04	29.1	8.5	18.7	13.1
<b>Offset Trade</b>	9.2	14.9	1.1	8.5	3.0	37.8	76.1	109.5	NA
<b>(Ratio)</b>	(6.3%)	(7.6%)	(2.0%)	(3.6%)	(2.1%)	(15.7%)	(18.2%)	(41.8%)	NA

Source: KIDA (2007)

RMA-driven defense industrial transformation is also changing the profile of Korea's exports of defense articles. Korea used to export military uniforms, ammunition, and small arms in the past. However, RMA-related big ticket items have emerged as the mainstay of its exports. For example, KAI exported KT-1 jets (Woongbi basic trainer aircraft) to Indonesia and Turkey, and will soon be concluding a supply contract of the T-50 (Golden Eagle trainer aircraft) with the United Arab Emirates. Samsung Techwin has also been successful in exporting K-9 self-propelled howitzers to Indonesia from 2000 to 2005. The Hyundai Heavy Machinery, STX, and Hanjin Heavy Industries have exported various naval vessels (FFK—Ulsan class Frigate Korea, LST—Landing Ship, Tank, and Flexible Support Ship) to Indonesia, Bangladesh, and Venezuela (Defense News, 2007).

### *Related and Supporting Sectors*

Korea's localization rate is relatively high. The government's defense procurement policy that favors domestic R&D and localization produced positive effects. For example, the Fund for the Promotion of the Defense Industry prioritized the localization of parts and components of the defense industry (Moon and Lee, 2008).

But, by enacting the Law on Defense Procurement on 1 January 2006, the act on special measures for defense industry which has played a pivotal role in supporting the defense industry last 30 years was abolished (Choi, Ko, and, Lee, 2010).

### *Strategy, Structure and Rivalry*

The administration believed that the key to improve the ability of national defense industries was to operate the defense policy based on the rule of competition among competitors in the defense industry. In 2009, Roh, Moo hyun administration declared the abrogation of the Specialization and Systematization Legislations on account of its unsuitable role and impediment for the progress of national defense industry overall (Kim, 2005). Along with the Defense Industry and Defense Products designation system, SSL has supported the development of Korea's defense industry.

The National Investment Fund was set up in 1974 as a way of mobilizing financial resources for heavy-chemical industrialization, which later became the Defense Industrial Promotion Fund (DIPF) in 1980 to direct financial resources toward the defense industry. The DIPF was abolished in 2006 (Moon and Lee, 2008).

### *Government*

Two factors affected the nature and direction of the "Defense Reform 2020" plan. One was the return of wartime operational control from the United States to Korea, and the other was advancements in Korea's science and technological capabilities. Whereas the former emphasized an aspect of 'independence' or 'self-reliance', the latter underscored a new direction of defense reform framed around speed, stealth, accuracy, and networks. Four major tasks have been identified in order to carry out the plan: 1) Securing military structure and defense capabilities corresponding to contemporary warfare; 2) Expanding the role of civilians in the defense establishment; 3) Innovating a low cost, highly efficient national defense management system congruent with a cutting-edge information-intensive military; 4) Improving the military personnel's barrack conditions (MND, 2006b).

In summary, an increased military self-reliance, a diminished dependence on the United States and improvements in indigenous science and technological capabilities has facilitated Korea's pursuit of a revolution in military affairs.

### **Lee, Myung bak Administration (2008-Present)**

#### *Factor Conditions*

Ironically, the pattern of defense spending under the Lee, Myung bak Administration, which won the presidential election on a conservative platform emphasizing a strong national defense, has been quite different. Although the actual amount of defense spending rose slightly as part of a fiscal stimulus package to cope with the global financial crisis, the relative share of total government spending was radically reduced to 10.8 percent in 2009 (Moon and Lee, 2010).

The above content suggests that the RMA is likely to continue shaping South Korea's future defense procurement. Nevertheless, the newly inaugurated Lee, Myung bak administration has queried the budgetary feasibility of the procurement plan integral to Defense Reform 2020, and is entertaining the possibility of attenuating the procurement period until 2025 (Moon and Lee, 2008). Having experienced enormous pressures from the United States regarding third country arms sales regulation in the 1980s and 1990s, South Korea has been more actively pursuing production of defense articles through domestic research and development.

The overall level of Korean defense science technology is evaluated at 78 percent relative to that of advanced countries, such as the U.S., UK, and France. DAPA will continue to expand investment in defense R&D and augment civil-military technological cooperation to enhance overall national industrial capability. The development of some cutting-edge technologies, which may be difficult for primarily profit-driven private enterprises, can be funded in the defense R&D sector. It will pursue the development of dual-use technologies and the commercial spin-off of defense technologies so that benefits from defense R&D will be spread across the industry (Choi, Ko, and, Lee, 2010).

#### *Demand Conditions*

With the recent review of the economic and industrial value of the defense industry, the ROK government has been vehemently enforcing the growth policy of its defense industry to establish global competitiveness. The "Defense Industry as the New

Economic Growth Engine” was designated as one of the 100 tasks of the current government. DAPA is spearheading the initiative. Main features of the initiative include promoting defense R&D, improving the business environment in the defense sector, and building a government-wide support system for defense exports (Lee and Lee, 2009).

According to weapons exports, Korea ranks 17th in the world. South Korea exported USD 261.89 million worth of arms in 2005, compared with USD 419 million in 2004 and USD 240.61 million in 2003. Under DAPA's plan, Korea aims to increase arms exports to USD 1 billion by 2011 and USD 2 billion by 2022, with the aim of becoming one of the world's top 10 arms exporters. Until 2008, yearly defense export sales amounted to USD 250 million, which shares only 0.5 percent in the worldwide defense market. In order to boost the defense industry, the government announced its decision to create a new council in charge of improving the defense industry that will be led by both defense and knowledge ministers. It is also planning to enlarge the role of defense supplies trade support center under the Korea Trade-Investment Promotion Agency, as well as come up with support measures for defense firms, including tax cuts (Choi, Ko, and, Lee, 2010; DAPA, 2008).

#### *Related and Supporting Sectors*

The Presidential Council for the Future and Vision reported national plans to develop the defense industry and create jobs in the industry for the purpose of defense advancement. The Council will perform overall reform on defense research and technological system that the Agency for Defense Development (ADD) monopolizes. Except for major, strategic, and secret weapons, private firms will be responsible for the development of general weapons and their efficiency improvement. From 2011, general weapons development and their efficiency improvement are going to be handled by some private firms and eventually all private firms will be slated to manage such a project by 2015. The ADD, instead, will focus on developing strategic and secret weapons and basic technology for the future. Furthermore, private firms will be able to use weapon testing facilities without trouble.

In addition, the Council aims to organize civil, government, and military joint teams designed to control the weapons development process from the initial stage of the demand proposal. The Council added that it will verify the validity of weapons in advance so that the military can obtain weapons of high efficiency (Korea Times, 2010).

*Strategy, Structure and Rivalry*

In 2008, the Specialization and Departmentalization System, which virtually limited non-defense companies' participation in the defense sector, was abolished (Choi, Ko, and, Lee, 2010). In the past, only a few companies were allowed to participate in Defense R&D, but now, any company with the technology can do business in the defense area. To minimize confusion and adverse effects resulting from the elimination of the system, DAPA has prepared comprehensive follow-on measures.

In particular, DAPA has explored measures to support small and medium-sized enterprises (SMEs) because more participation from large enterprises is expected and plans for minimizing infringement on a company's proprietary rights, which may take place due to M&A and overlapping investments. To this end, it will take various steps, such as increasing the compensation rate for cost savings from 50 percent to 90 percent. It will also strengthen Korea's institutional support system by selecting items suitable for development by SMEs or giving incentives to SMEs in accordance with their participation (Chae and Og, 2009).

*Government*

In 2009, the Ministry of National Defense revised the Defense Reform 2020 amid growing calls to prepare for North Korean asymmetrical threats, and nuclear and missile programs. The first revision called for securing independent capabilities to remove such North Korean weapons by deploying sophisticated surveillance, reconnaissance, and precision-strike assets.

Key procurement items included high-altitude unmanned aerial vehicles, a ground-based early warning radar, PAC-3 interceptors, and SM-3 ship-to-air missiles. The Army is supposed to triple the number of its K-9 self-propelled howitzers and multiple launch rocket systems to counter attacks by the North's long-range artillery near the border. Given this policy which promotes the self-functioning military equipments, the military readjusted its target troop numbers to 517,000. The original plan called for reducing the troop level from 690,000 to 500,000 by 2020 (The Korea Times, 2010).

The Korean government revealed its blueprint of jumping to the 7th largest defense export country in the world with annual sales worth USD 4 billion a year by 2020. In a defense and industry related ministries meeting, which was presided by President Lee on October 2010, the Presidential Council for Future and Vision reported national plans to



develop the industry and create jobs in the defense field for the purpose of defense advancement. The Council laid out its goal of joining the worldwide high ranks in defense industry exports and defense technology by 2020. It also aims to earn USD10 billion yearly to output and USD 4 billion export sales as well as create 50,000 jobs by that year (PCFV, 2010).

## **DISCUSSION**

This study analyzed the development and the competitiveness of the defense industry in Korea through Porter's diamond model to vindicate that the industry has been elaborated primarily based on the expansion of the domestic R&D rather than relying upon the developed countries.

Despite professed goals of self-sufficiency, most so-called second-tier arms producers – i.e., the smaller industrialized countries and the major arms producers in the developing world – have largely failed to eliminate or even substantially reduce their dependencies on foreign technologies, due to continued deficiencies and weaknesses in these countries' R&D and manufacturing bases.

Since the 1970s, in light of self-reliance in military capabilities, the Korean defense industry has been advanced through cohesive government support, salutary interrelationship with heavy chemical industry, dramatic increase of scientists, the transferring of advanced military technology from the U.S. and the covenantal domestic market. Korea opted for defense modernization in order to achieve independence and self-reliance in military capability during a period of waning U.S. hegemonic power.

Korea has confronted the immediate threat which is very possible military provocation by North Korea. The explicit security risk in Korean peninsula is highly able to trigger the conventional war between two Koreas. This drastic tension brought profound impact on shaping the national military policy. In Korea, the installation of a certain military policy for decision makers has been contemplated as the matter of the survival of the country, not just merely the protection of the nation against potentially intangible adversaries. Given this peculiar critical security condition, the role of the defense industry has been highlighted for Korea's own existence as a state.

Facing the conventionally controversial challenges, not only internally, but also externally, the Korea's defense industry has been progressed from the stage of the self-sufficiency of the general armed forces to the stage of the manufacture of high-tech-

oriented weaponry and the encouragement of the weapons export. Compared to other developed and developing countries, the defense industry in Korea generated relatively a typical path for the development and the strategy for its own survival. Especially the efforts of the top decision makers have been reflected to pursue the self-reliance policy for the proper engagement with encompassing powerful countries, China, Russia, and Japan and for the economic prosperity. Moreover, base on stratagem of the selection and the convergence, the development of the defense industry conveyed compendious positive current over the country. The government has devised the dual-edge strategy to promote economic development and nurture the defense industry along with preservation of the domestically consistent economic competitiveness. Even though the Korean local market itself is fully capable of absorbing the domestic-manufactured weapons, the government chased the aggressive policy encouraging more operational high-tech-oriented weaponry export globally. Thus, it pitched in not only the economic development but also the preservation of the national security.

However, there is still adversity which Korea should overcome; the consistent monitoring of the U.S., dramatic increase in demand of highly-advanced weapons, distrust of the quality of domestic-manufactured weaponry, and the creation of the persistent demand for local-produced weapons.

To secure the consistent competitiveness of Korea's defense industry, in-depth discussions are required to suggest the policy alternatives as follows: The establishment of a state's consistent and comprehensive systematic policy of the defense industry; Proper collaboration among the ADD, the Defense Industry, and universities through the distribution of roles; The establishment of advanced technological weaponry system for the construction of a technology-oriented military; The founding of long-term strategy of weaponry system; The enhancement of technology development via cooperation between the military and civilian sectors; and The improvement of export support policy.

Under extreme tensions in the Korean peninsula, Korea needs to maintain a massive size of armed forces regardless of size and population of the country. Korea must also keep the domestic market that is able to absorb the demand of domestically manufactured weaponry to replace obsolete weapons. Even though Korea has the potential market to digest domestically produced weapons, the defense industry currently confronts critical problems owing to multiple domestic and foreign factors: limitations of the domestic market's demand, regulation of weaponry export to third world countries, the prohibition

of transferring advanced military technology, limitations of the government's fiscal encouragement, conflicts of interest among defense industry sectors, and the decreasing demand of the defense industry since democratization.

The defense industry attempts to cope with the decreasing demand of domestic manufactured weaponry via international export. Yet, the industry is compelled to compete with numerous predominant multinational weaponry manufacturers in developed countries. To compete efficiently, government-sponsored support is inevitably required, including strategic and systematic intelligence supports, pioneering new markets globally, and public relations. Considering the aftermath of Korean reunification, Korea has to contemplate the competitiveness of the defense industry and is forced to discover new routes to boost the defense industry more effectively.

## **CONCLUSION**

This study reviews the development and transition of the Korean defense industry by examining the change process and perspective of the Korean defense industry in chronological order linked with economy development plan and a program of military buildup. It suggests key directions for future development in the Korean defense industry by reviewing the development process and outcome of localizing defense systems and equipments based on Porter's Diamond Model (see Table 8).

It may be the first attempt at explaining the competitive advantage of a defense industry within a specific country using Porter's model. As Porter indicated, in most countries, a nation succeeds because it combines some broadly applicable advantage with advantages specific to a particular industry or small groups of industries. In this sense, this study examines the effects of two external determinants, government and chance, on the four determinants.

**Table 8: Competitive Determinants of the Korea's Defense Industry**

Administrations	Defense Industry Competitive Determinants
<p><b>Park, Chung hee Administration (1963-1979)</b></p>	<p><b>Factor Conditions</b></p> <ul style="list-style-type: none"> <li>- R&amp;D infrastructure : Established the Agency for Defense Development (ADD)</li> <li>- R&amp;D Budget : From 1971 to 1979, defense-related R&amp;D investment was 3.4 percent</li> <li>- R&amp;D cooperation system : ADD established cooperative relationships with KIST</li> </ul> <p><b>Demand Conditions</b></p> <ul style="list-style-type: none"> <li>- Domestic demand : Government created demand through the expansion of defense budgets and aggressive procurement</li> <li>- Export : Until 1975, the dollar value of military exports was minimal</li> </ul> <p><b>Related and Supporting Sectors</b></p> <ul style="list-style-type: none"> <li>- Linkage strategy : Park seemed to consider weapons development policies as a means to develop commercial technologies</li> <li>- Dual-use technology : Spin-off effects of government-subsidized defense R&amp;D made contributions to the commercial sector</li> </ul> <p><b>Strategy, Structure and Rivalry</b></p> <ul style="list-style-type: none"> <li>- Management strategy : Role of the Office of the 2d Senior Presidential Secretary of the Economy was crucial</li> <li>- Competition strategy : Government provided assistance until the large Korean corporations could compete internationally</li> </ul> <p><b>Government policy, Chance</b></p> <ul style="list-style-type: none"> <li>- Government policy : The Park's political leadership demonstrated a strong commitment to the defense industry</li> <li>- Disruptive change : Military provocations by N. Korea in the late 1960s and 1970s, Park's assassination in 1979</li> </ul>
<p><b>Chun, Doo hwan Administration (1981-1988)</b></p>	<p><b>Factor Conditions</b></p> <ul style="list-style-type: none"> <li>- R&amp;D infrastructure : ADD merged or abolished divisions with overlapping functions and dismissed about 800 researchers</li> <li>- R&amp;D Budget : Rates of defense R&amp;D expenditure in the 1980s were low compared to those in the 1970s</li> <li>- R&amp;D cooperation system : ADD's leadership seemed to have reached its limit since the 1980s</li> </ul> <p><b>Demand Conditions</b></p> <ul style="list-style-type: none"> <li>- Domestic demand : The government relied on direct overseas acquisition rather than on domestic R&amp;D or co-production</li> <li>- Export : To overcome saturation of the domestic market, the government tried to export with the help of civilian sectors</li> </ul> <p><b>Related and Supporting Sectors</b></p> <ul style="list-style-type: none"> <li>- Linkage strategy : Trying to achieve the combined goal of economic development and self-sufficient defense did not survive</li> <li>- Dual-use technology : Defense production line was low, causing it to lose preference for the defense industry</li> </ul> <p><b>Strategy, Structure and Rivalry</b></p> <ul style="list-style-type: none"> <li>- Management strategy : Assertive state intervention was replaced by a more cautious and prudent market-conforming policy</li> <li>- Competition strategy : Government enforced investment readjustment on the heavy industry, introducing limited competition</li> </ul> <p><b>Government policy, Chance</b></p> <ul style="list-style-type: none"> <li>- Government policy : President Roh proposed the "Koreanization of Korean defense" slogan</li> <li>- Disruptive change : Continued tensions between indigenous development and cost-effective acquisition</li> </ul>

**Table 8: Competitive Determinants of the Korea's Defense Industry (continued)**

Administrations	Defense Industry Competitive Determinants
<b>Roh, Tae woo Administration (1988-1993)</b>	<p><b>Factor Conditions</b></p> <ul style="list-style-type: none"> <li>- R&amp;D infrastructure : Championed a self-reliant defense posture and interested in the domestic development</li> <li>- R&amp;D Budget : Defense-related R&amp;D investment increased from 1.4 percent in 1988 to 3 percent in 1993</li> <li>- R&amp;D cooperation system : Enhance the R&amp;D efficiency of ADD and reinforce the R&amp;D cooperation among laboratories</li> </ul> <p><b>Demand Conditions</b></p> <ul style="list-style-type: none"> <li>- Domestic demand : Since the end of the Cold War, most nations curtailed their defense expenditures and Korea is no exception</li> <li>- Export : Decrease in demand of the global arms market had a profound impact on Korean defense industry's exports</li> </ul> <p><b>Related and Supporting Sectors</b></p> <ul style="list-style-type: none"> <li>- Linkage strategy: Take more assertive measures to enhance coordination by rationalizing and systemizing the defense industry</li> <li>- Dual-use technology : Defense R&amp;D policy was shifting from spin-off to dual-use, involving both spin-off and spin-on</li> </ul> <p><b>Strategy, Structure and Rivalry</b></p> <ul style="list-style-type: none"> <li>- Management strategy : Reform of the defense sector and the scrutiny of the Yulgok led to inadequate conditions of the industry</li> <li>- Competition strategy : Government changed the competitive policy from monopoly to competition system</li> </ul> <p><b>Government policy, Chance</b></p> <ul style="list-style-type: none"> <li>- Government policy : Realigned the direction of defense industrialization toward the Koreanization of defense products</li> <li>- Disruptive change : End of the Cold War, U.S. Congress passed the Nunn-Warner Amendment in August 1988</li> </ul>
<b>Kim, Young sam Administration (1993-1998)</b>	<p><b>Factor Conditions</b></p> <ul style="list-style-type: none"> <li>- R&amp;D infrastructure : Democratic opening and the post-cold war further facilitated a downsizing of the defense budget</li> <li>- R&amp;D Budget : National Defense planned to increase the defense-related R&amp;D investment to 5 percent by 1998 but failed</li> <li>- R&amp;D cooperation system : Operated specialized research centers in the universities and government-sponsored laboratories</li> </ul> <p><b>Demand Conditions</b></p> <ul style="list-style-type: none"> <li>- Domestic demand : Reduction of defense budget and a paradigm change in the RMA prompted sophisticated weapons demand</li> <li>- Export : Development of the weapons system in 1990s paved the way to the competitiveness of the export in 2000s</li> </ul> <p><b>Related and Supporting Sectors</b></p> <ul style="list-style-type: none"> <li>- Linkage strategy : In RMA-driven restructuring, cutting-edge defense industrial firms were major beneficiaries</li> <li>- Dual-use technology : Enacted the Special Act on Scientific-technology Innovation to support a dual-use technology</li> </ul> <p><b>Strategy, Structure and Rivalry</b></p> <ul style="list-style-type: none"> <li>- Management strategy : Policy direction of the defense industry evolved and became more sophisticated</li> <li>- Competition strategy : Changed the competitive policy from competition to restricted competition system</li> </ul> <p><b>Government policy, Chance</b></p> <ul style="list-style-type: none"> <li>- Government policy : President Kim maintained a neutral position between the military and government</li> <li>- Disruptive change : National security could no longer be justified as deus ex machine</li> </ul>

**Table 8: Competitive Determinants of the Korea's Defense Industry (continued)**

Administrations	Defense Industry Competitive Determinants
<b>Kim, Dae jung Administration (1998-2003)</b>	<p><b>Factor Conditions</b></p> <ul style="list-style-type: none"> <li>- R&amp;D infrastructure : Restructured ADD to specialized research center in 1999</li> <li>- R&amp;D Budget : Maintained the defense-related R&amp;D investment 5 percent and established the 10% by 2015</li> <li>- R&amp;D cooperation system : Launched the civilian-military jointly operating technology center</li> </ul> <p><b>Demand Conditions</b></p> <ul style="list-style-type: none"> <li>- Domestic demand : Enhancement of the capabilities of weapon procurement systems increased the defense procurement needs</li> <li>- Export : Sharp rise in export volume was partly a consequence of the development of the big-ticket items and export promotion.</li> </ul> <p><b>Related and Supporting Sectors</b></p> <ul style="list-style-type: none"> <li>- Linkage strategy : Government's improved industrial capabilities in the areas of information technology, heavy machinery, et cetera</li> <li>- Dual-use technology : Introduced a law for the promotion of civilian-military dual use technology for domestic R&amp;D</li> </ul> <p><b>Strategy, Structure and Rivalry</b></p> <ul style="list-style-type: none"> <li>- Management strategy : Defense industry operated on a nation level more than one specific sector of the industry</li> <li>- Competition strategy : the third revision of the Specialization and Systematization Legislations in 1998</li> </ul> <p><b>Government policy, Chance</b></p> <ul style="list-style-type: none"> <li>- Government policy : Launched the Committee for the Promotion of Defense Reform and the 5 Year Defense Reform Plan</li> <li>- Disruptive change : Set up the Planning Unit for Military Innovation</li> </ul>
<b>Roh, Moo hyun Administration (2003-2008)</b>	<p><b>Factor Conditions</b></p> <ul style="list-style-type: none"> <li>- R&amp;D infrastructure : Mid-term plan was developed in 2006, with an emphasis on research and development</li> <li>- R&amp;D Budget : Increased the share of defense spending in GDP from 2.42 percent to 2.72 percent in 2007</li> <li>- R&amp;D cooperation system : Established the Defense Agency for Technology and Quality (DTaQ)</li> </ul> <p><b>Demand Conditions</b></p> <ul style="list-style-type: none"> <li>- Domestic demand : Enactment of the Law on Defense Procurement in 2006 to give additional incentives to domestic firms</li> <li>- Export : Military exports rose from USD147 million in 1998 to USD 255 million in 2006</li> </ul> <p><b>Related and Supporting Sectors</b></p> <ul style="list-style-type: none"> <li>- Linkage strategy : Fund for the Promotion of the Defense Industry prioritized the localisation of parts of the defense industry</li> <li>- Dual-use technology : Act on special measures for defense industry was abolished</li> </ul> <p><b>Strategy, Structure and Rivalry</b></p> <ul style="list-style-type: none"> <li>- Management strategy : Operated the defense policy based on the rule of competition in the defense industry</li> <li>- Competition strategy : Abrogation of the Specialization and Systematization Legislations on account of its unsuitable role</li> </ul> <p><b>Government policy, Chance</b></p> <ul style="list-style-type: none"> <li>- Government policy : Established the Committee on Defense Reform, which drafted the "Defense Reform 2020" plan.</li> <li>- Disruptive change : Set up the DAPA in charge of procurement and sales</li> </ul>

**Table 8: Competitive Determinants of the Korea's Defense Industry (continued)**

Administrations	Defense Industry Competitive Determinants
<b>Lee Myung-Bak Administration (2008-Present)</b>	<p><b>Factor Conditions</b></p> <ul style="list-style-type: none"> <li>- R&amp;D infrastructure : DAPA will continue to expand investment in defense R&amp;D</li> <li>- R&amp;D Budget : Relative share of defense spending of total government spending was radically reduced to 10.8 percent in 2009</li> <li>- R&amp;D cooperation system : Begin civil-military technological cooperation to enhance national industrial capability</li> </ul> <p><b>Demand Conditions</b></p> <ul style="list-style-type: none"> <li>- Domestic demand : Designated defense industry as the New Economic Growth Engine of the current government</li> <li>- Export : Korea aims to increase arms exports to USD 1 billion by 2011 and USD 2 billion by 2022</li> </ul> <p><b>Related and Supporting Sectors</b></p> <ul style="list-style-type: none"> <li>- Linkage strategy : Presidential Council for the Future and Vision performs overall reform on defense R&amp;D system</li> <li>- Dual-use technology : General weapons development and improvement to be handled by some private firms</li> </ul> <p><b>Strategy, Structure and Rivalry</b></p> <ul style="list-style-type: none"> <li>- Management strategy : DAPA has explored measures to support small and medium-sized enterprises</li> <li>- Competition strategy : In 2008, the Specialization and Departmentalization System was abolished</li> </ul> <p><b>Government policy, Chance</b></p> <ul style="list-style-type: none"> <li>- Government policy : In 2009, the Ministry of National Defense revised the Defense Reform 2020</li> <li>- Disruptive change : Change the North Korean policy to the tougher way</li> </ul>

But this study remains the task of the analysis of the defense industry by extending Porter's Diamond Model that appropriately explains the international perspectives of competitiveness (Hax and Majluf, 1991; Moon, Rugman, and Verbeke, 1998).

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