A STUDY ON IMPACTS AND INFLUENCE FACTORS OF THE TECHNOLOGY TRANSFER AS A MILITARY OFFSET TRADE FROM A VIEWPOINT OF AN EXPORTING COUNTRY

: CASE STUDY OF K-9 SELF-PROPELLED ARTILLERY EXPORT TO TURKEY

By

Won-Seok Kim

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
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MASTER OF PUBLIC POLICY

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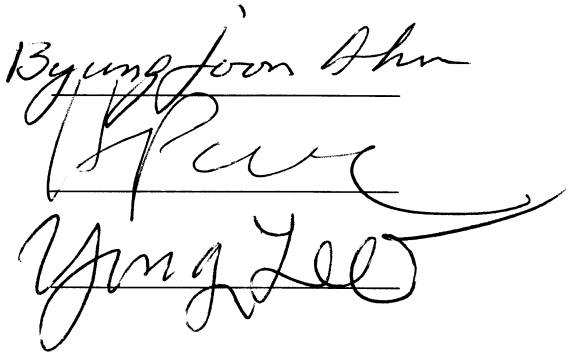

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ABSTRACT

A STUDY ON IMPACTS AND INFLUENCE FACTORS OF THE TECHNOLOGY TRANSFER AS A MILITARY OFFSET TRADE FROM A VIEWPOINT OF AN EXPORTING COUNTRY

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The defense industry became high value-added, capital- and technology-intensive. In order to become a magnate in the world arms market, a seller should interpret the essence, impact and influence factors of an offset trade, which is prevailing in the market. However, South Korea is still familiar to a position of importer, and there are a few studies on offsets in South Korea. For this reason, this paper aims to shed light on impacts and influence factors of offsets, especially the technology transfer which is recently increasing. Relevant theories, diverse arguments and counterarguments would be provided through literature review, and their validity would be assessed through the K-9 export case study. Unlike general recognition on offsets, the technology transfer is beneficial to a seller by attracting potential consumers. In addition, Possibility that the technology transfer makes a future competitor is much lower than expected. On the one hand, the proactive strategy can make up for a seller's disadvantages in the arms market. Therefore, South Korea needs to aggressively utilize the technology transfer as the proactive strategy. Along with that, this paper recommends to avoid subcontracting and prepare relevant law and regulation.

ACKNOWLEDGEMENTS

돌이켜보기에 KDI에서의 지난 2년여는 꿈같은 시간이었습니다. 입학 여부에 대한 불안함부터 졸업논문에 대한 부담감까지 쉬웠던 것은 하나도 없었음에도 불구하고 하고 싶은 일을 하고 있었기에 즐기며 임할 수 있었습니다. 군 생활 통해 접해보지 못했던 지식들을 받아들이던 때의 느낌들은 바로 '행복'이었습니다. 그 모든 것의 기회를 준 육군과 국가에 큰 감사를 드립니다. KDI의 교수님들과 교직원들, 그리고 함께 공부한 동문들은 제게 세상은 넓고 인재는 많음을 알게 해주었고, 그래서 앞으로 군에 복귀 후에도 자만하지 않고 신중하고 성실히 근무할 수 있도록 해 줄 것입니다. 특히, 부족한 제 능력에도 불구하고 흔쾌히 논문지도를 수락하여 주시고 세밀히 지도해주신 안병준 교수님께 큰 감사의 말씀을 올립니다.

또한, 항상 즐거이 공부와 연구에 임할 수 있게 해 준 제 사랑하는 부인에게 감사합니다. KDI에 있는 동안 연애/결혼을 통해 삶을 안정되고 편안하게 만들어 주었습니다. 항상 응원하고 힘을 주시던 서울, 포항에 계신 부모님께도 감사드립니다. 11월에 태어날 나의 소중한 아기 축복이는 제게 행복하게 공부해야할 이유를 부여해 준 가장 귀한 선물입니다. 제 손을 통해 느껴지는 축복이의 엄마 뱃속에서의 강렬한 발차기, 머릿속에 그려지는 그 귀여움은 공부와 논문에서 간혹 생기는 스트레스를 모두 날려주었습니다. 엄마 뱃속에서 잘 자라주어서 아빠에게 근심을 주지 않아 고맙고 또 사랑한다.

2009년부터 KDI에서 보낸 시절은 제 인생에 가장 즐거운 시절로 기억될 것 같습니다. 학업과 논문 작성을 통해 느꼈던 공부의 즐거움과 그 즐거움을 도와준 모든 분들을 평생 기억하며 군에서 성실히 제 몫을 다하겠습니다. 감사합니다.

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I. INTRODUCTION

According to World Development Indicator reported by the World Bank in July 2010, South Korea has the 15th biggest economic scale in the world(Cho, 2010). Although the GDP ranking of South Korea has declined from 2003 when it reported 11th ranking(Cho, 2010), the economic scale is still large. Apparently, what support economy of South Korea which has few natural resources are the exports. Because of the increasing exports, South Korea could rapidly overcome international financial crisis which started in late 2008. Even during first half of 2010, trade surplus of South Korea was $11.61 billion(Kim, 2010). In short, exports are the growth engine of South Korea's economy.

For the constant exports, new overseas markets should be ceaselessly exploited, and the world arms market is one of them. South Korea's government recognizes potential of the world arms market, and decides to develop competitiveness of the own defense industry. However, the position of South Korea in the market is very unpresentable. The third largest importer in the world is not suitable for South Korea's economic scale. It is apparently damage to South Korea's balance of payment.

Nation	China	India	South Korea	UAE	Greece
Share of global arms imports (%)	9	7	6	6	4
Main supplier (share of recipient's transfers)	Russia (89%)	Russia (77%)	U.S.A (66%)	U.S.A (60%)	Germany (35%)

Table 1: The Five Largest Recipients of Major Conventional Weapons, 2005 -2009 (SIPRI, 2010)

Then, what did make South Korea which has great manufacturing industries a net importer in the world arms market? As seen in Table 2, the main reason is that the world arms

market has been monopolized by a few Super Powers. Accordingly, South Korea has been familiar with a position of a consumer, and its interest on the defense exports has naturally been small.

Nation	U.S.A	Russia	Germany	France	U.K.
Share of global arms exports (%)	30	23	11	8	4
Main recipients (share of recipient's transfers)	South Korea (14%) Israel (11%) UAE (11%)	China (35%) India (24%) Algeria (11%)	Turkey (14%) Greece (13%) South Africa (12%)	UAE (25%) Singapore (21%) Greece (12%)	USA (23%) India (15%) Saudi Arabia (10%)

Table 2: The Five Largest Suppliers of Major Conventional Weapons, 2005 -2009 (SIPRI, 2010)

With time, South Korea's interest and investment in the defense R&D has grown, which have reduced the technological gap between South Korea and developed countries. However, development of studies on offsets from a viewpoint of a seller could not keep pace with these growths. In other word, South Korea is a skillful weapon-producer without marketing know-how. Majority of studies on offsets have been conducted from a point of view of an importing country. These focus on how to make up for the expenditure spent on weapons purchase through offsets.

Naturally, studies on the technology transfer as offsets from a viewpoint of a seller are also insufficient. However, buyers' requirements of the technology transfer are increasing in the world arms market. For this reason, a study on how to react to the requirement becomes important for an exporting country. There have been many studies on the technology in South Korea, but majority of them are regarding transfers between domestic organizations or a strategy as a recipient. As a result, almost studies focus on how to evaluate technology transferred as the compensation practice, how to calculate the technology fee, spin-on or spin-off between military and civil organization, and etc. Therefore, current situation on offsets and the technology transfer should be revised for development of the defense exports.

1. PURPOSE OF THE STUDY

Under such requirement, it is decided to study offsets and the technology transfer from a viewpoint of a seller. As South Korea enters to arms exports competition, more studies on how to conduct an offset trade and how to react to requirement of the technology transfer are required. Currently, if a seller doesn't compensate a buyer for something in the world arms market, a potential buyer doesn't consume arms from the seller. In order to sell more weapons, a seller should study on the way to compensate efficiently. Especially, buyers' demands of the technology transfer as offsets are increasing, but it is recognized that the transfer is very harmful because it transfers not only skill to use the arms but the technology to manufacture the arms. Thus, this paper has tried to answer to the following questions.

Firstly, what are the defense industry, the defense export, and the technology transfer as one way of an offset trade? How different are they from commercial ones?

Secondly, what are the impacts of an offset trade and the technology transfer on an exporting country? Is the technology transfer really harmful to a seller like pre-existing recognition?

Thirdly, which factors do make a successful an offset agreement?

Fourthly, in case of the K-9 export to Turkey, how are the impacts of the offset trade? In addition, how did factors affecting success of an offset agreement act in making the agreement? Especially, which factor is critical for South Korea with less experience on arms exports?

Fifthly, how should South Korea as an exporting country act to increase defense exports in the world arms market?

2. SCOPE AND LIMITATION

In order to answer to the first, second, third questions, this paper has reviewed the preceding researches and governmental reports. Then, to answer to the fourth question, collecting data from relevant governmental organizations, newspapers, and websites has been fulfilled. In the process, because of the national security problem, many data are restricted to access. Finally, for the fifth question, this paper tried to suggest method to utilize the technology transfer by applying what are founded in answering to the previous questions.

The foreign literatures that this study has reviewed were almost written by scholars and governmental organizations of the U.S. and the U.K., or in English by Western European scholars. The world trend on offsets can be known indirectly by reviewing the U.S.'s offsets trend, because the U.S. has conducted one third of all arms exports. While there is no data to report all offset trades in the arms market, there are many studies and public reports regarding offsets conducted by the U.S. For example, the U.S. Bureau of Industry and Security has been reporting offsets to its Congress annually and frequently. In addition, the U.S.'s exports environment is similar to that of South Korea. Cho, Han, Park, Shin and Yang(2007) stated that nations with U.S.-origin arms are the potential consumer of South Korea, because South Korea's weapons has high interoperabilities with the U.S.-origin arms. Thus, South Korea needs to study on how the U.S.'s consumers have conducted an offset agreement, and how the U.S. has reacted to that. 2nd biggest seller, Russia's studies and reports on offsets are not suitable for this study. Because arms of Russia do not have interoperabilities with those of South Korea, its consumers are unlikely to be consumers of South Korea. Studies and reports of Germany and France, which are 3rd and 4th biggest sellers, are hard to access due to language problem. Therefore, this study has reviewed literatures written by the U.S., or Europeans in English.

The scope of this study is limited to defense-related offsets, and especially the

technology transfer. In addition, as previously noted, the research scope is limited to a position of an exporting county. This paper is concerned with final products and main components which are required the high technologies in manufacturing themselves, not simple labor-intensive goods.

Ⅱ. THE THEORETICAL BACKGROUND

In order to answer to the 1st main question stated in the chapter I.1., this chapter provides theoretical background regarding the defense industry, the defense exports, and the technology transfer. Because terms used in this paper are related to military, these can cause confusion with meanings of general or civil terms. In addition, properties of relevant products, the market, and the technology transfer are different from those of commercial or general things. This chapter explains these differences.

1. THE DEFENSE INDUSTY AND EXPORT

The term "defense(defence)" lexically means the act of protecting somebody or something from attack, criticism, etc., and the term "industry" does the production of goods from raw materials, especially in factories. Therefore, as a compound word, the 'defense industry' is the production of goods used in protecting somebody or something from attack, criticism, etc. from raw materials, especially in factories.

Recently, the term "defense industry" has almost become a proper noun, as its importance has drastically grown in the fields of national security, economy, and diplomacy. Many researches regarding the defense industry have been conducted, and in the researches, the defense industry is called an armaments industry or an ammunition industry, an war industry, and weapons industry or arms industry according to researchers' inclinations or according to each nation's recognition on the defense industry(Korea National Defense University, 2005).

In the Western Europe, concepts related to the defense industry have been offered in a broader sense. The U.K. Ministry of Defence(2002) stated that the nation's defense industry

“embraces all defense suppliers that create value, employment, technology or intellectual assets” in the country(p. 4). Recently, the term “the defense industrial base” is more frequently used. Examples include: “the defense industrial base consists of those industrial assets which provide key elements of military power and national security: such assets demand special consideration by government”(HCP, 1986, xxxii); or the defense industrial base “constitutes those companies which provide defense and defense related equipment to the defense ministry”(Dunne, 1995, 402). As a result, their common thing is that the defense industry provides goods related to the national defense, but all those don’t set a big portion on specific kinds of defense-related products.

By contrast, South Korea sees the term defense industry as a restricted sense pursuant to kinds of final goods. According to Defense Acquisition Program Act(2008a), the defense industry means “the manufacture or research and development of defense materials”, which is designated by “the Administrator of the Defense Acquisition Program Administration” “after consultation with the Minister of Knowledge Economy”. The designate materials are “classified as weapons systems as defense materials, which are necessary for the securing of stable source of procurement, strict quality assurance, etc., [but,] that materials that are not classified as weapons systems but prescribed by Presidential Decree may be designated as defense materials”(Defense Acquisition Program Act, 2008a). Thus, this concept limits the scope of the defense industry to weapon systems and some certain products.

Which products are ‘weapon systems’ and ‘some certain products’ can be known by defining and dividing the term defense contractor. A defense contractor is an enterprise that manufactures defense materials and is designated by the Minister of Knowledge Economy(DAPA, 2008a). The Minister shall classify the “contractor as either a major defense contractor or general defense contractor”(DAPA, 2008a). Enterprises that

"manufacture defense materials[1]" which article 35 of the Defense Acquisition Program Act states shall be appointed as Major defense contractors(DAPA, 2008a). By contrast with "major defense contractors, enterprises that manufacture other defense materials shall be general defense contractors"(DAPA, 2008a).

Besides above concepts, there are many definitions about the defense industry, and they are in substantial agreement with each other. This paper focuses on the defense exports of South Korea, and the scope of this research becomes too huge if broad concept is used. Thus, DAPA's concept is better for an efficient study.

The defense industry has unique characteristics. The arms market is unusually a monopsony system that a military or a government is only a demander. In addition, actually pursuant to a criteria for industrial classification, the defense industry contains almost manufacturing sectors such as mechanic, metal, nonmetal, electricity, telecommunication, precision · optics, and chemistry(DAPA, 2008b). Thus, it exhibits unique characteristics comprising of own traditional properties and those from each industry.

First of all, the defense industry is a national security industry(DAPA, 2008b). While a principle of an 'industry' set a top priority on economic benefits, a core of 'defense' is the national security. Though a government tries to balance between the two, it should choose the national survival when the two values are incompatible with each other.

Holding a strong defense industry means that the country is relatively free from a

[1] Defense materials stated in article 35 of the Defense Acquisition Program Act are : Firearms and other fire power weapons; Guided weapons; Aircraft; Vessels; Ammunition; tanks, armored vehicles and other mobile combat equipment; radars, identification friend or foe, and other communication and electronic equipment; night observation devices and other optical or thermal imaging devices; combat engineering equipment; chemical, biological and radiological warfare equipment; command and control systems; or other materials that the Administrator of the Defense Acquisition Program Administration designates as recognized to be important for military strategy or tactical operations. (DAPA, 2008a)

potential risk such as lack of arms imported from abroad caused by trouble with the exporter. For instance, during the Falkland Island War, Argentina didn't receive Exocet Missiles that had been imported from France, and during the Iraq War, even the U.S. did not get some vital components of weapons from Switzerland(DAPA, 2008b). Therefore, the defense industry can influence on implementing a military operation.

Due to the security problem, the defense industry requires a security blanket. A defense contractor can leak intelligence about own military power to enemies by opening information about weapon systems which the firm manufactures. For this reason, promotional activities on website or even promotional materials of a defense contractor need ex ante a security check by a government.

Secondly, the defense industry is a high level of technology- and capital-intensive industry(Kim & Lee, 2001). A defense industry needs the most advanced scientific technology, and many equipments including the microwave oven and the internet have originated from a military part. Technology-intensive goods require research activities for long time and massive investment in production facilities, and furthermore it spends very long time from initial investment until commercializing military technologies and getting profits. Therefore, defense contractors should be able to secure high technologies and huge capital, and should take many risks accompanied with the process.

Thirdly, because a national security is a kind of public goods, a defense industry also shows attitudes of public goods. While private goods are for one person and less to others, a public good is one which is capable of being used by many persons at the same time without reducing the amount available for any other person. Like that TV or Radio broadcasting provided by private company is a public good, the national security is also a public good despite weapons are produced by private defense contractors. Thus, inherent properties of a public good exist in producing weapons. Deciding how much to produce or who to pay is one

of such properties. A government as an agent of own people imposes tax on its people, estimates its people's desire for security as weapons' value, and pays for weapons. This process is much difficult policy-making or -implementing, so there is a possibility of inefficiency. In addition, because a probability of an externality is the biggest problem of a public good, a government should prepare for occurring of an externality. Therefore, a government is likely to or should intervene aggressively in the defense industry.

Fourthly, it is very difficult to enter into the defense industry and to survive in arms market. Due to properties of a public good, only governments are the consumers of the defense industry. On the other hand, suppliers compete fiercely for sales with each other, and are at a disadvantage in deciding a price than a government. It has high possibility of a market failure, which makes firms hesitate to enter into a defense industry. For this reason, pre-existing defense contractors keep advantageous position by constantly developing relevant technologies. As a result, this deepening phenomenon becomes a barrier for new enterprises to enter into the defense industry.

Fifthly, the defense industry makes 'forward · backward effects' on a national economy through national defense R&D and production activities regarding weapon systems, facilities, and equipments(Lee, 2008). An increase of the military power caused by the developed defense industry strengthens the national security, which causes stability of a society. In the stable society, economic activities become invigorated, and this condition guarantees sustained growth of the national economy. In addition, national defense R&D creates a spin-off effect on civil industries, and the defense exports contribute to growth of national economy. The developed economy invests more in the defense R&D, and such process repeats again and again. Therefore, development of the defense industry can make the virtuous circle with national economy.

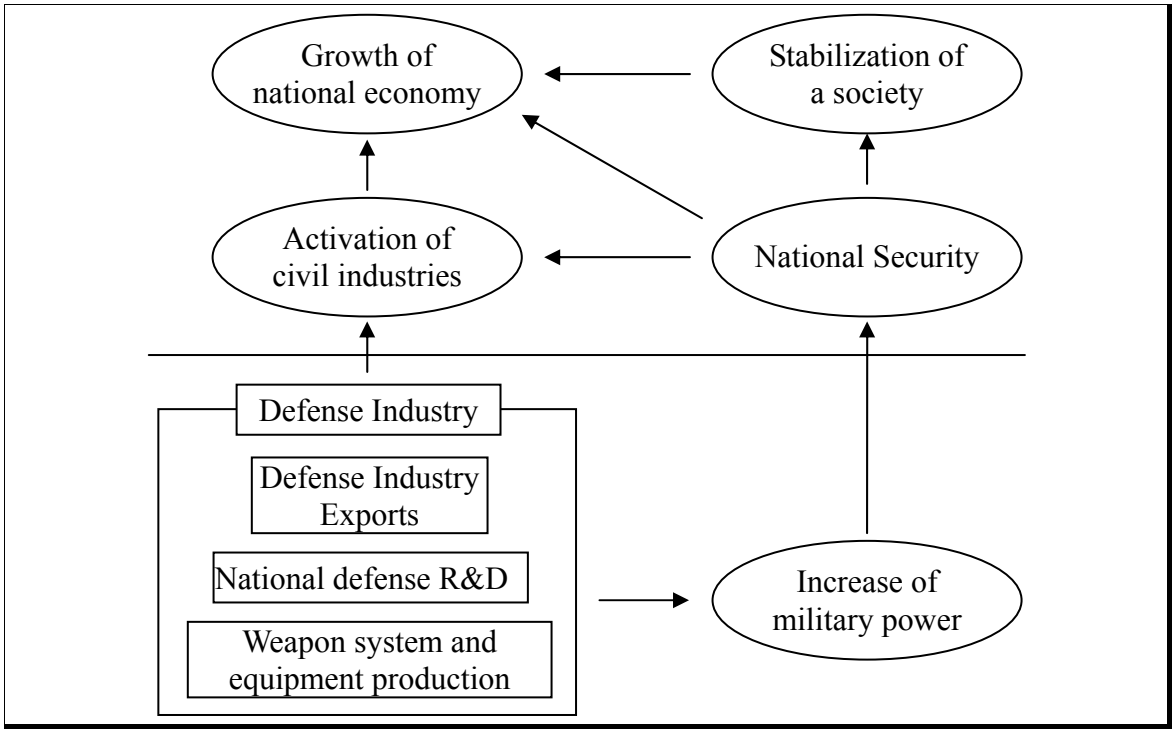

Figure 1: Defense Industry and National Economy(Lee, 2008) with author's own adjustment

Besides above properties, there are many unique characteristics, and the details compared with general industries are listed briefly in Table 3.

Classification		General Industry	Defense Industry
Investment	Scale	Proper investment by market principles	Massive investment by Purpose superiority
	Payback	Minimum	Longer
	Risk	Low due to demand forecasting	High due to becoming stale of weapon system and etc.
Product	Purpose	Firm's pursuit of profit	Superiority of performance to main enemy
	Deciding Production	Based on marketability	Based on weapon system
	Credibility	Related to profitability	Related to morale of army
	Form	Simple	Complex and diverse
	Accuracy	Low	Much higher
	Unit Price	Low, economic efficiency	High, non-economic efficiency
Production	Research Period	Short	Long
	Know-How	Firm's security	National security
	Facility	Simple	Complex
	Volume	Planned production (Demand forecasting)	Build to order (Government's plan)

Purchase	Period of Delivery	Firm's control	Government's control
	Selecting Consumers	Possible	Impossible (Only government)
	Price	Market competition, low	Govern's forecasting, high
	Contract	Competitive contract	Special appointment contract
Ripple Effect		Abundance of national economy	Leading technology-intensive industry

Table 3: Comparison of Properties of Defense and General Industry(Moon, 2008)

Along with the importance of the defense industry, the defense exports began to grab the attention. In October 2009, South Korea government established Korea Defense Industry Trade Support Center, which is a cooperative organization between the Ministry of Knowledge Economy, the Ministry of National Defense, and the Defense Acquisition Program Administration. It was an intention to integrate efforts of each governmental organization and civil defense contractors, which revealed that the government had realized the importance of the defense exports and difficulty to foster those. The difficulty derives from unique properties of the defense exports. Kim, K.(2007) distinguished the properties according to four factors of marketing method: product; price; place; promotion.

Firstly, in the aspect of product strategy, it is almost impossible for a defense contractor by itself to invent and export military articles, if its own government does not demand the weapon systems(Kim,K., 2007). The U.S. GAO(1995) analyzed as follows:

> ...potential customers abroad view domestic procurement of a product as an important endorsement of confidence and one that helps lower unit costs by increasing the economies of scale associated with a system. … it is very difficult for a company to sell a defense article if its own country's defense department or ministry does not use the equipment. For example, ... Northrop's F-20 was designed specifically for export; however, Northrop was unable to sell the aircraft overseas, in part, because the U.S. government did not purchase it for domestic use. (p. 9)

Such analysis of GAO showed how critical a government's purchase as an endorsement of confidence is. Decision-making of a government or an army should precede enterprises' plan

to invent, produce, and export weapons. In addition, the use of an own country means that the army is developing the relevant field manuals, drill guidelines, and something related to the military articles. As a result, the weapon purchase of its own country is a premise to export it.

Secondly, in terms of price strategy, governmental decisions on the R&D costs and technology royalties are determinants of the unit price exported, which are required to secure price competitive in the international arms market(Kim,K., 2007). Of course, the capabilities of weapons are much more crucial than the unit price in the arms trade. If all the Required Operational Capabilities are met, the unit value will become the most important consideration. In deciding the unit price, while the researchers want to highly evaluate the R&D costs and technology royalties, consumers hope to cut that. Therefore, the governmental policy to satisfy both of developers and consumers is needed.

Thirdly, in the aspect of place strategy, some restrictions exist in choosing export routes, and these restrictions are both in exporting nation's internal system and in the international arms market(Kim,K., 2007). The very powerful strategic weapons are likely to be prohibited to export because of the possibility to be used to attack or threaten the producer and its allies. For instance, an F-22 aircraft produced by Lockheed Martin needs approval of the U.S congress for its export. Besides, some cooperating arrangements[2] prevent nations in the war and hostile states from importing powerful weapons. Thus, finding proper sales routes is not easy for a government and especially for a firm with insufficient information.

Fourthly, in terms of promotion strategy, effective increase in the arms export is impossible without cooperative efforts of a government, the army, and defense contractors(Kim, K., 2007). In the defense export, promotion factors are not only social-cultural things mainly considered in exporting civil products, but military-related factors including the political-military ties, a military alliance, interoperability of weapon systems,

[2] For example, "Wassenaar Arrangement", "Nuclear Supplier Group", "Missile Technology Control Regime", and "Australia Group"(Lee, 2008, 18).

military training theories, and military institution. However, these military-related factors are difficult for civil enterprises to access or recognize. Furthermore, because the officials of potential consumers in charge of weapons procurement works are likely to be incumbent soldiers, civil companies of selling countries need assistance of military including offers of sufficient information and intermediation by Military Attaches.

By the way, increase of defense exports is always not beneficial for a country, and there are some adverse effects caused by the increase. A major arms-exporting state is likely to be shown as an international public enemy that entices others in the war(Kim,K., 2007). For example, the biggest weapons exporting country, the U.S. has been suspected of making the war in order to sell more arms. In addition, drastic growth of the arms export may accelerate weapons build-up of states around an importing state, and raise international tensions(Kim, K., 2007). The growth of South Korea's arms sales may also provoke the North Korea, and cause crisis of the war around the Han peninsula(Kim, K., 2007).

However, despite of the adverse effects, majority of countries are not indifferent to international arms exports, because becoming a magnate in the market gives various and enormous benefit. For this reason, South Korea has also tried to develop competitiveness in weapons exports.

2. AN OFFSET TRADE

The first time when the term "offsets" was used in the field of military sales was 1961 at that time the U.S. government put pressure on Germany to purchase the U.S.-origin weapons in order to offset its military expenditure spent on troops stationed in Germany. After that, offsets were suggested to save the foreign currency in importing expensive weapons. In 1960s, European countries asked barter-type trade to the U.S. in buying U.S-origin military items due to lack of foreign currency, so an offset trade was mainly utilized as

one way to remedy financial situations of the NATO nations for the post-war reconstruction. With time, offsets have become a tool to obtain essential technology in order to construct an independency of the importer's defense industry(Weida, 1986).

Offsets have been defined variously. The term "offset" has lexical meaning of using one cost, payment or situation in order to cancel or reduce the effect of another. In the field of arms trade, definitions of each nation or each organization are a little different. It can mainly be divided into two definitions of the buyer's position and of the seller's one.

Definitions of an offset trade in the position of buyers are much positive, and focus on getting something. According to Defense Acquisition Program Act of South Korea, the term offset trade means "trade where a condition of reciprocal service, such as transfer of relevant knowledge, technology, etc., the overseas export of domestic weapons, equipment, parts, etc. is attached when purchasing weapons, equipment, parts, etc. from abroad"(2008a). Suman(2005, 2) defined offsets as "some sort of a leverage exploited by a buyer to obtain compensatory benefits by asking the seller to undertake well-designated activities to boost the economy of the buying country".

On the other hand, sellers' definitions focus on paying something back for sales of military items as an inevitable action. For instance, "offsets are a range of industrial compensation practices required as a condition of purchase in either government-to-government or commercial sales of defense articles and/or defense services as defined by the Arms Export Control Act(AECA) and the International Traffic in Arms Regulations (ITAR)"(BIS, 2009, 35). In addition, Suman(2005, 2) stated that "offsets can generally be termed as formal arrangements of trade, wherein a foreign supplier undertakes specified programs with a view to compensate the buyer as regards his procurement expenditure and outflow of resources". Therefore, in the position of sellers, an offset trade is, for more weapon sales, a military and industrial activity of an exporting country which pays back

partially to an importing country.

Currently, many arms-importing countries are asking an offset trade due to several reasons. As noted earlier, for importing countries, the initial reason to pursue an offset trade was to save foreign currencies. For the European countries which tried to reconstruct their economies after the World War II, and for current less developed or developing countries, an offset trade is an opportunity to acquire modernized weapons by paying less money.

With time, countries have become to recognize the importance of the defense industry, and to utilize an offset trade as a tool to build up the industry. Neuman(1985) stated that more countries are asking manufacturing know-how than hardware, and an offset is useful for that. Weapon-manufacturing technology is difficult to obtain from other countries due to reasons related with their national defense problem, and besides, succeeding in the R&D is more difficult. For this reason, as another way of an offset trade, an industrializing country that imports arms can require an industrialized country that exports the arms to invest in the own defense industry(Han & Lee, 1998). Such investment helps the buyer's defense industry grow up, and the growing industry maintains and raises employment(Neuman, 1985). Therefore, an offset agreement can be a steppingstone to develop a baby defense industry of an importer.

In addition, developing countries are regarding an offset trade as mechanisms to encourage export earnings and economic growth(Neuman, 1985). Through an offset trade such as the counterpurchase, they can access to new markets of selling countries to export their commodities, and enlarge preexisting markets by using the distribution network of sellers. An importing country can also force an exporting country to choose its firm as a subcontract to manufacture parts of the military item targeted, which gives a firm of a consumer a chance to compete in the market(Han & Lee, 1998). Therefore, an offset trade becomes a great tool to open a new market or to raise exports for an industrializing country.

According to Neuman's study, an offset trade provide a buyer with a "way of disguising the discounting of exports, a means of undercutting the prices set by international commodity agreements"(1985, 71). While exporting a commodity at world price, a developing country is likely to pay more for a military item than expected price. This is actually a kind of price-cutting of an importer's product that encourages exports without causing a trade dispute with other competitors that export same commodity, and simultaneously without getting penalties of antidumping measures from a contracting party. As a result, an offset trade can be a kind of dumping measure of a developing country.

Along with the aspect of exports, the fact that sometimes imports is possible through only offsets is crucial for LDCs. Neuman(1985) noted that LDCs circumvent IMF's regulation on their imports by using an offset trade. IMF forces LDCs to reduce trade deficit by importing less, however LDCs justify their imports by using offset trade.

Besides economic reasons, political interests have contributed to the trend of increasing offset trades. Politicians promise increase of the jobs, industrialization, and other economic benefits through an offset trade. In addition, sometimes an offset trade is promoted as a symbol of national prestige or solidity with a world power by politicians(Neuman, 1985). Thus, an offset trade with a developed country is a useful tool for politicians of less developed or developing countries.

From a military viewpoint, offset trade is an opportunity to procure a maintenance skill in depot(Han & Lee, 1998). Serious breakdowns of arms are repaired not by users, but by experts in a depot. However, if there is no one who has maintenance skill in an importing nation, the weapons should be transported to the nation which manufactured the weapon. The absence of a main weapon system during transportation, repair, and return can be a risk for national security. Money spent on the process is also huge damage to the army. Thus, acquiring a maintenance technology in depot through an offset trade lets the army save times

and moneys.

By contrast, arms-exporting countries have conducted offset trade due to completely different reasons. Especially, the U.S. has experienced many offset trades, and recognized the necessity. The 14th Report to the Congress by US Bureau of Industry and Security revealed this main reason(2009) :

> …the Government considers offsets to be "economically inefficient and trade distorting,"[3] and… [However] U.S. prime contractors generally see offsets as a reality of the marketplace for companies competing for international defense sale…[and]offsets are usually necessary in order to make defense sales … (p. i)

The U.S.'s point is that an offset trade is better than no sale at all. Today, it is more correct to say that exporting countries can sell weapons and maintain market share because they have something to compensate importing countries. Therefore, for sellers such as the U.S., offset trade is not a choice, but a necessity.

Securing suppliers of components of a final weapon is also one reason of conducting an offset trade for industrialized countries. Neuman(1985) stated that even nations that have own developed defense industries cannot have the resources or the capacity to guarantee across-the-board arms production. Any states cannot always export, and importing intermediate commodities from nations with low wage level is cheaper than domestic production or purchase. Therefore, even industrialized states need to secure steady suppliers of raw materials or intermediate commodities, and offsets help that.

In case of technology transfer as a compensation practice, a license fee or a royalty is also economic benefit for exporting countries. These give an exporting country constant

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[3] Regarding the negative effects of an offset trade, BIS stated as follows:

> When an offset agreement requires a high proportion of subcontracting, co-production, licensed production or purchase transactions, it negates some of the economic and industrial base benefits accrued through the defense export sale. (2009, iii)
>
> [For example,] an exporting country's prime contractors develop long-term supplier relationships with overseas subcontractors based on short-term offset requirements. (2009, 14)

income.

As previously shown, for importing countries, an offset trade has become an unforgivable method in trading arms due to several reasons. On the other hand, for exporting countries, an offset trade is not a pleasant, so they are be likely to be passive to offsets.

In order to satisfy such several motives, there are several methods of offsets. This paper reveals the classification and each definition officially used by the U.S. government, which is the most systematic.

An offset trade can be distinguished according to the compensation method; "coproduction, licensed production, subcontractor production, overseas investment, technology transfer, countertrade"(BIS, 2009). U.S. Bureau of Industry and Security(2009) defined each offsets as follows:

> Co-production : Overseas production based upon government-to-government agreement that permits a foreign government or producer(s) to acquire the technical information to manufacture all or part of [a seller][4]-origin defense article. Co-production includes government-to-government licensed production, but excludes licensed production based upon direct commercial arrangements by U.S. manufacturers. (BIS, 2009)
>
> Licensed Production : Overseas production of [a seller][4]-origin defense article based upon transfer of technical information under direct commercial arrangements between a manufacturer and a foreign government or producer. In addition, licensed production almost always involves a part or component for a defense system, rather than a complete defense system. These transactions can be either direct or indirect. (BIS, 2009)
>
> Subcontractor Production : Overseas production of a part or component of [a seller][4]-origin defense article. The subcontract does not necessarily involve license

[4] The Report, "*Offsets in Defense Trade*" published by US BIS originally used the term "U.S." instead of "a seller".

of technical information and is usually a direct commercial arrangement between the defense prime contractor and a foreign producer. (BIS, 2009)

Overseas Investment : Investment arising from an offset agreement, often taking the form of capital dedicated to establishing or expanding a subsidiary or joint venture in the foreign country. (BIS, 2009)

Purchases : Procurement of off-the-shelf items from the offset recipient. Often, but not always, purchases are indirect by nature. Indirect purchases are similar in definition to countertrade, while direct purchases are analogous to buy-backs. (BIS, 2009)

Technology Transfer : Transfer of technology that occurs as a result of an offset agreement and that may take the form of research and development conducted abroad, technical assistance provided to the subsidiary or joint venture of overseas investment, or other activities under direct commercial arrangement between the defense prime contractor and a foreign entity. (BIS, 2009)

Training generally includes training related to the production or maintainance of exported defense item. Training, which can be either direct or indirect, may be required in unrelated area, such as computer training, foreign language skills, or engineering capabilities. (BIS, 2009)

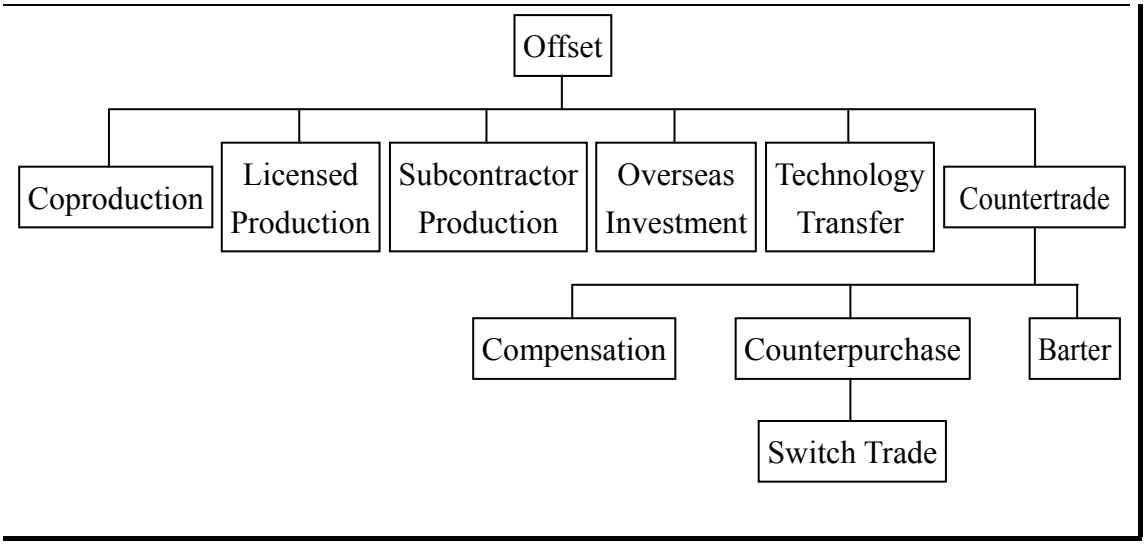

Figure 2: Classification of Offset Trade(Neuman, 1985)

Distinguishing these offsets clearly may be a little confused. Especially, co-production, licensed production, and subcontractor production are similar in the aspect of overseas production. However, some distinction can be shown according to whether doers of the three offsets are government or not, and whether technical information is provided. In addition, technology transfer is differentiated from co-production or licensed production, which provides technological information to the trade partner, from the viewpoint that import of components of arms is not occurred.

On the one hand, an offset trade is divided into two primary groups, direct and indirect offsets, according to relation between a compensation practice and a weapon system targeted in the main contract. U.S. Bureau of Industry and Security(2003) defined each offsets as follows:

> Direct Offsets : Contractual arrangements that involve defense articles and services referenced in the sales agreement for military exports. These transactions are directly related to the defense items or services exported by the defense firm and are usually in the form of coproduction, subcontracting, technology transfer, training, production, licensed production, or financing activities. (BIS, 2003)

> Indirect Offsets : Contractual arrangements that involve defense goods and services unrelated to the exports referenced in the sales agreement. These transactions are not directly related to the defense items or services exported by the defense firm. The kinds of offsets that are considered "indirect" include purchases, investment, training, financing activities, marketing/exporting assistance, and technology transfer. (BIS, 2003)

The Figure 3 shows that offset transactions distinguished according to that the compensation method belongs to which part of direct or indirect offset trade. BIS(2009) discovered the new trend of offset trades in the international arms market. In the aspect of value of offset trades in 1993 ~ 2008, the U.S. has made more indirect offset transactions, on

average 60%, than direct offset transactions, on average 40%. However, in 2008, the values of direct and indirect offset trade approximately account for half respectively. The trend has been caused by the views of importing countries that direct offset is more efficient to foster their own defense industries.

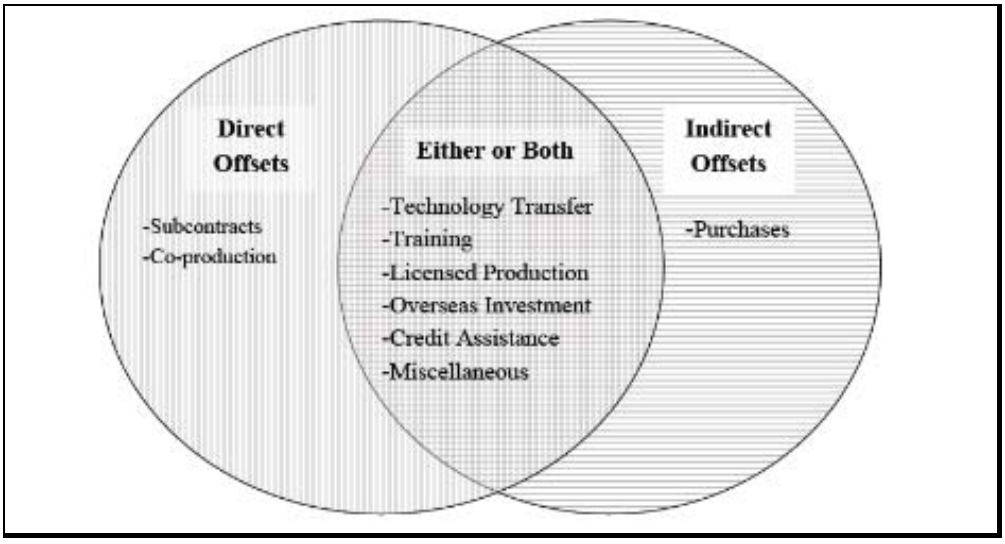

Figure 3: Classification of Offset Transaction Categories(BIS, 2009)

This phenomenon has relation with development level of trade partners. Brauer(2004, 59) stated that "DCs tend to negotiate direct arms trade offsets, and LDCs tend to negotiate indirect offsets". GAO's analysis(1996) showed that developed countries such as Netherland and United Kingdom can usually make link between offsets and their own defense industry. By contrast, newly industrialized countries such as Singapore and South Korea link offset trades more to non-defense industries, and less industrialized countries such as UAE and Saudi Arabia integrate only to non-military industries(GAO, 1996). When considering rapidly increasing development levels of NICs and LICs, arise of the direct offsets has been not an accident.

3. THE TECHNOLOGY TRANSFER AS OFFSETS

A concept of the technology is very broad, and is recognized variously on how you see it. Among the various concepts, the technology provided to an importing country as a compensation practice in an offset trade is certainly the military technology or the dual use technology. Kim(1990) stated that the defense technology is the technology developed for the purpose of contributing to national security by procuring technical superiority of national defense. Hong(1993) defined the dual-use technology as the technology to be able to improve both security capability and industrial competitiveness in a military sector and in a private sector. These two technologies are the main subjects of this paper.

Kinds of the technology transfer also vary. The technology transfer can be classified according to relation between a transferor and a transferee. Walker and Ellis(2000) divided the transfer of technology into intra-organizational (including transfers between functions and divisions), inter-organizational (including intra- and inter-industry) and inter-economy (focusing on the macro-economy rather than transfer at the company level). Though none of these categories is mutually exclusive, the technology transfer as one way of an offset trade is categorized into inter-economy transfer because it usually occurs across the border.

On the one hand, based on which technology is dealt with, the technology transfer as an offset trade can be categorized. As forms of the technology transfer, U.S BIS(2007) cited "research and development conducted abroad, exchange programs for personnel, data exchanges, integration of machinery and equipment into a recipient's production facility, technical assistance, education and training, manufacturing know-how, and licensing and patent sharing"(p. 2-7).

These technology transfers can broadly be divided into two groups, direct and indirect offsets. Figure 3 shows that the technology transfer may be either direct or indirect offset

trade.

Then, why or how many have the technology transfers as offsets increased in the arms market?

There are R&D and introduction of technology as main ways to procure the defense technology. Each of two ways has pros and cons respectively, and there have been many controversies on which of two is better. Especially, Chang(2004) stated procuring the defense technology through R&D has risk because of its uncertainties. In other word, there are technological uncertainty, cost uncertainty, and market uncertainty in conducting R&D. In the field of military, the rapid evolution of weapons has made the pre-existing defense technologies become stale, and the possibility on failure of technology development is great because sometimes researchers should study the new R&D area. In addition, it usually takes huge amount of money, very long time and a lot of efforts to verify the probability on utilization of a weapon system developed, because it should complete a set of course composing of production of a prototype, test and evaluation, production, deployment, and operation. Furthermore, while R&D requires much investment, demands for a weapon manufactured by using the technology may be a few and limited. Therefore, even deciding to conduct R&D is hard either for a government or for a firm.

Classification	Research & Development	Initial deployment	Deployment completion
K-9 Self-propelled Artillery	1989 ~ 1998	1999	2010
KT-1 Trainer	1988 ~ 1998	2000	2005
Short-range Surface to Air Missile	1987 ~ 1999	1999	2010
Unmanned Aerial Vehicle(UAV)	1991 ~ 2000	2002	2004

Table 4: Fielding Period of Main Military Equipments Developed by South Korea (Ministry of National Defense, 2002)

For these reasons, introduction of the defense technology from abroad which is a relatively stable way is popular for governments of developing or less developed countries that want to foster the defense industry rapidly. Actually, nations such as Israel, India, and Brazil, which have become magnates in exporting arms, had pursued a strategy of procuring weapon systems through introduction of technology from abroad, and then had reached a reasonable level of proficiency in weapons production through constant development and accumulation of technologies(Kim & Lee, 2001). Therefore, countries, which have watched their successes, are interested in the technology transfer from industrialized countries.

In addition, even if one pursues the R&D method in acquiring the defense technology, it is certainly designed to face the technology transfer problem. Precisely speaking, the R&D and introducing technology from others are not exclusive each other. Ellis and Walker stated that any company cannot keep the R&D strategy in every technology and "there should be provision within the R&D strategy for the importation of technology, either to support current technology that is internally available or new technology that is required as a result of changes in strategic requirement"(2000, 99). In other word, introducing technology is a crucial part of the R&D. Therefore, introducing technology at the initial period is inevitable.

However, introducing the defense technologies from abroad is also not easy for the developing or less developed countries. Highly expensive cost spent on getting license and loyalty has been a big burden for them. In addition, industrialized countries, which have already achieve great development of defense technology, don't intended to provide the technology to others in order to preserve their monopoly position in the arms market, even if developing or less developing countries are likely to offer costly price for the technology.

The solution for this problem is just an offset trade. As offsetting has become prevailing in trading arms, developing or less developed countries have regarded it as an opportunity of acquiring advanced military technology. For the U.S., while some other ways

of compensating have been reduced or changed slightly, the number of requiring the technologies as a compensation practices has gradually increased. The technology transfer accounted for 18.92 percent out of all 8 "transactions reported for 2008 based on quantity"(BIS, 2009). By calculating the value of technologies transferred to importing countries, the change of the technology transfer based on quality can be known easily, too. In 1993, the technology that the U.S. offered to importing countries have actual value of $300,307,000 and credit value[5] of $320,504,000, but in 2008, the U.S. transferred technologies of actual value of $958,314,000 and credit value of $1,462,126,000(BIS, 2009). In other word, the trend that importing countries require the exporting countries to transfer the advanced military technology as compensation practices has become quite intensified in the arms market.

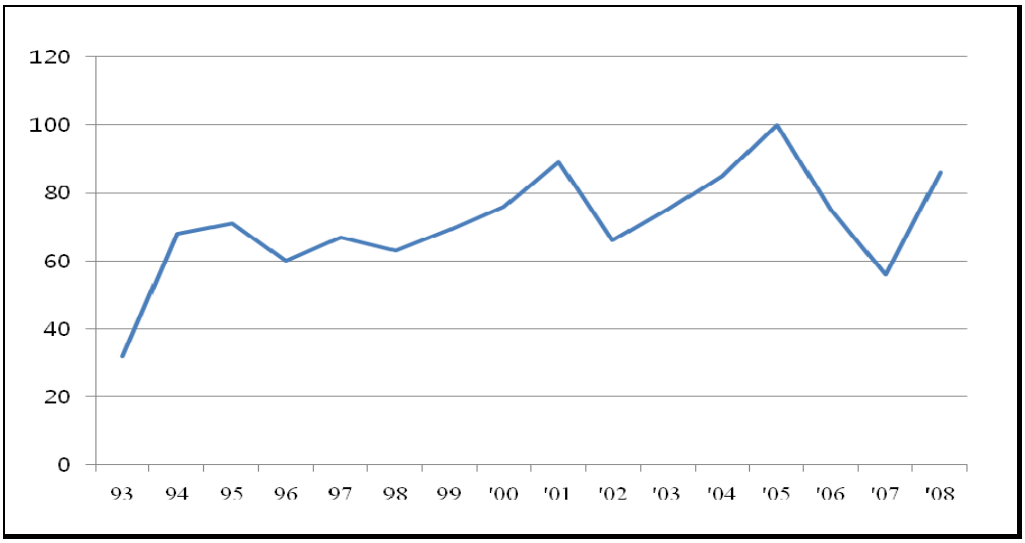

Figure 4: Trend of the U.S.'s Technology Transfer as a Compensation Practice, 1993-2008(BIS, 2009) with author's own adjustment

[5] BIS defines the credit value as:

> The credit value is a value that some foreign governments provide as an incentive for certain kinds of offset transactions. This value varies greatly by country and by the kind of transaction (i.e., purchase, technology transfer, investment, etc.), but is normally more than the actual value. (2003, 11-12)

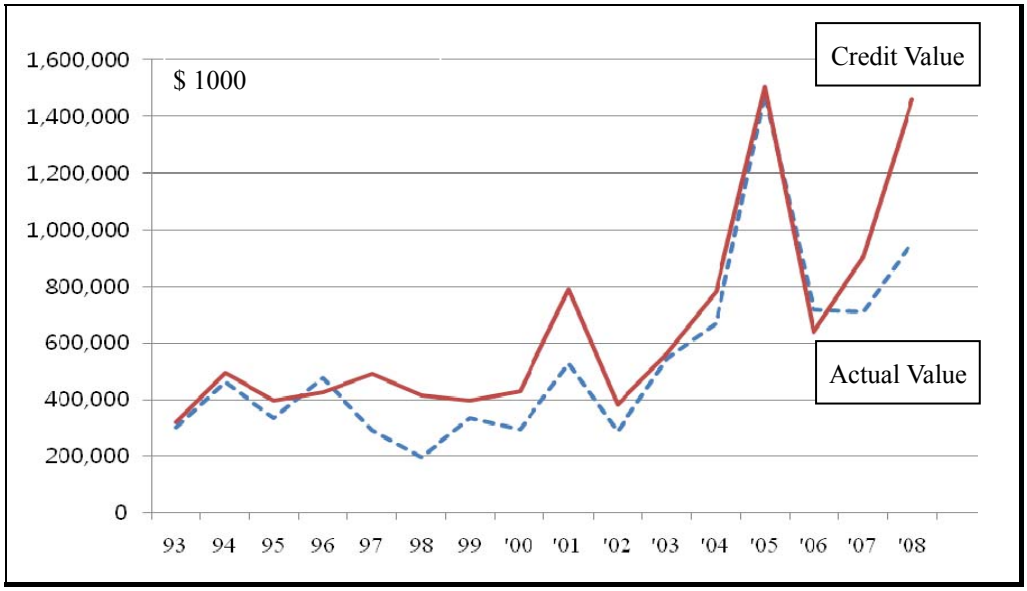

Figure 5: Value of the U.S.'s Technology Transfer as Compensation Practice,1993-2008(BIS, 2009) with author's own adjustment

On the contrary to for importing countries, for exporting countries, transferring the military technology of which they have spent much effort, time, and money on development is not pleasant. Lopez and Loren(1988, 46) argued that "design and management of the critical transition … provide the recipient with greater overall expertise and a stronger position as a future competitor". In addition, Schaffer stated that "the company must evaluate how much the loss of technology will hurt it in future bids against a new technologically enhanced competitor"(1989, 193-194). From their viewpoint, it can be known that future loss resulting from the technology transfer is the likely to be much greater current benefit from that.

For this reason, the U.S. government has particularly paid much attention on an offset trade issue regarding technology. Basically, the U.S. government does not participate in an offset agreement. A memorandum on a basic offsets policy signed by Duncan, Deputy Secretary of Defense stated that "because of the inherent difficulties in negotiating and implementing compensatory coproduction and offset agreements, and the economic inefficiencies they often entail, DOD shall not normally enter into such agreement"(Weida,

1986, 108). It also means that the U.S. government does not prevent private company from entering into the agreement. However, there exist a few exceptions, of which representative one is the technology transfer. OMB(1985, 41) stated that the U.S. government's involvement in offsets has occurred "primarily … to protect the technology involved,…". It reveals that the technology transfer is a very critical and unpleasant problem for an exporting country.

Nevertheless, the U.S. firms has made an offset agreement including the technology transfer, because only a few demanders exist in the arms market and sale with the technology transfer is better than no sale at all. When potential consumers require a certain level of the defense technology, transferring the technology with greater conditions than other sellers' conditions is necessary for business in the arms market. Thus, for a seller, providing the military technology has become a crucial tool to survive in the world arms market.

In sum, the technology transfer as offsets has become very important both for developed exporters and for developing or less developing importers in the world arms market. For this reason, South Korea should construct a strategy to confront the problem regarding selling or transferring own defense technology.

The technology transfer as an offset trade has distinctive properties. Of course, this transfer has common characteristics of a general technology transfer for the commercial purpose. However, while transfer of technology is generally conducted due to provider's motive to sell own technology and recipient's wish to get the technology, the technology transfer as offsets is implemented as a concomitant of the arms trade, not a main contract. Because it is hard to say that an exporting country usually wants to sell its technology, an approach only from a standpoint of studies on general technology transfer is not suitable for this study. Therefore, it needs research on the properties of the technology transfer

considering aspects of military offsets, the countertrade, and the inter-economy level.

In transferring the technology, the maturity of technology and technical capability of a recipient are important factors. Initial level of technology which just finishes the R&D cannot be transferred, and if a recipient' capability is not good enough to internalize the technology targeted, the transfer will go to the failure. Even technology which had no problem in producing a prototype may cause some troubles at the level of supplementation, mass production and final commercialization. Therefore, technology transferred should be at the level where a recipient can utilize the technology with only a little supplementation.

According to the technical maturity of a recipient, a proposer of technology transfer as an offset trade becomes differentiated. There are two cases of that an importing country asks an exporting country to provide technology, and that an exporting country suggests the technology transfer to an importing country. The former happens when an importing country has a certain level of technology and information about the advanced technology, and the latter occurs when capability and information of an importing country are poor(Kim, Y., 2007).

Where the initiative in negotiation goes over is one difference between the general technology transfer and the one as an offset trade. In negotiating on the technology transfer, a provider is superior to a recipient in the general market, however in the international arms market, an importing country is at an advantage than an exporting country because the market is consumer-superior(Kim, Y., 2007).

Computing the value of the technology transferred is the most important issue in making an offset trade agreement. An exporting county tries to exaggerate the value of compensation practice, and vice versa for an importing country. Converting the value of technology into the money is a little objective, so it is likely to cause some troubles between trade partners. Thus, understanding the technology-valuing process is helpful to taking an

initiative in the negotiation.

The negotiation process would show one of two types according to the attitude of an importing country. A potential consumer country usually requires more than a certain portion of compensation practices of applicants which compete against each other to sell their own articles. An importing country chooses one of them as a trade partner whose suggestion firstly satisfies its demand, and detailed provisions are adjusted in negotiation. When an importer puts an emphasis on offset proportion of compensation practices, the negotiation mainly deals with adjustment of offsets value suggested. By contrast, if an importing country emphasizes a kind of the compensation practice, an importing country tries to acquire what it wants, acknowledging the offset value that an exporter wants(Kim, Y., 2007).

As mentioned above, properties of the technology transfer as offsets are rather unique. The technology transferred should be one that can be utilized by a recipient with just slight adjustment. Value of the technology is a very important problem, and can be a main conflict between trade partners.

Ⅲ. IMPACTS OF AN OFFSET TRADE

As mentioned in chapter Ⅱ, the defense exports are beneficial for an exporting nation or firm, but it cannot avoid offset obligations including technology transfer at the same time. Offsets have generally been regarded as being harmful to an exporter. With time, exporters become to know the real impacts of the military trade. It can say that the trade is success if overall impacts are positive. In other word, successful trade for exporters is that other positive impacts resulting from the main trade are greater than the negative impacts of offsets. Thus, realizing several impacts of defense exports and offsets is needed to know which offset trade is successful for an exporter. Diverse researches introduced in this chapter will tell diverse impacts of offsets, which are different from generally negative arguments stated in the chapter Ⅱ.

Recently, because scale and range of the defense industry have been expanded enormously or complicatedly, it is hard to precisely estimate the impacts of the defense exports which may include considerations of economy, international politics, military, and etc. Furthermore, evaluating impacts of the military offset trade is more complex because it includes assumption that what if there was no offset provision. Thus, the U.S. has annually focused on assessment of impacts of offsets on only the employment, balance of deficit, competitiveness of the defense industry, and the defense preparedness “pursuant to Section 309 of the defense Production Act of 1950”(BIS, 2009). This paper follows the U.S.’s assessment method.

1. IMPACTS ON EMPLOYMENT

Job creation is the one of an importing country's purposes of pursuing the military offsets, and there had been no doubt in the fact that an importing country benefits from the offsets in employment. However, some studies have disputed against that and discovered new one. For example, in South Africa, it was expected that a cost of R104 billion spent on a military offset agreement with European suppliers creates "65,000 new jobs over seven years", but "amount to a cost of R1.6 million per job…, nearly 20 times the average cost per job in South Africa's defense industry"(Dunne & Lamb, 2004, 288). In addition, a "case study on defense offsets in Saudi Arabia reveals that instead of a projected 75,000 local jobs, the various programs generated employment in the region of 2,000"(Dunne & Lamb, 2004, 11). From their point of view, creating new jobs through a military offset agreement is not very efficient for an importing country.

On the one hand, there have existed many debates on whether an offset trade encourages employment of an exporting country, or not. Some have argued that an offset agreement enhances military sales, which causes increase of employment. On the other hand, some insists that because of offset obligation, prime contractors should make another contract with subcontractors of an importing country, which move jobs from an exporting country to an importing country.

The former is based on the premise that without offset, arms exports would not be made. Some U.S. firm's officials insisted that "many offset deals create new and profitable business opportunities for themselves and other U.S. companies,…[and]… export sales provide employment for the U.S. defense industry and orders for larger production runs"(GAO, 1996, 11). It is certainly true that new business and larger production runs is connected to more employment. For instance, "McDonnell Douglas claimed that if the United States did not sell 72 F-15E fighter-bombers to Saudi Arabia, 40,000 jobs would be lost"(FAS,

1994). In addition, the offsets negotiation requires a lot of administrative works such as document translation, for which demand gradually arises as time spent on negotiation increases. Regarding this, Bureau of Export Administration insisted that "additional employee with expertise in offsets often must be hired"(2001, 8). Even in case of indirect offsets, a prime contractor should also hire more workers such as marketing experts because the firm has to be responsible for sale of a buyer's products, of which it has no specialty(BXA, 2001) . Finally, BIS concluded that "2002-2005 defense exports sales averaging $5.5 billion annually had a net positive effect on employment in the defense sector during the four-year period"(2007, 3-3).

Furthermore, many studies have argued that at least, the offset trade does not affect adversely on an exporting county. In other word, by transferring some jobs to abroad, more or similar amount of jobs can be created. OMB(1988, 58) concluded that "the effect of offsets on total U.S. employment in minor, if not actually positive". Besides, Weida(1986) stated:

> the direct effect on the U.S. economy of foreign weapon sales is very small [because] total foreign defense deliveries in most years support between two and three hundred thousand jobs in the U.S. private sector… [which is] less than half of one percent of total private employment. (p. 131-132)

From their standpoint, the change of employment caused by the military offsets is a negligible quantity.

However, there exists a critical problem that the damage of military offsets is concentrated on a certain part of the defense industry and its employees. The military offset trade moves jobs from subcontractors and lower tier suppliers to prime contractors and overseas firms.[6] Another problem is an assumption regarding no offset. It is easier to calculate the possible employment under ordinary trade circumstance.[7] BIS stated that "the $5.9 billion in reported offset transactions [in 2005 ~ 2008] would have created or sustained

[6] How military offset agreements made by prime contractors affect subcontractors and lower-tier suppliers will be explained in chapter Ⅲ.3. IMPACTS ON THE DEFENSE INDUSTRY.
[7] The U.S. regards military offset arrangement as trade distorting.

employment opportunities equivalent to approximately 59,000 U.S. aerospace sector jobs if the work associated with those transactions were performed in the United States"(2009, 17). Therefore, exporting countries worry about employment in subcontractors, and have unsatisfied feeling on possible employment under the ordinary trade conditions.

This paper attempts to take one step, and there are two variables in the process. In other word, employment can vary in accordance with how to make up for and how a trade partner is developed or industrialized.

Co-production, subcontractor production and licensed production are especially harmful to employment of an exporting country. These moves part or all of production facilities from home to overseas, which cause reduction of domestic jobs. Overseas investment is also not good to job creation of a seller. It reduces the potential of own employment by making investment in a foreign country, which instead could be spent on own domestic industry. By contrast, the technology transfer, training and credit assistance do not show direct effects on employment of an exporting country. These do not transfer any production facilities to a foreign country.

In addition, the military offset trade with industrialized countries is more harmful to employment of an exporting country. Some military jobs was lost in the U.S. due to a military "offset agreements with highly industrialized countries such as the Netherlands and Switzerland"(Brauer, 2004). It means that even highly industrialized exporting countries such as the U.S. can be hurt by the military offsets with developed countries. Because industrialized countries have well-developed defense industrial bases, they have both intention to obtain defense-related compensation practices and capability to adjust specification over offset arrangement(GAO, 1996). In other word, industrialized countries usually demand direct offsets, of which main kinds are co-production, subcontractor production, and licensed production. On the other hand, developing or less developed

countries usually require indirect offset agreements, because they do not have sufficiently developed defense industries and capability to effectively negotiate. Therefore, the impacts of the military offset trade on employment can vary in accordance with the development level of a trade partner.

In brief, effects of the defense offsets on job creation are different according to the position in the sales, a kind of compensation practice, and a trading partner. A buyer can take profit in employment, but is likely to obtain smaller jobs than expected. On the other hand, a seller should endure a structural change of employment, but its degree depends on a kind of compensation practice and the development level of a trade partner.

2. IMPACTS ON BALANCE OF TRADE

Arguments and their reasonings about impacts on trade balance show similar pattern to those on employment.

Some, especially prime contractors, contend that the offsets raise the exports by attracting foreign consumers, and that foreign competitors would win the bids if nothing was made up for. From their standpoint, a certain percent of something is more profitable than 0 percent of nothing, and for example, if the offset proportion is 60%, the net benefit becomes 40% of exports.

However, it cannot deny that fulfillment of the offset mandate is able to raise the imports. BIS stated that “almost 80 percent of offset transactions reported for the 1993 ~ 2004 period fell in the manufacturing sectors of the U.S. economy, eroding U.S. production and workforce capabilities and the balance of payment benefits of the export”(2005, 3-1). This arise is concentrated on the intermediate commodities that could be produced by subcontractors and lower-tier suppliers of an exporting country. It also reduces own suppliers’ world market share. The market share reduced is connected to decline of capacity utilization

rate, which hugely affects their survival. If the subcontractors and suppliers collapse, imports of the intermediate commodities increase much rapidly. Though this process may be a little exaggerated, subcontractors apparently worry about their survival.

The degree of impacts on trade balance also depends on a trade partner and compensating method. While co-production, licensed production, and technology transfer almost do not buy anything from an importing country, subcontractor production and countertrade surely make imports. Especially, BIS noted that "purchase, which are indirect offsets, can displace sales from the commercial manufacturing sectors of the U.S. economy"(2007, 3-1). In other word, countertrade causes much bigger arise in imports not only in the defense industry, but also in others. As above noted, LDCs usually demand indirect offset trade, which contains countertrade. LDCs' main exports are raw materials and intermediate commodities, which compete against subcontractors and lower-tier suppliers of an exporting country.

On the one hand, the negative effects of the defense offset agreement can be relieved by three factors(Kremer & Sain, 1992). The first is a multiplier, which "make it easier for prime contractors to fulfill their offset obligations by allowing for higher offset credit levels than normally granted"(BIS, 2007, 5-5). For example, the Canadian government allows more than one dollar of credit value for a dollar spent in underdeveloped provinces(Weida, 1986). The second one is a 'time-discount rate[8]' or 'inflation rate', which makes current value of military items exported more valuable and reduces value of compensation practices imported later. The third is that the large firms can recover the loss by extended business in other area. Regarding this, Shaffer said:

> Large companies, like Boeing, are finding that offset agreements are a way of expanding the scope of a transaction, creating more opportunities for profit. What

[8] The time-discount rate is the rate by which the future value is to be discounted to make it equal to the present value.

> they give up in subcontractors and coproduction, they more than recover in service agreements, training, and market position in a country over time. (1989, 68)

Like impacts on employment, impacts of the military offsets on trade vary in accordance with the position in the sales, a kind of a compensation practice, and a trading partner. While prime contractors more exports, subcontractors and lower tier suppliers are faced with reduction of sales. Subcontractor production, and especially countertrade certainly reduce trade surplus, and an offset trade with LDCs also does. However, the trade deficit can be mitigated by a multiplier, time-discount rate, and extended business of large firms in other areas.

3. IMPACTS ON THE DEFENSE INDUSTRY

Like impacts of offsets on employment and balance of trade, estimating exactly its impacts on a seller's defense industry is very difficult. Some have insisted that the impact is not good for domestic defense industry. Weida said:

> if the offset creates a new foreign manufacturer of arms, it has the potential to alter procurement patterns in the long run by lowering the growth rate and reducing the ultimate size of the U.S. defense industrial base. (1986, 118)

By contrast, the opposite arguments have been suggested, and for example, OMB report in 1988 stated:

> if the defense industrial base effects that may be attributed to offsets were significant, one would expect to see lagging competitiveness in this sector. In fact, at a time when other economic sectors are experiencing large trade deficits, aerospace exports have remained highly competitive and have continued to show large, growing trade surpluses. (p. 38)

In addition, BIS estimated overall impacts of the military offsets, concluding that "the U.S. defense exports associated with the [offset] transaction do directly enhance U.S. defense production"(2007, 3-5). However, these are too broad, and it will be better to consider each

aspect of both prime contractor and subcontractors.

In the military offset trade, prime contractors are the beneficiaries. Weida(1986) argued that "prime contractors structure offsets so that they derive the maximum benefit from offset agreement"(p.132). How to compensate the weapons-purchasing cost is determined by demand of a buyer and prime contractor's intention to achieve maximum benefit. Thus, impact of the military offsets on prime contractors is certainly positive.

On the contrary, impacts on subcontractors and lower-tier suppliers are likely to be negative. Prime contractors don't need to consider domestic subcontractors' and suppliers' benefit, of which market position is weak. Weida stated that "subcontractors are to a large extent at the mercy of the primes when it comes to offset contracts"(1986, 7). From the perspective of international economics, the military offsets can be viewed as a kind of globalization or open trade, which is not just stuck in domestic suppliers. In other word, an offset trade makes suppliers enter into competition against foreign firms. Though consumers'[9] surplus and total welfare becomes greater, domestic suppliers, of which products are imports-competing, are hurt by globalization. U.S. Office of Technology Assessment(1991) indicated that "global sourcing may already be making defense production more efficient, but in the long term, it will also tend to displace U.S. defense subcontractors"(p. 26).

Furthermore, BIS(2009) pointed out that "U.S. prime contractors develop long-term supplier relationships with overseas subcontractors based on short-term offset requirements… [which] limit future business opportunities for U.S. subcontractors and suppliers"(p. 14). In other word, benefit of primes during short-term makes prolonged damage of subcontractors.

Impacts of the military offsets on a seller's defense industry vary in accordance with compensating method, and a trading partner. BIS(2007) noted :

[9] In the military offsets case, consumers of intermediate commodities are prime contractors.

> defense subcontractors and suppliers, and in some cases portions of the prime contractor's business, are displaced by exports that include Subcontract, Co-production, or Licensed Production offsets. (p. 3-1)

Especially, subcontract is the most fatal to domestic subcontractors and lower-tier suppliers, but unfortunately most popular for an importing countries in 1993 ~ 2008. In addition, it is direct offset trade, which is likely to occur in transactions with developed countries.

Transaction	Actual value ($ million)	Credit value ($ million)	# of Transaction
Subcontract	10,857.64(22.18%)	12,004.24(20.85%)	2,249(62.28%)
Total	48,961.05(100%)	58,317.72(100%)	3,611(100%)

Table 5: U.S's Subcontract Transactions,1993-2008(BIS, 2009) with author's own adjustment

4. IMPACTS ON THE DEFENSE PREPAREDNESS

National security is the most important interest for every country and should be addressed prior to economic problems because survival is precondition for all. If the military offset trade affects adversely defense preparedness while enhancing economy including above employment, balance of trade and the defense industry, the transaction should not be approved. Studies on this problem agree on that exports increased by offsets can be salutary for the defense preparedness, but the transaction with a high proportion of offsets is injurious to that.

The military offset trade can strengthen the national defense. Exports help not only economic development but national defense, because defense force of one nation is ultimately proportional to its economic scale. Offsets attract potential consumers, and value of military contract is usually enormous.

In addition, exports caused by offsets help own military hold more arms at less expenditure. BIS(2007) stated that "exports of major defense systems helps defray high overhead costs for the U.S. producer"(p. 3-1). The reduction of production cost is generated

by the economy of scale. Besides importing countries, a government of an exporting country is purchasing the military article, so price reduced of the military article caused by cost reduction cuts down own government's military expenditure.

Increasing defense exports resulting from offsets allow flexibility to prepare for emergency. BIS(2007) stated:

> Exports of major defense systems … help maintain production facilities and workforce expertise for current and future U.S. defense need. The production capabilities and workforce are also available in case they are needed to respond to a national emergency. (p. 3-1)

Because average capacity utilization rate of defense contractors is generally low, surviving in the world arms market is very difficult for a defense contractor. Constant sales through defense exports maintain or raise capacity utilization rate of defense contractors, and prevents quality talents' turnover to other industries. It takes very long time of several decades from R&D to decommissioning of weapon system, so it is very necessary for unpredictable emergency to maintain capacity utilization rate and expertise related to the weapon.

Moreover, defense exports mean increase of arms with interoperability. BIS(2007) cited that "exports… promote interoperability of weapon systems between the United States and allied countries"(p. 3-1). Especially because indirect offset trade provides military-related things except the military article referenced in the main contact, one indirect offsets means more than two common weapons between trade partners. In international scale of war, interoperability between allies help combined operation because they know well the friends. Thus, it is possible to say that the military offset trade ultimately has positive effect on the national defense.

By contrast, the defense offsets can affect adversely the national security because of yielding foreign source dependency. Weida(1986) stated that "offsets … could result in more foreign source dependency at the subcontractor level"(p. 6) which "affects the ability to

sustain weapon production in time of war"(p119). Domestic subcontractors and lower-tier suppliers can be displaced by the offset arrangement, and an exporting country's dependency on foreign source is intensified. Therefore, impact of excessive offsets on defense preparedness is negative, negating effect of increasing exports.

On the one hand, some kinds of compensating method and trade with specific nations are in particular harmful to defense preparedness. Especially, subcontracting has directly adverse effect on defense preparedness by displacing domestic subcontractors and lower-tier supplier. Co-production, licensed production and purchases negatively act to national defense indirectly by affecting adversely a seller's economy. In addition, co-production and subcontracting are the representative direct offsets that developed trade partners hope, while the purchases, which have relatively small effect on national defense, are indirect offsets that LDCs desire.

Consequently, effect of the military offset trade on defense preparedness is different according to compensating method, and the trade partner. Direct offsets are relatively bad for that, and offsets with a developed nation are also worse to that.

5. IMPACTS OF THE TECHNOLOGY TRANSFER

In the past, perspectives on impacts of the technology transfer were significantly negative for an exporting country. Majority considered its negative ripple effects on employment, balance of trade, the defense industry and the defense preparedness in the future rather than immediate impacts on those. Thus, for an exporter, the technology transfer as an offset trade was regarded as a myopic transaction that sacrifices bigger business in the future for current small interest by nurturing enemies. OTA(1991) cited that "over the past two decades, these [technology transfer] arrangements have contributed to the emergence of new centers of advanced defense industry and technology, first in Europe, next in Western Pacific,

and increasingly in developing nations around the globe"(p. 25). Especially, developing countries and LDCs, which received the technology, were expected to grow rapidly, based on cheaper wage rate and raw materials. Mirus and Yeung(1989) stated :

> The transferor does not have any meaningful ownership control of the technology and the manufacturing facilities which the technology helps to construct. Equipped with an advanced technology and inexpensive local inputs, the transferee may become a competitor to be reckoned with.(p. 34)

Development of other nations means that many sellers come in the world arms market, and competition has become fierce which lowers price of arms and each firm's profit. While Co-production, subcontract, licensed production displace subcontractors and lower-tier suppliers of an exporting country, the technology transfer would injury all including even prime contractors. As a result, the technology transfer will erode overall the defense industry and employment of an exporting country.

In addition, from pessimists' standpoint, the technology transfer as indirect offset trade, which provide civilian-oriented or commercial technology, does not impact on a transferor's defense industry and its employment, but negatively affects other industries and their jobs. Lumpe(1994) argued that "by assisting foreign industries with U.S. commercial technology and access to the U.S. market, indirect offsets have the effect of supporting jobs in the arms industry at the cost of commercial employment over the long run". In other word, indirect offsets, especially the technology transfer, which developed a seller's defense industry through growing exports, eroded own commercial industries. The reason was explained by Brauer, who stated that "for offsets to carry a genuine economic impact, world demand for the underlying products must be increased, [but] world demand for commercial product is hurt, not helped, by extra military expenditure"(2004, 60). Thus, the technology transfer also hurt commercial industries and their jobs.

As result of appearance of competitor in the world arms market and even world

commercial market, a seller's trade balance would be affected adversely. In other word, the technology transfer adversely affects both the defense and civil industries. It is a big differential when comparing to coproduction, subcontract, licensed production, and purchase. Coproduction, subcontract, and licensed production nearly impact on just the defense industry. Purchase affects negatively just the civil industry.

In addition, the evidence that the technology transfer is harmful to an exporting country's defense preparedness was suggested. Lumpe(1994) cited that "Israeli arms manufacturers have illegally incorporated U.S. designs and technology into their weapons and exported them to countries the U.S. would not sell to for human rights or foreign policy reasons". It means that military technology illegally transferred can be used in manufacturing weapons of enemies that can threaten the original owner.

However, according to opponent studies, some of them are exaggerated too much and suspect. Rather, selling or transferring a certain technology is likely to be more profitable for an exporting firm or country. In this case, what matter is when and which technology is transferred or sold. Weida(1986) stated:

> [technology is] a perishable commodity... If [a firm] holds the technology too long, it will be worthless. If it sells or trades the technology too soon, it will ruin its competitive advantage. And, when it exchanges the technology at the correct time, it may lose a little, but it will gain greater benefits than it has loses. (p. 143)

In addition, regarding a kind of the technology, Storer(1987, 12) stated that firms "tend to give away only those technologies which they can afford to give away, not 'patented' high technology". Schaffer(1989) also insisted that firms tend to transfer only technology expected to go out of fashion in the near future. In addition to that, Brauer(2004) noted :

> technology transfer provide an opportunity to dispose of technology that is on the verge of being outdated. Offset receiving countries recognize this and can partially protect themselves if they negotiate buy-back deals(which obligates the technology exporting country to buy-back product made with the transferred technology). Still,

> an outdated technology combined with low-cost labor might make a buy-back deal attractive to the offering firm. (p. 60)

In other word, transferor can get another benefit through buy-back. In sum, firms sell or transfer the technology even in the arms market, and what matter is the timing and the kind.

Furthermore, while majority believe that a compensation practice is free, some studies have showed the opposite. Han and Lee(1998) argued that the price determined by an offset agreement goes up by less than 10% than original price. Markusen also stated that the administrative cost of offsets "is currently running between 7 and 10 percent of the value of the arms sale"(2004, 71), and Brauer and Dunne believe that "this cost must be recovered in some form"(2005, 21). The cost can increase more than other offsets, because of difficulty of the technology transfer such as searching for stable technologies, training foreign firms' engineers and etc. Therefore, value of technology transferred as a compensation practice is actually not free, though it may be cheaper than the technology directly purchased.

Above all, the most doubtful issue is that the technology transferred, especially to LDCs, will make potential a competitor, effectively contributing to development of a transferee's defense industry. Brauer argued that "the exporting country will further develop its technological prowess, once more leaving the receiving country behind" and creating effective competition(2004, 60). For example, despite the U.S. "encourages the transfer of production technology to NATO and major Non-NATO allies"(Lumpe, 1994), "the U.S. technology lead is widening, not narrowing"(Brauer, 2004, 60). Moreover, LDCs' domestic industrial condition is not suitable to develop the defense industry. According to Heckscher-Olihn Theorem[10], Developing countries and LDCs do not have comparative advantage in the defense industry, which has become capital-intensive as weapons have been modernized or mechanized. Brauer(2004) explained their limited potential as follow:

[10] It say that the labor abundant country has comparative advantage in the labor intensive good, and the capital abundant country has comparative advantage in capital intensive good.

> It is not actual arms production that creates the potential, but the potential that permits actual arms production. A country's arms production potential depends on the state of its human and physical capital. … developing nations do not posses the requisite capital, neither to engage in arms production nor arms coproduction, and that technology transfer and training do not transfer this capital in a self-sustaining manner. These capabilities apparently cannot be imported; they need to be grown indigenously. (p. 60)

It says that it is possible for transferee to be a competitor against a seller only after accumulating sufficient capital. The fact that LDCs are unfamiliar with the technology transferred makes assimilation of the technology more difficult. It is like teaching an infant a differential equation prior to spelling. Thus, an exporting country does not need to worry too seriously about nurturing future enemy in the world arms market by transferring the military technology.

Another suspicious issue is regarding quality of the technology transferred as a compensation practice. BIS(2007) stated :

> The cutting edge or nascent technologies under development in U.S. R&D activities may be less likely to be transferred to foreign companies in fulfillment of offset obligations than older technologies. Regardless, any transfer of export-controlled technology must be approved through the U.S. Government's normal export licensing process. The existence of an offset obligation provides no circumvention of the established licensing process for the U.S. Departments of Commerce and State to rule on applications for the transfer of sensitive technology. (p. 3-5)

It means that a transferee should indigenously develop the technology transferred, because stated-of-the-art technology would not be transferred. The old technology transferred can be only stepping stone to develop more advanced that. Otherwise, an importing country must constantly import technologies, and even if it succeeds in developing the technology, technological dependency is still not removed completely. Chinworth found that Taiwanese "efforts to develop indigenous systems in the 1990s resulted in items that remained heavily dependent on imported technology; not all domestic development program were

successful"(2004, 246) Furthermore, an importing country should apply the technology obtained, which may be specific to only a certain arms, to another production. Utilization in large range is just economy of scale that lowers marginal cost, and a transferee should develop the technology for this larger utilization. Thus, without technological base, utilization of the technology transferred is restricted.

As counterarguments, some examples that transferees succeeded in advancing their own defense industries are suggested. However, their developments were caused by only the technology transfer. Brizinger stated "Singapore's defense industry appears to be thriving, largely because of its core competencies/niche production business strategy"(Brauer & Dunne, 2004, 16). According to Brauer and Dunne, Brazil's success in the technology transfer was "achieved through massive government investment and subsidy and Brazil is still nowhere near having fully autonomous arms production in any sector"(2004, 15). South Africa' defense industrial capacity could be exploited due to equity investment linked to arms purchases from European governments, joint ventures with European firms, and due to becoming a part of the European's global supply chains, rather than the technology transfer(Brauer & Lamb, 2004). In order to develop the defense industry, an importing country needs not only advanced technology, but comprehensive complex comprising an effective macroeconomic policy, governmental subsidy, massive investment, and etc. Therefore, it is hard to, in whole, deny contribution of the technology to competitors' development, but the technology transfer is not main reason of that.

As above noted, the technology transfer cannot be the main reason of competitors' arise in the world arms market. In other word, offering technology is not much harmful to an exporting country's defense industry, when compared to compensating methods such as co-production, subcontract, and licensed production.

Moreover, non-military technology transfer as an indirect offset trade does not

contribute to arise in non-defense industries. Brauer and Dunne cited that "the experience with civilian-oriented technology transfers appears to be worse than the examples with military-offset technology transfers"(2004, 15). Thus, it is hard to say that non-military technology transfer as an indirect offset trade makes competitors in the world non-military markets, and reduces overall domestic employment and trade balance.

Rather, it is a great measure to reduce actual value of a compensating practice. As earlier noted, one of mitigating the trade balance reduced by offsetting measure is a multiplier. GAO(1998) noted :

> From the contractors' perspective, the technology transfers are often a relatively inexpensive way to earn offset credit because, in some cases, the contractors already possess the technology the foreign government desires. In most cases, the value of technology transfer is negotiated between the U.S. contractor and the foreign government. The negotiated value of the technology is often based on the contractor's prior investment in research and development, the market value of the technology, … Multiples of the negotiated value are also used, depending on the value the foreign government places on certain types of technology. (p. 6)

In other word, because the original market value and excess value caused by desire of an importing country are combined, the credit value of the technology is bigger than actual value. As a result, an exporter can compensate less than actual value, through the technology transfer, and it contributes to balanced trade of an exporting nation.

Consequently, dislike vague expectation of pessimists, the technology transfer is not harmful to an exporting country compared with co-production, subcontractor, licensed production, and counterpurchase. Rather it can be a useful tool in mitigating adverse impacts caused by an offset arrangement. Thus, South Korea, as an emerging seller in the world arms market, should break passive attitude to offsets.

Ⅳ. FACTORS AFFECTING SUCCESS OF OFFSET AGREEMENT

As noted in the chapter Ⅲ, overall impacts of offsets including the technology transfer are not always bad for an exporter, and rather those can be beneficial by raising exports. For this reason, South Korea needs to actively make an offset agreement. Then, which factors affects success of making an offset agreement?

Before searching the factors affecting success of offset agreement, correctly defining the 'success of an offset agreement' from a seller's perspective is required. The term "offsets" is generally used, but precisely speaking, an offset trade and an offset agreement are not same. While South Korea uses the term an "offset trade" without any distinction, the U.S. divides offsets into an offset agreement and an offset transaction. BIS stated that offset agreements are to "enter into between the U.S. firms and [foreign trade partners] in connection with contracts for the sale of U.S.-origin defense items", and offset transactions are "to satisfy these offset agreements"(2009, i-ii). Thus, South Korea's an "offset trade" is similar to an offset transaction, rather than an offset agreement.

Without the distinction, there are only a few efforts to define the success of offsets. Ianakiev and Mladenov(2009) stated :

> The success of offset policies as an instrument for overcoming barriers to the establishment of transborder industrial relations resides in the incentives that they provide for searching for local partners in the importer's economy. These incentives result from the conditioning of the core contract to the acceptance of the offset obligation; refusing to establish relations with local suppliers implies losing the profits obtained through the main contract. (p. 9)

Their statement is limited to mainly subcontract production among several compensating methods. On the other hand, Kremer and Sain(1992) defined successful offsets as "the [development or] implementation (phase 1) and execution (phase 2) of an offset agreement in

such a manner that all parties to the agreement are satisfied with the results"(p. 32). They pointed out 'final signed agreement' in phase 1 and 'fulfilling the terms of the agreement' in phase 2 as indications of each party's satisfaction(1992). In other word, because trade partners do not know result of an offset trade in advance, they make an agreement at a point where they feel satisfaction simultaneously and implement the agreement, expecting each own successful offset trade. Though Kremer and Sain defined "offsets", its meaning has "success of an offset agreement" under these distinct definitions. Thus, this paper will follow the definition by Kremer and Sain in defining success of an offset agreement.

Along with the definition, Kremer and Sain(1992) drew 20 factors that affect success of an offset agreement by reviewing studies on offsets, countertrade, international joint venture and international cooperative projects, and then classified those into 4 groups related to buyer, seller, contract and product.

1. FACTORS RELATED TO BUYERS

As factors related to buyers, Kremer and Sain(1992) indicated 5 factors such as international experience, not being viewed as a competitor, technical experience, sufficient financial resources, and stable environment.

An importing country's experience decides its attitude in making agreements and executing mandates. Lecraw stated that "countertrade is more successful, the greater the importer's countertrade experience"(1989, 51). Kremer and Sain cited that international offset experience is "concerned … more specifically with the amount of experience with offset deal"(1992, 84-85). Regarding this, Mirus and Yeung(1989) gave an example that a Chinese firm, which wanted to import technology to produce ethylene diamine and had not experienced any international negotiation, were interested in protecting itself from the risk. Like the case, less international experience of an importer can be connected to its passivity.

Whether an importer is viewed as a competitor or not is as critical as its experience. Mirus and Yeung(1989) cited that “a final worry of the [technology] transferor is that the transferee will become a competitor in the future”(p. 34). For this reason, Jacques Rostain, vice president of Combustion Engineering Trading Inc., said that “it is critical for successful countertrading to handle products that are ‘noncompetitive and complementary’ to [a seller’s] own products”(Kremer & Sain, 1992, 33). Thus, an exporting country or firm will not make an offset agreement with a country that is considered as a potential competitor in the world arms market.

An importer’s technical experience is one success criteria of offsets, too. “The availability of local country expertise” acts as the key elements of any offset(Weida, 1986, 81), and Kremer and Sain specified the variable as “the degree which the foreign company has experience with the relevant technology”(1992, 85). Mirus and yeung argued that “absenteeism, low productivity, and unsatisfactory workmanship of the local labor force” are the problems for a technology transferring firm(1989, 34).

The sufficient financial resources of an importing country are also important condition of successful offset agreement. However, Kremer and Sain(1992) said that it is hard to decide how to estimate the criteria. Instead, they utilized a change in GNP growth rate during recent 5 years of an importing country as indirect index. Because client is a country in the world arms market, its growth rate could indirectly show its availability of financial resources, premising that at least growing nations seldom go to bankruptcy.

A stable environment in an importing country and its relation with an exporting country are also important for a successful offset agreement. Kremer and Sain(1992) specified a buyer’s stability into four variables, which contains the internal economic-, political- and social stability, and the treat from external entity. Especially, economic instability can be connected to public opinion which opposes procurement of the arms.

2. FACTORS RELATED TO SELLERS

As factors related to sellers, study by Kremer and Sain(1992) explained 7 factors such as compatible goals, proactive strategy, in-house offset group, top management support, commitment to project, international experience, and large company.

Compatible goals are regarded as a prerequisite for success of offsets. Verzariu said that successful offsets is determined by "the matching of … commercial objectives"(Kremer & Sain, 1992, 36). According to specific explanation by Kremer and Sain, each trade partner should "accomplish its goals without hindering the ability of the other party to meet its own goals"(1992, p 88). In other word, each goal doesn't need to be same, but should be compatible.

A proactive strategy was suggested for a seller's voluntary attitude in making an offset agreement. Kremer and Sain(1992) explained the variable more in detail as "attempts by the seller to anticipate and plan for offsets, and actively seek out projects which could be used to fulfill current or future offset obligation"(p. 89). Weida(1986) emphasized "operating in a pro-active mode in the future", stating that "to maximize the benefits [both to a buyer] and to the company selling the weapons[,] … this could only be done through a great deal of advance planning"(p. 159). Regarding the role of a proactive strategy, Neale, Sercu, and Shipley(1992) noted that "a proactive strategy embodies determined scanning for profitable countertrade opportunities.. [and], increases countertrade effectiveness and profitability"(p. 308). Thus, Kremer and Sain (1992) argued that despite of mandatory offsets, a proactive strategy allows flexibility and control in the negotiation, and finally contribute to success of an offset agreement.

For a proactive strategy, an in-house offset group is required. Neale, Sercu, and Shipley(1992) stated:

> … effective organization is critical to countertrade success. Three key organizational principles apply. First, … Second, since all countertrade deals

> involve some unique characteristics, flexibility is required so that relevant expertise can be incorporated to meet specific needs. Third, since countertrade involves many complex dimensions, the organization needs to include personnel drawn from several functions,[such as] finance, legal, technical, production, quality control, distribution and sales as well as marketing. (p. 308)

In other word, an effective organization with diverse expertise is critical for success of offsets. In addition, in-house group will be better, because recruiting "relevant service suppliers externally… may dilute confidentiality" (Neale, Sercu, & Shipley, 1992, 308). Especially, since weapon trading is concerned with national security, the group should be in-house rather than outside.

For a proactive strategy, the top management support is also needed. Neale, Sercu, and Shipley(1992) asserted that "top management support is required to inspire an appropriate countertrade culture within the company"(p. 307). They viewed the variable as first one of three elements for effective organization, citing "there is a need for a clearly-defined chief co-ordinator of countertrade activity to provide accountability, authority and leadership"(1992, 308).

Commitment to the project is also related to proactive strategy. Neale, Sercu, and Shipley(1992) argued that "top management responsibilities should demonstrate enthusiasm for countertrade"(p. 307). As a role of the variable, Kremer and Sain(1992) stated that this is related to "activities which show that the seller is actively interested in the successful completion of the project"(p. 90). It makes a buyer have credibility on a seller's willingness to make or execute the agreement.

Even a seller' experience is an important variable for success of offset agreements. Lecraw said that "countertrade is more successful, the greater the producer's export and countertrade experience"(1989, 51). It is because "frequent countertrade involvement generates scale and experience economy, ... [and] also creates a reputation for willingness to participate that attracts repeat business from proactive customers and builds a network of

contracts for profitable product disposal"(Neale, Sercu, & Shipley,1992, 308).

The next variable related to a seller is its size. Lecraw(1989) stated that "for large firms selling high-value, complex products, countertrade success was higher than for small firms selling low value, standardized products"(p. 55). The advantage of larger seller is caused by its "sourcing(purchasing) capability", "more capital for investment schemes and a richer variety of technologies to choose from in transferring technology under an offset requirement"(Shaffer, 1989, 8-9). Thus, a larger firm can succeed in an offset agreement than smaller one.

3. FACTORS RELATED TO THE CONTRACT

As factors related to the contract, Kremer and Sain(1992) indicated 5 factors which include transferability of obligations, dual contracts, the size of the sales, a long payback period, and low penalties.

Transferability of obligations should be stipulated in the contract document. Weida asserted that "any properly negotiated offset contract will contain… assignability of contract"(1986, 78-80). There are some entities related to the military offset agreement, which could influence on execution of the obligation. For example, the prime contractor could not execute the mandates due to non-fulfillment of any subcontractor who may be a local or foreigner. Thus, the variable is stipulated as a contingency plan.

Kremer and Sain(1992) emphasized "the importance of using separate contracts for the sale of the goods and the offset or countertrade obligation" which allows better "flexibility in financing and payments"(p. 42). Their study founded dual contracts are needed for "the different time frames for the obligations"(1992, 41). For this reason, "*Offset Program Guidelines"* published Korean DAPA(2008b) stipulates uses of "main contract", "Offset Memorandum of Understanding(MOU)", and "Offset Memorandum of Agreement(MOA)"

respectively.

The size of sale is another contract-related variable. Lecraw(1989) asserted that “countertrade is more successful, the larger the size of each sale”(p. 51). According to Kremer and Sain(1992), the larger sales are more attractive to the trade partners than smaller ones, both “because of the amount of time and effort involved in negotiating, implementing and administrating an offset proposal,”(p. 91-92), and because of that “there is as much time and energy spent on negotiating small contracts as there is on large contract”(p. 43). For this reason, countries are regulating the minimum contract value in trading arms where they begin to require the offset agreement(Brauer & Dunne, 2004). In other word, an offset trade is unlikely to occur in the sales of less than minimum value.

A long payback period is also contract-related variable. Kremer and Sain(1992) cited “a longer timeframe to allow more flexibility [for a seller]”(p. 43). It is closely related to the inflation rate or the time-discount rate. Although nominal value of compensation is fixed, actual value of that would constantly decline as payback time becomes long.

Low penalty is the last contract-related variable. Almost the military offset arrangements include a provision that regulates a penalty of a exporter who does not fulfill obligation, and sometimes it can be excluded from future potential trade(Brauer & Dunne, 2004). If the penalty rate is high, a seller will take a risk not to be penalized even in contingency. Therefore, low penalty allows a seller’s flexibility in reacting to unexpected incidents.

4. FACTORS RELATED TO THE PRODUCT

As factors related to the product, Kremer and Sain(1992) founded 3 factors, mature technology, complexity or uniqueness of product, and a high visibility of product.

Mature technology is product-related variable. Kremer and Sain(1992) considered

aspects of both “the product being sold” and “the technology being transferred in the offset agreement”(p. 93). In case of technology transfer, the technology transferred should be properly well-developed in order to attract consumers, but should not be state-of-the-art.

Complexity or uniqueness of product is also product-related factor. Lecraw asserted that “countertrade is more successful, the more complex the export product”(1989, 51). The army should always consider “METT-TC[11]”, which is unique according to a country’s environment. The METT-TC determines Required Operational Capability(ROC), which product should meet of an importing country. Therefore, a consumer would select the weapons with uniqueness suitable for its ROC.

A high visibility of product is also cited as a product-related factor. Lecraw(1989) asserted that “countertrade is more successful, the higher the ‘visibility’ of the export product in the importing country”(p. 51). Kremer and Sain(1992) stated that a high visibility would imply conceived requirement for the product exists in an importing country, therefore, the seller is at the advantage than the consumer in negotiation. This variable would be considered in terms of both “the visibility of the end product” within an importing country and “the visibility of the selection process”(Kremer & Sain, 1992, 94-95).

In sum, these 20 factors affecting success of an offset agreement are exhibited in the table 6. The exhibition order is not what reveals the importance level of each factor in making an offset agreement. The success does not require all the factors, and there are relatively more critical variables. Those can be known by analyzing actual case later.

[11] Mission, Enemy, Terrain and weather, Troops available, Time available, Civilian

Category	Factors Affecting Success of Offset Agreement
Factors related to Buyer	International experience(countertrade or especially offsets) Not being viewed as a competitor Technical experience Sufficient financial resources Stable environment(economic, political, social, security-related) and relationship with a exporting country
Factors related to Seller	Compatible goals(not same) Proactive strategy In-house offset group Top management support Commitment to project International experience Size of seller
Factors related to Contract	Transferability of obligations Dual contracts(main contract and MOU or MOA) The size of the sales Long payback period Low penalties
Factors related to Product	Mature technology Complexity or uniqueness of product High visibility of product

Table 6: Factors Affecting Success of Offset Agreement (Kremer&Sain, 1992) with author's own adjustment

Ⅴ. CASE ANAYSIS OF THE K-9 SELF-PROPELLED ARTILLERY EXPORT TO TURKEY

In the previous chapters, research on success factors and impacts of offsets, especially the technology transfer were conducted. From now on, this paper examines what were found in the previous chapters through a case study. Case of the K-9 export to Turkey is the most suitable for this study which is searching the effects and influence factors of offsets, since those of the exports can be known more easily than other Korean cases. The K-9 Thunder, Korean new self-propelled artillery Project was aiming at its exportation even at the initial planning period. The K-9 export to Turkey was the biggest sales Korea has ever undertaken, and enough time to observe valid impacts has passed.

This chapter will review the Turkey, South Korean and the K-9 Thunder. After that, it will analyze the impacts on employment, trade balance, the defense industry and the defense preparedness, and finally pick out the success factors regarding a buyer, a seller, the contract and the product.

1. THE REPUBLIC OF TURKEY

This study will give an outline of Turkey in order to help understanding a consumer of the K-9 self-propelled artillery. The outline will focus on events, situation and etc. specifically in 1999 ~ 2001 when Korea bid on Turkish new self-propelled artillery business and succeed in making an offset agreement with Turkey.

1.1. INTERNAL AND EXTERNAL ENVIRONMENT

Turkey, which officially called the Republic of Turkey, lies from Anatolian peninsula in the Middle East Asia to Trace in Balkan of Southeastern Europe, thus it has played a role of

intersection where Asia and Europe or Islam, Catholicism and Christian contact. Anatolian peninsula accounts for 97%, Trace region accounts for the rest, 3%. Turkey shares border with eight countries including Bulgaria, Greece, Georgia, Armenia, Azerbaijan, Iran, Iraq and Syria from Northwest to South. Its capital is Ankara(Ministry of Foreign Affair and Trade, 2005).

Figure 6: The Map of the Republic of Turkey(Embassy of the Republic of Korea in the Republic of Turkey, 2010)

Population of Turkey is about 70 millions, of which ethnic Turks account for 90%, and the rest is comprised of about 10 millions of Kurds, 360 thousands of Arabs, and Armenians, Greeks, and Jewish people. Almost people is Muslim and its official language is Turkish which belongs to Ural-Altaic to which Korean also does(Ministry of Foreign Affair and Trade, 2005).

As a result of defeat at the World War I, Turkey lost almost territory except Anatolian plateau and parts of Constantinople. Mustafa Kemal Pasha, who has been called as the Atatürk which means father of Turkey, led the Turkish national movement. Under Kemal

Pasha' leadership, Turkey expelled Greek army in Trace peninsula in 1922, and finally succeeded in recovering almost Anatolian peninsula. Kemal Pasha became the first president of the Republic of Turkey, and he reformed the republic, implementing the western style of modernization policies(MOFAT, 2005).

Turkey participated was on the side of the U.S.A against the U.S.S.R. in the Cold War. It took a part of the Korean War in 1950, and joined in the NATO in 1952. In late 1950s, the deficits of budget and trade became worse, and political suppression and religious tendency got intensified. Finally, a military coup occurred in 1960, and the military regime peacefully transferred the power to the parliament formed in 1961(MOFAT, 2005).

Currently, Turkish government can be regarded as basically the parliamentary system, which contains some characteristics of the presidential system. The Parliament selects the president, and the President appoints the Prime Minister, who charges for the practical Executive power. Except the third president Celal Bayar in 1950 ~ 1960, all president from the first to the sixth in 1923 ~ 1980 had been ex-servicemen, but since 1980 civilians has became the president and in 2000 Ahmet Necdet Sezer, Chief Justice of the Constitutional Court, became the 10^{th} president. He pursued revision of human right and democratization as the "Secularism" policy in order to join Turkey to the EU. Selecting the leader of majority party as the Prime Minister is the Turkish political tradition. However, since 1990 Turkish political situation has been unstable, and majority party has changed seven times. In 1999 ~ 2002, Democratic Left party, which has the middle left tendency and was led by Bülent Ecevit, formed the coalition government with the National Action Party and the Motherland Party(MOFAT, 2005). Conflict between the President Sezer and the Prime Minister Ecevit made the its political situation more unstable(Korea Eximbank, 2005).

Furthermore, Turkish economic situation was much more unsecure. Before 1970s, Turkish economy had been the agriculture-based self-sufficient system, and its government

had frequently intervened in the economy. Since 1980s, the government turned its economic policy to market-friendly one, but in 1994 faced financial crisis because of budget deficit caused by political interests and surge of national debt. In 1994 its economic growth rate was -6.0 %, and since 1990s inflation rate has been more than 50%. Budget deficit and national debt has been constantly accumulated. As a result of that, Turkey got bailout from the IMF under conditions of social welfare reform, revision of governmental budget, reform of financial market, improvement of transparency in public area and etc. Nevertheless, the promise of some reforms was not implemented well, and budget deficit and insolvency of financial institutions were intensified. Finally, in February 2001, Turkey confronted historically the most serious financial crisis, and in February 2002, IMF gave $16 billion of bailout under condition of more severe reforms. Anyway, 2001 was economically the worst year for Turkey, reporting -9.4% of GNP growth rate, 68.5% of consumer price increase rate, and 88.6% of wholesale price increase rate(MOFAT, 2005).

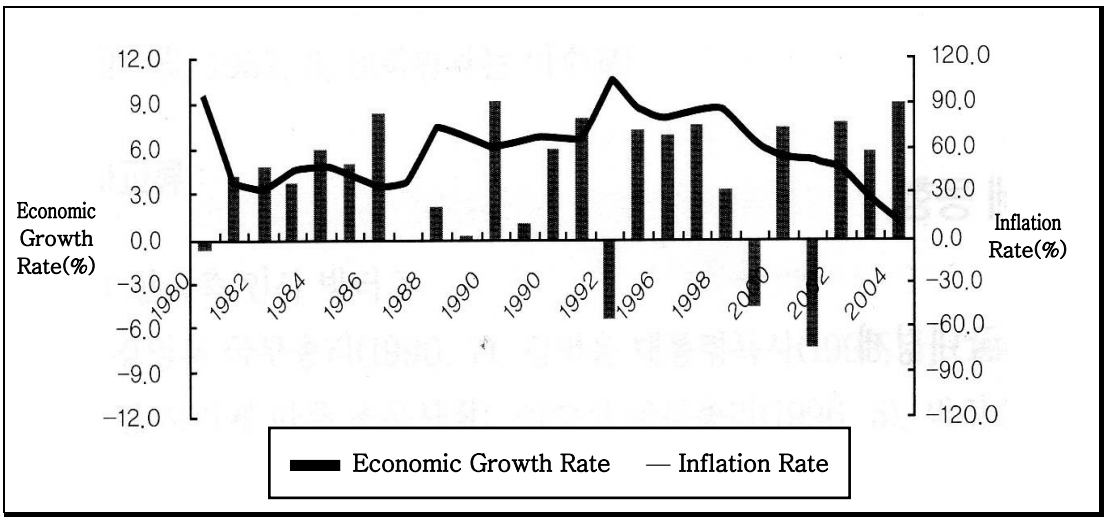

Figure 7: Trends of Turkey's Economic Growth and Inflation(Korea Eximbank, 2005)

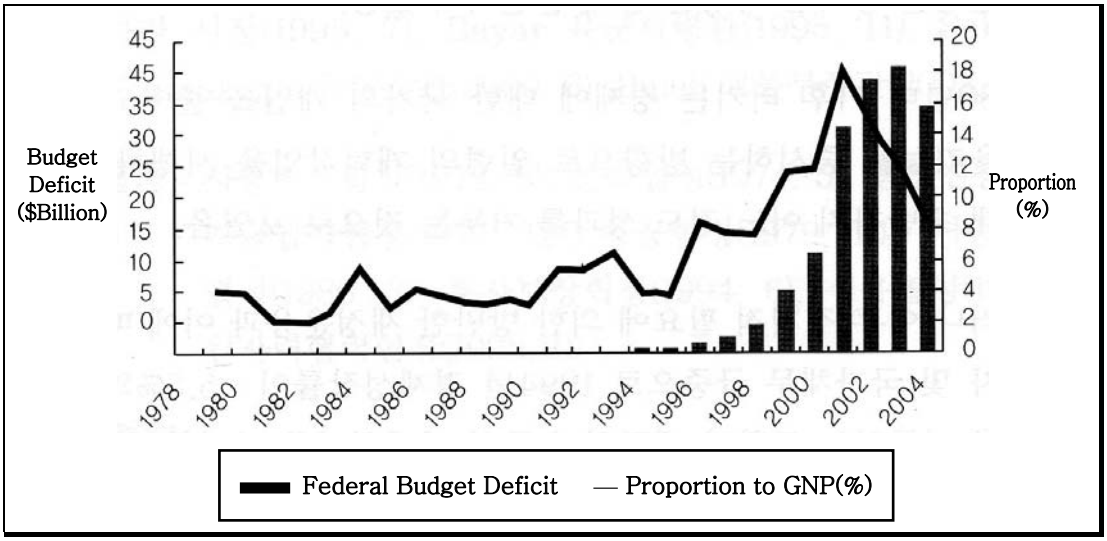

Figure 8: Trend of Turkey's Federal Budget Deficit(Korea Eximbank, 2005)

Political and economic unrest made even social atmosphere uneasy. Workers of agriculture, who account for 12% of GDP and 35% of employment, were unsatisfied with the reform ideology that the government had pursued(MOFAT, 2005).

The country that has made conflicts with Turkey is mainly Greece. Malice between two has been caused by problems regarding arming of Greek islands, the continental shelf, Flight Information Regions, the territorial waters, sovereignty over Kardak island, and etc. Especially, the secession problem of the North Cyprus derived from rooted conflict between Turkey and Greece. In Cyprus Turkish people account for 23%, and Greek people do 77%, and conflicts and crashes between two races have continued. In 1974 Turkey dispatched 40 thousands of troops to Cyprus and conquered its northern area. North Cyprus declared the independence of the Turkish Republic of Northern Cyprus(TRNC) with Turkey's assistance. Despite many efforts to make an agreement regarding federation or reunification, parties have not succeeded in doing that(MOFAT, 2005).

On the one hand, relationship between South Korea and Turkey is very good. Turkish some traditions are similar to Korean's ones. Turkish government and majority of people

regard South Korea as the “blood alliance”. In the Korean War, Turkey sent a 14,936 strong of troops, and reported 721 killed, 2,147 injured, 175 missed, and etc.(MOFAT, 2005).

Especially, Turkey has been interested in Korean economic development, so-called the “Miracle of Han River”, and wants to learn the know-how. After visiting Korea of the president Evren in 1982, exchange and visiting between two countries have been done several times. However, trades between two are not balanced. While South Korea exported $1.2 billion in 2000 and $0.7 billion in 2001 to Turkey, Turkey did $50 million in 2000 and $130 million in 2001 to South Korea. Exports of Korea to Turkey has been manufacturing goods, but exports of Turkey to South Korea have consisted of agricultural goods and raw materials. Furthermore, South Korea has made almost no investment in Turkey(MOFAT, 2005).

1.2 MILTARY AND OFFSETS POLICY

Because of frequent troubles with Greece and its geopolitical position, Turkey has attempted to expedite increase of armament. While gradually reducing its scale from 580 thousand to 425 thousand, Turkey is promoting own troops’ mechanization and modernization(MOFAT, 2005).

Turkish parliament ratified Defense Industry Law(Law no. 3238) in 1985 in order to develop a national defense industry and implement offsets regarding the defense acquisition(Cakir, Tezcan & Zorluoglu, 2008, 51). Especially, the law stipulated that “domestic suppliers should be facilitated to maximum extent practicable for foreign arms procurements, pointing to offsets” (Cakir, Tezcan & Zorluoglu, 2008). Pursuant to the law, the five main offsets organizations are established; “the Defense Industry Executive Committee, Undersecretariat for Defense Industries[(SSM– the Turkish acronym)], the Defense Industry Support Fund, Defense Industry High Coordination Council, and Defense Industry Control Committee”(Cakir, Tezcan & Zorluoglu, 2008). $10 billion of fund to

modernize the army was also financed(MOFAT, 2005).

The Defense Industry Executive Committee, which is composed of the Prime Minister as a head, the Chief of General Staff[12], and the Minister of Defense, makes main decisions related to defense industrial issues and major weapon acquisition project(Cakir et al., 2008, 51). The mission of the SSM that implement "decision of the Defense Industry Executive Committee" is "to meet the requirement of the Turkish Armed Forces and the government organizations that promote national defense, and to establish and implement strategy and procedures for development of the defense industry"(Cakir et al., 2008, 51-52).

Gencturk[13] argued that purpose of Turkey's offsets policy has changed gradually, which could be distinguished into 3 categories; "1st period, 1984 to 2000" when "offsets were implemented as a tool of financing", "2nd period, 2000 to 2007" when "offsets were implemented to develop the national defense industry base", and "3rd period, from 2007" when "offsets were implemented to increase the competitive power of Turkish defense industry and to reach the strategic goals of SSM"(Cakir et al., 2008, 53).

During 1st period from 1984 to 2000, the main purpose of offsets was to secure foreign financing for the acquisition business. "*Offset Handbook*" published by the SSM in 1991 stated:

> … to provide foreign currency through exporting defense products and the other related industrial products, and foreign capital investments, consequently; to recover foreign currency flowing out because of the procurement to maximum extent possible. (Cakir et al., 2008, 53)

In other word, fostering its own defense industry was not yet a main purpose. Indirect offsets were prevailing than direct offsets because for Turkey, a nation having a non-developed defense industry, it is not realistic to require direct offsets such as high technology(Cakir et al.,

[12] The actual commander of the Turkish Armed Forces. He is superior to even the Minister of Defense, and command line of Turkish army is orderly the president, the prime minister, the Chief of General Staff(MOFAT, 2005).

[13] "Hasan Gencturk is the author of 'Offsets in Defense Industries' thesis of expertise for SSM in 1989, which is the first study in this area in Turkey"(Cakir et al., 2008, 51).

2008). For this reason, *Offset Handbook* of 1991 implied that "even if technology transfers and foreign investments [are] directed towards development of the national defense industry, they are treated as indirect offsets". Actually, these transactions were regarded as lower priority(Cakir et al., 2008, 58).

During 2nd period from 2000 to 2007, the main purpose of offsets policy was to foster its own defense industry. "*Industrial Participation & Offset Directive*" of 2003 published by SSM stated that the purpose was "… to increase the capacity and capabilities as well as to increase the market share and the competitive power of the national defense industry in the international market"(Cakir et al., 2008, 55). SSM reduced the burden of a buyer by easing requirement if the buyer met more than 51% of local content. Multipliers were given to technology transfer, and nevertheless the technology transfer was still difficult for Turkey. For this reason, "technology transfer, license, R&D, and joint ventures were still regarded as indirect offsets"(Cakir et al., 2008, 58). The recognition was reflected on "*Offset Directive*" published by SSM in 2000 as follows:

> If a foreign company transfers technology or contracts for R&D activities with a Turkish company, that company is obliged to pay back 50% of the offset transaction (before multipliers are applied) without interest to Defense Industry Support Fund in USD or Euros in a 5 year period. Even though this regulation was intended to provide a method for Turkish companies to assess the value and quality of technology transfer, this regulation discouraged technology transfers in practice. (Cakir et al., 2008, 59)

In other world, the technology transfer was not regarded as prior one. Thus, technology transfers were classified into Category Four, while exporting goods and services produced by Turkish defense industry belonged to Category One[14](Cakir et al., 2008).

Turkey has many offset experience as an importing country. Until December 2008,

[14] "*Industrial Participation & Offset Directive*" of 2003 set 4 categories according to each priority(Cakir et al., 2008).

Turkey completed 22 transactions, and 55 transactions were in progress(Cakir et al., 2008). Among them, F-16 procurement was the most representative one. Turkey agreed with General Dynamics on purchasing 160 F-16 aircrafts and coproducing 152 out of all 160 in Turkey. In addition, indirect offsets compensated by GD were approximately $800 million investing in the local thermal power plant and hotel industry. Total worth of the offsets was $1 billion, 25% of the main contract(Schaffer, 1989). Lately, Turkey has conducted other forms of offsets such as a joint venture. A consortium including Turkey requested A400M Transport Aircraft Project in 1997, and made a single contract in 2003 which would provide 7 European nations of the consortium with 180 aircrafts. Turkey planed to procure 10 aircrafts, which account for 5.56% out of 180. Without traditional offsets, Turkish defense firm was responsible for 5.56% work-share under control of SSM which is mainly about sub-assembly, participating even in design and development. As a result of that, Turkey expects various benefit from the project including "positive ROI(Return on Investment), job creation, capability development, sustainment of indigenous defense capabilities, technological spin-offs", and integration of Trkish defense industry into the world arms market(Cakir et al., 2008, 102). In Joint Strike Fighter Project emerged in 1995, Turkey planed to acquire 100 F-35A aircrafts. In the project, Turkish offset method, participation way, and result expected were similar to those of the A400M Transport Aircraft Project(Cakir et al., 2008).

On the one hand, there has been few arms trade between South Korea and Turkey. Turkey's arms procurements from abroad have conducted with the NATO nations and the U.S.A.(MOFAT, 2005).

2. SOUTH KOREA AND K-9 SELF-PROPELLED ARTILLERY

South Korea's development of a new self-propelled artillery with the striking distance of more than 40 km should be conducted by the R&D method, not introduction of relevant

technology or licensed production. Germany's PzH2000 which can also attack the enemy 40 km far was fielded in 1998, and the U.S.'s Crusader[15] with the striking distance of 50 km was expected to be fielded in 2006(Bae, Kim, Ko & Lee, 2002). These production technologies could not be introduced to South Korea due to their policies protecting state-of-the-art technologies. South Korea needed acquisition of a new artillery with high performance in order to offset quantitative disadvantage of firepower against North Korea. Thus, the Agency for Defense Development, a governmental defense R&D institute decided to develop a new artillery with performance more than that of the PzH2000 and the Crusader.

Ground Firepower	South Korea	North Korea	Ratio
Field Artillery	5,200	8,500	1:1.63
MLRS	200	5,100	1:25.5
Total	5,400	13,600	1:2.52

Table 7: Comparison of Ground Firepower(MOD, 2008) with author's own adjustment

In fact, in 1987 the ADD suggested to the Korean Army Headquarter improvement of performance of the K-55 self-propelled artillery which had been produced by Samsung Techwin under license right of the U.S. in order to utilize the K-55 for the Corps. The Army Headquarter, which did not share the requirement, rejected that, but the ADD did not give up the improvement and decided to develop a self-propelled artillery based on a new concept. In developing new one, the ADD considered a 155mm/52caliber barrel which is suitable for the Trajectory Agreement of September 1987 made by the U.S., England, Germany, and Italy. In other word, the ADD considered its future exportation as well as the world top level of performance. Self-development is the prerequisite of exportation. For this reason, the K-55, which had been produced under license right of the U.S., could not be exported by South

[15] The Crusader Project was canceled in 2002 due to the budget problem. After that, the U.S.'s main-force artillery has been the M109A6 Paladin.

Korea to others. Therefore, the reject of Korean Army Headquarter was connected to the willingness for R&D of a new artillery which will make huge exports(Yoon, 2003).

K-9 self-propelled gun project was implemented as a form of the government-led project[16]. In other word, a government paid the R&D cost, and managed the whole process. When considering development of the defense industry, the contractor-led way was needed, but South Korean government decided the government-led because it set the priority on improvement of localization and technology competitiveness through self-development(Bae el al., 2002). When exporting products, more localization gives more profit to an exporter. Thus, the project method was also suitable for its exportation.

Input	Concept Reseach	Search Development	System Development	Total
Period	1989~1991	1992	1993~1998	1989~1998
Budget(billion)	2.67	7.38	138.88	148.93
Workforce	22.5	78.8	464.2	565.5

Table 8: Inputs in Each Level during the K-9 R&D(ADD, 2008) with author's own adjustment

Although ROC suggested by the Army Headquarter in 1990 greatly exceeded the technological capacity of the domestic defense industry, coordination of ADD, relevant contractors, and some research institutes finally satisfied the ROC, inputting 565 persons[17], 9 years and about 148.93 billion. The K-9 can carry out the 'counterfire operation' and the 'operation in enemy depth' by striking targets within 40 km, and fire within 30 seconds from receiving fire-order by using automatic fire control system(Yoon, 2003). Because moving and

[16] There are 3 way in the defense procurement project, according to how to manage the R&D and business. In the government-led, a government manages both R&D and business. In the defense contractor-led, a contractor can manage both the R&D and business. In addition, in the defense contractor-led, a contractor can manage only the R&D, and in this case, business is managed by a government(Bae el al, 2002).

[17] Because of precise relevant data, the workforce is just the average of the R&D budget in proportion to total budget.

loading an ammunition inside the artillery become automatic, the it can fire rapidly 3 times per 15 seconds or maximumly 18 times per 3 minutes or constantly 2 times per a minute during 1 hour(Samsung Techwin, n.d.). Furthermore, it can carry out 'Time on Target[18]' by itself, which means striking a target at the same time. It fires 1st ammunition at the high altitude, 2nd one at middle altitude, and 3rd one at the low altitude by calculating each altitude rapidly. Accordingly, the striking and TOT capacities of K-9 Thunder are 3 times that of other conventional artilleries. Viability is also superior by using high-strength armor produced domestically, and dominant mobility makes "Shoot & Scoot" possible, which means rapidly hiding itself in shelter after fires(Yoon, 2003). In a word, it was an innovation in the Korean defense industry.

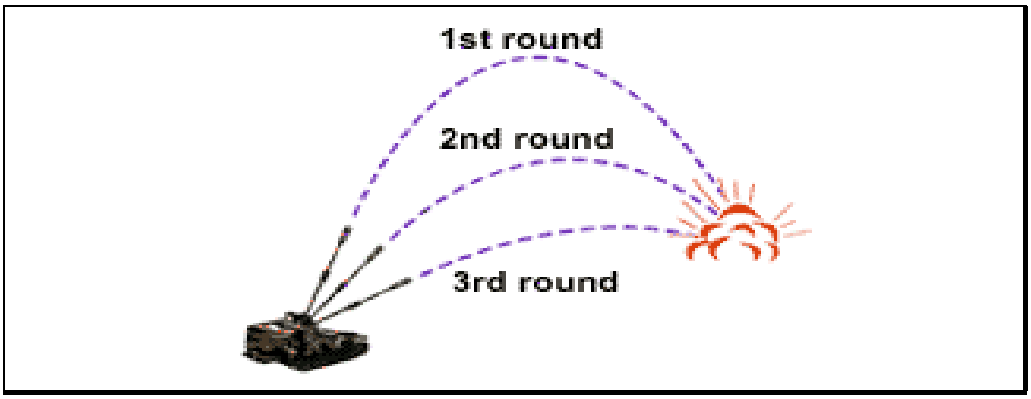

Figure 9: Time on Target(Samsung Techwin, n.d.)

The K-9 Thunder's great performance can be known by comparing with PzH2000, AS90, and Paladin. It has comparative advantage in the performance and price. The K-9 has superiority in almost capabilities including striking distance, rapidity of fire, viability, ammunition carrying capacity and mobility than the U.S.'s Paladin, and does so in striking distance, reactivity and mobility than England's AS90(Yoon, 2003). When comparing with Germany's PzH2000, the K-9 has small disadvantage in ammunition carrying capacity and rapidity of fire, but shows similar capacity in striking distance and reactivity, and advantage in mobility(Yoon, 2003). Above all, the K-9 Thunder is 3.7 billion won(Lee, 2009), which is

[18] Before the K-9, Time on Target commonly was carried out by several guns or batteries.

cheaper by 40% than the PzH2000(Kim, 2002). Thus, it can say that the K-9 have competitiveness in the world arms market.

3. SELECTING PROCESS

Despite of the K-9's outstanding performances, it was not famous in the world arms market, and there were many obstacles in exporting it. Case of the K-9 Thunder export to Turkey is a milestone for the Korean defense industry resulting from coordination of Ministry of Defense, the Army Headquarter, ADD, and Samsung Techwin(Yoon, 2003). Before the case, small guns and K-200 armored vehicle had been exported, but the first massive export of defense product which developed by own technology was the K-9 case(Baek, 2004).

Just after the K-9 mass production contract between the Korean Army and Samsung Techwin, Il-sung Moon, leader of the Acquisition Office within MOD visited in Ankara in March 1999, and suggested the technology transfer and co-production of the K-9 to Turkey. Moon ordered colonel Hyun-soo Ko, a Defense Attach to prepare presentation and promotion of K-9, who had studied Military Science in Turkey and made a lot of Turkish officer friends. Colonel Ko made Korea, which participated in the competition the most lately, hold briefing session of the K-9 prior to other competitors through helps of his Turkish alumni. The colonel Ko's presentation produced a deep impression of high-ranking officers who exceptionally participated in the session(Yoon, 2003).

However, the K-9 was not yet known well, and expectation for the export was still not positive because Turkey was still interested in PzH2000. It is hard for Turkey to choose other one except the PzH2000 because Greek was holding the PzH2000, which was known as the most powerful one. Thus, South Korea's diplomatic efforts to make a contract began. In August 1999 when massive earthquake happened in Izmir, Turkey, General Dong-shin Kim, the Army Chief of Staff visited there as the first case of foreign General's visiting, and handed over donation to General Attila, Turkish Land Forces Commander. It was broadcasted

live nationwide. In the meeting with General Attila, General Kim explained superiority of the K-9 and the possibility of the technology transfer and co-production. South Korean Ministry of Defense and defense contractors also made donation and handed over that to Turkey(Yoon, 2003).

Meanwhile, Germany, which had been succeeded in making the first prototype of Turkish self-propelled gun, could not implement the contract with Turkey any more in August 1999, and Turkey broke the contract with Germany(ADD, 2002). It was assumed that the Germany's political interest impacted that. Some Germany politicians opposed the export of arms to Turkey because of its oppression against ethnic Kurds(Song, 2001). In November 1999, Sung-tae Cho, Minister of Defense visited in Turkey, and promised a governmental guarantee on the K-9 if Turkey bought it. As a result, in September 1, 1999 Turkey expressed an intention to send inspectors in order to assure performance of the K-9 and South Korean defense industry, and the inspectors visited in Korea in September 12, 1999(Yoon, 2003).

Turkish inspectors were impressed with the K-9's performance and relevant facilities. After coming back to Turkey, they canceled plan to visit in Israel regarding their self-propelled artillery project. In February 2000, Turkey requested South Korea to send the Technology Assessment Team, and South Korea dispatched the Task Force led by Dr. Dong-soo Kim, colonel who had led the whole K-9 Project. They assessed level of Turkish defense industry and interests of two countries, and negotiated production of Turkish self-propelled gun. Outline of the negotiation was to co-develop Turkish gun by using main component imported from South Korea with technological assistance from South Korea. In May 2000, General Attila and Yong-ok Park, the vice Minister of Defense made a MOU on Turkish self-propelled artillery in Seoul. Context of the MOU was that South Korea exports main content through Samsung Techwin, the prime contractor, and Turkey guaranteed $1 billion worth of imports which can make 350 guns until 2011. Actually, it was a production by Turkey

through the technology introduction. Above all, it was a conditional agreement under prerequisite of success in developing a prototype of Turkish self-propelled artillery, and if Turkey would export the gun to others, South Korea would receive license fee from Turkey. In September 2000, the Task Force dispatched from South Korea succeeded in making the prototype of Turkish gun, and Turkey named the gun as “Pirtina”, which means storm in Turkish similar to Thunder. Therefore, in July 2001, two countries made the first contract regarding $65 million of trade which can make 24 guns(Yoon, 2002).

In the process, there was many crisises for South Korea. One of the crisises is regarding engine of the K-9 that imported from the MTU firm, Germany. When the MOU is made, Germany informed that it would not allow supply of the MTU engine. Germany’s some politicians opposed supply of the engine because the K-9 would be exported to Turkey which had suppressed the ethnic Kurds(Song, 2001). The Task Force considered to substitute MTU engine by an engine of Perkins firm, the U.K., and all available government organization tried to persuade Germany government(Yoon, 2003). Especially, South Korean government required Germany government to permit supply of the MTU engine as compensation of importing submarines from Germany(Song, 2001). South Korea informed that South Korea would not coordinate on any business with Germany if Germany did not permit that(Yoon, 2003). As a result, in September 2000, Germany approved supply of the MTU engine(Yoon, 2003). Another crisises were some damages and faults of components, but these became opportunities to show off Korean technological superiority by treating them rapidly. Above all, the biggest crisis was the financial crisis in 2001 which Turkey had not experienced before. Turkish public opinion had opposed the project due to lack of foreign currency. Meanwhile, Turkish General Hüseyin Kivrikoğlu, the Chief of General Staff ordered strike demonstration of fire equipments including the K-9, and it would be

broadcasted live nationwide. In the demonstration, the K-9 was the highlight, and precisely hit the target 40 km far. Finally, the opposite voice lost the power(Yoon, 2003).

4. IMPACTS OF THE K-9 OFFSET TRADE WITH TURKEY

Then, how are the actual impacts of the K-9 export and offset transaction? Are those great like what was expected at that time? Evaluating the precise impacts is not almost impossible due to security problem, impossibility of inducing only impacts of the export out of all, and etc. Some studies have been conducted by public institutes, and these dealt with the impacts of whole sales of the K-9, a sum of domestic sales and export. Impacts of the K-9 exports can be extracted from these studies. Because the K-9's domestic sales and exports are similar, simple comparison of whole sales and exports is convincing. For these reasons, this paper will use simple estimate which compares export to all sales. The K-9's export volume is 350 units, 1.3 trillion won[19] until 2011, domestic sales volume is 255 units, 1.547 trillion won until 2007[20](ADD, 2008)(Baek, 2004). Thus, this paper will simply see impacts of the export to Turkey as 45.7% of impacts caused by whole sales, based on the value.

4.1. IMPACTS ON EMPLOYMENT

Impacts of K-9 exports on employment can be assumed indirectly through the total worth of export, the workers requirement coefficient, and the employees[21] requirement coefficient.

Baek's study in 2004 explained this process. The workers requirement coefficient includes all labors needed indirectly in the production spread process as well as labors needed

[19] $ 1 billion worth of K-9 export to Turkey is converted to Korean won by applying the average exchange rate of 2001($1 = 1298 won).
[20] Although the volume of export is larger than domestic sales, the total worth of domestic sales is greater than that of export because export has been restricted to some main components of the K-9.
[21] Employees = Workers – (persons self-employed + unwaged family workers)

directly in producing 1 unit of output in a certain industry. In other word, the coefficient is workers required directly or indirectly in the industry and other industries as demand increase by 1 billion won. The workers requirement coefficient of the Korean defense industry is 18.5, of which the defense itself accounts for 67.5%, and followed by food, accommodation, whole/retail sales, general machine and etc. In addition, the employees requirement coefficient refers to employees caused in a certain industry and other industries by 1 billion won increase of demand in the industry. The employees requirement coefficient of defense expenditure is 16.5, of which defense itself account for 76%. From those, workers and employees generated by 2.874 trillion won of K-9 expenditure, sum of domestic sales and export to Turkey are as follow:

Classification	Workers Requirement Effect	Employees Requirement Effect
Persons generated directly	20,499	18,780
Persons generated indirectly	17,339	11,964
Total	37,838	30,744

Table 9: Workers and Employees Requirement Effect of K-9 Project(Baek, 2004)

We can induce the impacts of the K-9 export to Turkey on employment, by applying 45.7% to all columns of Table 9. The impacts are positively presented, as shown in table 10.

Classification	Workers Requirement Effect	Employees Requirement Effect
Persons generated directly	9,368	8,582
Persons generated indirectly	7,924	5,468
Total	17,292	14,050

Table 10: Workers and Employees Requirement Effect of K-9 Export

Then, how many jobs have been transferred to Turkey by the offset trade? South Korea loses the jobs at final assembly stage, because main context of the contract is transferring

technology, final assembly by Turkish firms, and components supply by South Korea. Unit price of the K-9 final product is about 3.7 billion won, while unit price of the K-9 components exported to Turkey in 2002 was 2.7 billion won(ADD, 2008). In other word, about 1 billion won of production activity per a K-9 occurs in Turkey. Because 350 units of export is guaranteed, total production activity transferred to Turkey is about 350 billion won. From that, we can induce the impacts of the offsets on employment, by applying 12.2% to all columns of Table 9.

Classification	Workers Requirement Effect	Employees Requirement Effect
Persons generated directly	2,496	2,291
Persons generated indirectly	2,115	1,460
Total	4,611	3,751

Table 11: Workers and Employees Requirement Effect of the K-9 Offset

When comparing Table 10 with Table 11, the impacts of offsets are relatively small, about a fourth of impacts of the export. By scarifying small jobs, South Korea can get much larger jobs. Besides, South Korea seldom faces job loss at the subcontractors, which the U.S. worries the most seriously in conducting offsets. Consequently, impacts of the K-9 offset trade are very positive.

4.2. IMPACTS ON TRADE BALANCE

Worth of the K-9 export to Turkey is $ 1 billion until 2011, actually small when compared to whole trade volume of South Korea. However, it is very meaningful for the South Korea's defense industry when comparing with total $5.5 million of 2000 defense exports(ADD, 2002). Table 12 and Figure 10 show the defense exports of South Korea have increased from 2001 when export of the K-9 began. Table 13 and Figure 11 shows how big portion the K-9 export has taken out of whole defense exports.

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Whole Exports ($10,000)	14,719	19,663	5,537	23,720	14,390	24,061	41,901	26,189	25,526	84,493
Rate of Increase(%)	153.7	33.6	-71.8	328.4	-39.3	67.2	74.1	-37.5	-2.5	231.0
Offsets (Proportion)	920 (6.3%)	1,492 (7.6%)	111 (2.0%)	852 (3.6%)	299 (2.1%)	3,780 (15.7%)	7,613 (18.2%)	10,953 (41.8%)	5,800 (22.7%)	23,230 (27.5%)

Table 12: Annual Defense Exports Value of South Korea(Moon, 2008) with author's own adjustment

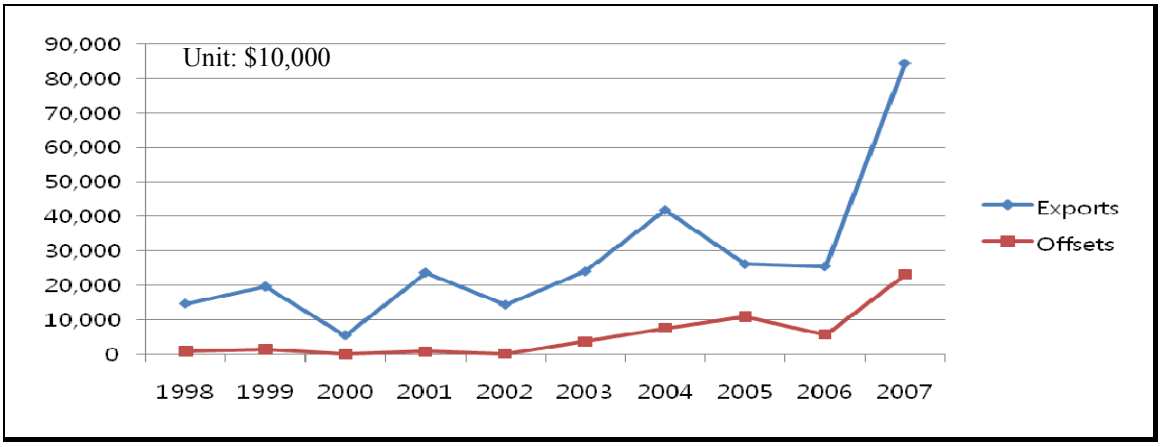

Figure 10: Trend of the Defense Exports and Offsets of South Korea(Moon, 2008) with author's own adjustment

Year	Unit Value	Quantity	Exports Value ($10,000)	Total Defense Exports of South Korea($10,000)	Proportion of K-9 Export
2000	3,350	1(Prototype)	335	5,537	6.1%
2001	2,708	24	6,500	23,720	27.4%
2002	2,708	24	6,500	14,390	45.2%
2003	2,438	16	3,900	24,061	16.2%
Total		65	17,235	67,708	25.5%

Table 13: Contribution of the K-9 Export to Defense Exports(ADD, 2008) with author's own adjustment

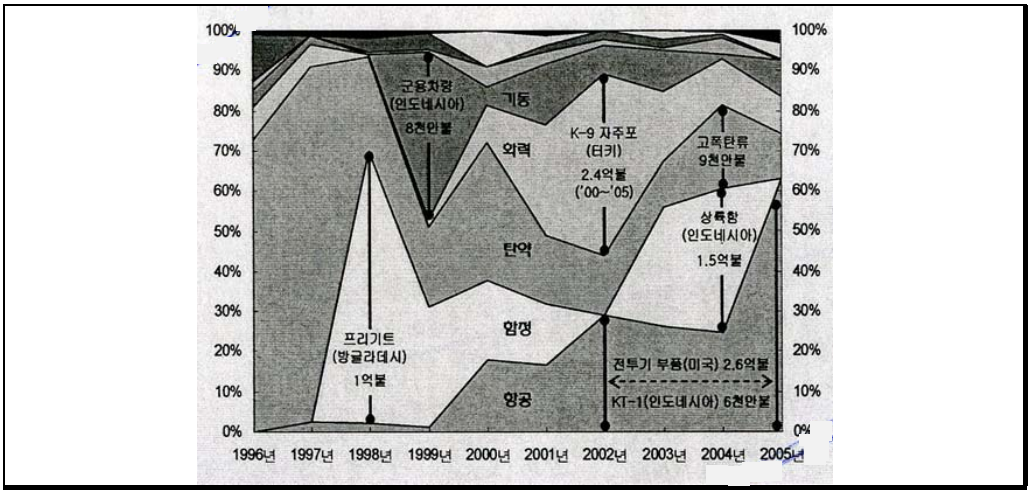

Figure 11: Change of the Defense Exports Proportion(Moon, 2008)

Above all, export of the K-9 is very meaningful in opening new market. The exports contributed to diversification of South Korea's export products, and became an opportunity to show off the technological superiority of South Korea's defense industry. Until 1990s, South Korea had exported only small guns in the fire weapons market, however, after the export, it entered into the system weapons market(Moon, 2008). In addition, the defense exports of South Korea had been concentrated on the South-East Asia, but the K-9 export became the first case of selling system weapons to the Middle-East Market(Moon, 2008). After that, Indonesia and Australia are negotiating with South Korea to purchase the K-9, and $410 million of KT-1 Trainer and $223 million of K-2 Tank were exported to Turkey, Indonesia and Europe(ADD, 2008).

The export can be connected to even other additional exports. It is expected that Turkey will purchase additional munitions involved(ADD, 2008) and components for repair in the future, because usually such weapons are utilized for several decades. The K-10 Munitions Transporting Vehicle, which carries the K-9's munitions, is also expected to be sold to Turkey(ADD, 2002).

Inflow of foreign currency to South Korea is expected through license, if Turkey exports the Pirtina to other country. If do that, South Korea will receive license fee according

to the contract. Of course, exports of the Pirtina are likely to be recognized as appearance of competitor in the world arms market. However, Turkey should import main components used for production from South Korea in order to make more Pirtina. Therefore, exports of Pirtina will increase income of South Korea.

Then, trade balance of South Korea is hurt by the offset trade? The technology transfer is actually not free. South Korea has sold some components, of which price is 114% of domestic procurement price(ADD, 2002). Although the excessive 14% per 1 gun may be a little cheaper than actual value of technology, the offset trade is very greatly positive to trade balance of South Korea, as above noted. Previously noted, while about 350 billion won of production activities are transferred, income caused by the export is $1 billion or 1.3 trillion won. Consequently, it can say that the export case has contributed to trade balance of South Korea very positively.

4.3. IMPACTS ON THE DEFENSE INDUSTRY

The K-9 export to Turkey has greatly contributed to the South Korean defense industry. It can be known by reviewing the K-9's relevant capacity utilization rates and income distribution structure. As previously mentioned, impacts of the export on capacity utilization and income are regarded as 45.7% of all.

South Korea's defense contractors are commonly running the both defense businesses and civil or commercial businesses(Moon, 2008). However, average capacity utilization rate has declined constantly since 1986(Moon, 2008), and accordingly profit of the defense industry has deteriorated. It is because of that demand of the South Korea Army for conventional weapons has decreased due to completion of fielding of those weapons(Kim, 2003). For example, production of the K-55 artillery, which is still the main-force artillery of South Korea, was finished in 1997 when the 1040th gun was supplied(Army Headquarter,

n.d.), Thus the K-55-related facilities are suffering lack of works, but cannot be removed due to the security problem.

1986	1990	1993	1998	2000	2001	2002	2003	2004	2005	2006
77.8	55.6	54.2	52.8	48.5	50.3	54.5	57.3	56.1	57.8	60.6

Table 14: Average Capacity Utilization Rate of Defense Contractors between 1986 and 2006 (Moon, 2008)

In such situation, export of the K-9 has contributed to firms' maintenance of defense facilities. On average, capacity utilization rates of firms related to the K-9 are higher than other defense firms. As shown in Table 15, the K-9 facility has been run frequently when comparing with others.

Firm	Weapon (Component)		Annual Average Possible Production	Late 3 years' Annual Average Production	Capacity Utilization Rate
Doosan Infracore	Biho		30	17	56.7
	Chunma		20	12	60.0
	K-200-related Performance Upgrade		-	42	-
Rotem	K1A1 Tank		80	46	57.5
	Recovery Tank		15	8	53.3
	Out-sourcing Maintenance		50	42	84.0
	Decontamination Equipment		120	45	37.5
Samsung Techwin	Mobile Equipment	K-10	50	9	18.0
		K-77	20	0	0.0
		K-9	100	54	54.0
		KAAV	20	15	75.0
	Engine of Aircraft	F110 Engine	-	14	-
		F404 Engine	-	4	-
	Engine of Ship	LM2500 Engine	-	4	-

Table 15: Production Capacities and Capacity Utilization Rates of Main Defense Contractors between 2003 and 2006(Moon, 2008)

In addition, capacity utilization rates of facilities producing munitions of the K-9 are relatively high. In Table 16, shaded parts are related to the K-9, among which three except 155mm RAP are used for only the K-9. The 155mm RAP is used for K-179, K-55, and K-9, but demands of K-179 and K-55 are very small because their productions are completely finished. According to prerequisite, about half of the impacts have been generated from the export.

Firm	Weapon (Component)	Annual Average Possible Production	Late 3 years' Annual Average Production	Capacity Utilization Rate
Hanhwa	130mm Multi Launch Rocket	Confidential		32.5
	Proximity Fuze M732 Fuze			51.3
	K-4 High Explosive Dual Purpose			9.2
	K-9 Propelling Munition			70.8
	Korean Mine-Scatterer Munition			29.8
	2.75″ Dual Purpose Distribution Munition			41.7
	81mm High Explosive Dual Purpose			12.6
	Pomins-II			44.7
	K731 Torpedo Component			13.0
	K701C Mine Component			20.8
	Chunma Munition Component			44.0
	227mm Multi Launch Rocket			32.2
	Light Weight Grenade			32.5
	KM739A1 Fuze			8.6
	KM577A1 Fuze			11.7
	KT-1/KO-1 Component			68.4
	T-50 Component			66.7
	KMK-45 Component			20.0
Poongsan	155mm K310 DP-ICM BB	Confidential		67.6
	5.56 Munition			61.6
	155mm K-307 BB-HE			68.7
	120mm High Explosive Anti-Tank-Tracer			93.9
	227mm Rocket Warhead Complex			182.9
	50 Caliber Machine Gun Munition			62.7
	20mm Anti-Aircraft Artillery Munition			28.5
	105mm High Explosive Anti-Tank-Tracer			30.1
	155mm RAP			38.5

Table 16: Production Capacities and Capacity Utilization Rates of Munition Defense Contractors between 2003 and 2006(Moon, 2008)

On the one hand, the prime contractor of the K-9, Samsung Techwin's sales including the K-9 sales account for 40% of whole defense sale of South Korea(Moon, 2008). Figure 12 shows that 106 1st suppliers including main 9 firms and maximum 170 2nd tier suppliers are participating in the K-9 business(Moon, 2008). In other word, a lot of firms are getting profit

from the business, and about half of the incomes are generated from the export to Turkey.

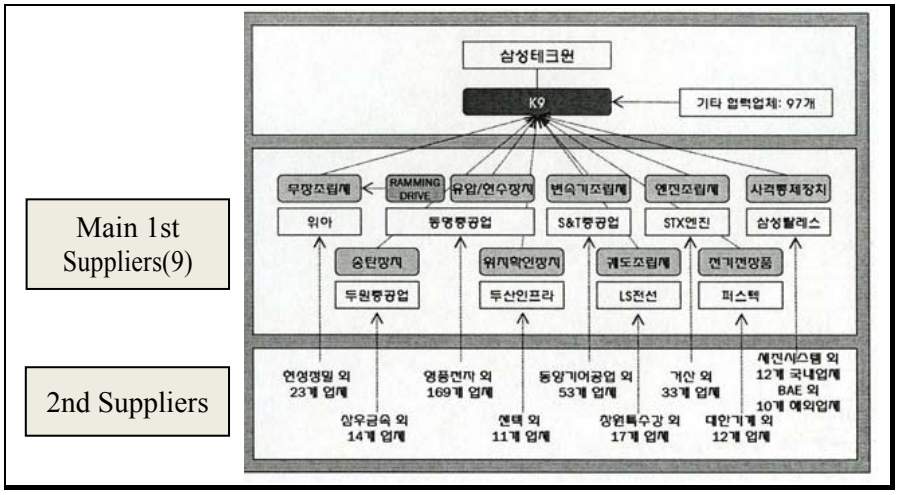

Figure 12: The K-9 Production Structure(Moon, 2008)

Annual average sales of the K-9 of Samsung Techwin are 241.2 billion won(Moon, 2008). 113.7 billion won are distributed to 1st tier suppliers, and among 113.7 billion won, 49.6 billion won are transferred to 2nd tier suppliers(Moon, 2008). Among main 9 1st tier suppliers, A, B, C and G companies greatly depend on the K-9 sales. Thus, the K-9 export which account for 45.7% of total sales is very important for many firms.

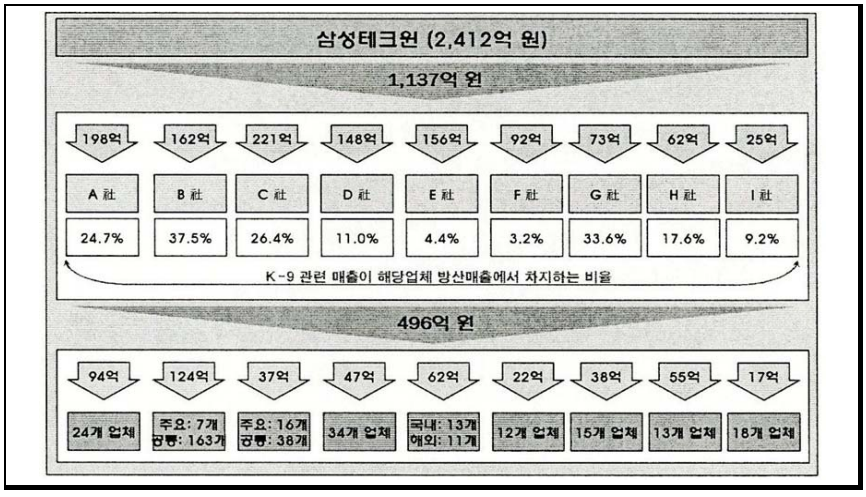

Figure 13: Distribution of Income Generated by the K-9 Business(Moon, 2008)

Then, how much the defense industry of South Korea is hurt by the offset trade? Its damage is not great. Only final assembly works has been transferred, so only small potential income of the prime contractor has not occurred. When considering contribution mentioned above, the impacts of the K-9 export are very positive to the defense industry of South Korea.

4.4. IMPACTS ON THE DEFENSE PREPAREDNESS

Impacts of the K-9 export on the defense preparedness can be known through capacity utilization rates and change of procurement expenditure. As mentioned earlier, the capacity utilization rates of relevant facilities have increased. It means that South Korea could reduce the level of worry regarding a security problem caused by close of defense firms. Besides, the massive production caused by increasing production capacity usually reduces the production cost. However, the unit production cost is not disclosed by the defense firms. Thus, save of governmental procurement expenditure cannot be discussed in this paper.

Then, how much the K-9 offset trade is injurious to the national security of South Korea? Above all, the risk when the technology transferred is leaked out to North Korea is very small. Interoperability of arms between South and North Korea is much low. In addition, since South Korea protected state-of-the-art technology from Turkey(ADD, 2002), North Korea cannot get the latest technology through any channel from Turkey. Even regarding source dependency problem, it has not made any damage to the defense preparedness of South Korea because it does not import components from Turkey. Rather, it is harmful to security of Turkey, because the contract increases Turkey's foreign component dependency. As a result, positive impact caused by increasing capacity utilization rate and no damage generated by the offset trade totally make positive impacts on the defense preparedness of South Korea.

4.5. POSSIBILITY OF COMPETITOR APPEARANCE

The most worrying problem of the technology transfer is the appearance of the future competitor. While Turkey's desire was to foster its own defense industry through the technology transfer, big concern of South Korea was just that. As a result, any export of Turkey's Pirtina to other nations has not been reported from 2001 to now.

With time, Turkey becomes to know that the technology transfer, co-production, and licensed production are not greatly helpful to indigenous development of Turkish defense industry. Rather, it has accumulated much technologies and know-how through joint-venture procurement projects. Currently, Turkish SSM's priorities policy of offsets are orderly; above all pursuit of "initiating indigenous projects for enhancing critical industrial capabilities"; if impossible, as next one, "joint development, perhaps with multinational collaboration"; as final demand, "co/licensed production and other offsets"(Cakir et al., 2008, 90). A speech taken from an international conference supported by SSM said:

> In today's world, developed countries are focused on the indigenous solutions, mutual development and international cooperation projects to meet their defense weapon systems requirements. Depending on the experience regarding the foreign dependency and being aware of the benefits of the indigenous or joint development models for Turkey, buy off the shelf and co/licensed production models are being diminished. Indigenous development projects [of Turkey] … can be considered as a leading model for this tendency.
>
> Therefore, it is assessed that it is going to be more beneficial for us to participate actively and on time in joint projects initiated mainly by U.S.A and EU and other countries while both developing indigenous solutions and meeting large volume development costs and time. Other than this, seeking the international participation to the Turkish development projects should be evaluated as an alternative target as well. (Cakir et al. 2008, 90-91)

From the SSM's viewpoint, we can know that Turkey has not been satisfied by the technology transfer as offsets. In other word, Turkey has not accomplished purposes of offsets which include becoming a magnate in the world arms market.

There are some reasons regarding that Turkey cannot become a competitor.

South Korea made the agreement with Turkey, which included the technology transfer after concluding that the possibility of making competitor is low. One of missions of the Technology Assessment Team sent to Turkey in 2000 was to evaluate the possibility. After visiting in many defense facilities, the team concluded that Turkish firms could not make a

own system design, and overall technological level is much lower than that of South Korea(ADD, 2002). However, some hardware can be imitated if many technological data are leaked out to Turkey(ADD, 2002). As a result, overall possibility of making a competitor was depreciated.

In addition, South Korea protected state-of-the-art technologies from being transferred. South Korea distinguished technologies into 3 categories which included targets transferred, targets negotiated, and targets protected(ADD, 2002). 47.2% of technologies were selected as targets negotiated, and 37.2 % were not allowed to be transferred. At the initial period of negotiation, South Korea decided to willingly transfer only 15.4% technologies. Previously mentioned, because developing countries do not know the technologies well, Turkey was at disadvantage in the negotiation. Thus, Turkey should still develop the state-of-the-art technologies by itself.

Another main reason is the supply method of the components. In order to make additional Turkish self-propelled artilleries, Turkey should import components from South Korea. Value of the components may include transportation cost, administrative cost caused by additional negotiation and etc. Production cost of the Turkish gun is surely higher than South Korea's gun. Accordingly, these make Turkish gun's price higher and less attractive to potential consumers than price of South Korea's gun.

Consequently, although the technology transfer improves Turkey's technology to some degree, it is still not a competitor against South Korea. Turkey is required to develop state-of-the-art technologies by itself through R&D in order to be a magnate in the world arms market. On the other hand, the technology transfer was a great tool of South Korea to attract Turkey. Thus, South Korea does not make a competitor in the world arms market, but got huge benefit through the K-9 offsets, the technology transfer.

5. FACTORS AFFECTING SUCCESS OF THE K-9 OFFSET AGREEMENT

The result of the K-9 offset transaction, the technology transfer is very successful for South Korea. Like this case, if some offset contract will be forecasted to give benefit to South Korea in the future, it will have to do its best in making the offset agreement. In this regard, the export case provides South Korea, a rookie in the world arms market with important implication on how to overcome many obstacles and how to make an offset agreement. Thus, this paper reorganizes what were stated previously according to the criteria already explained in the chapter Ⅳ.

5.1. BUYER-RELATED FACTORS

Turkey's offset experiences as a consumer are enough to participate in negotiation. As earlier noted, Turkey completed 22 transactions, and 55 transactions were in progress from 1984 to 2008. Thus, this factor impacted the agreement positively.

From South Korea's viewpoint, possibility that Turkey would become a competitor in the world arms market was small. Defense industrial base of Turkey is not systemic, but leakage of critical technology data could raise the possibility. For this reason, South Korea reduced the possibility by protecting state-of-the-art technologies. Thus, this factor also acted positively.

Technical experience of Turkey to assembly the gun as the final level was sufficient. The Technology Assessment Team concluded that Turkey's technology to make a design was not enough, but skill to make final products according to design transferred by South Korea was sufficient. This factor was positive for the agreement.

On the other hand, Turkey's overall environments were not good. Political situation was unsecured, and specifically economic environment was the worst. In early 2001 just before when the agreement was made, Turkey faced the most serious financial crisis that it

has ever undertaken. Public opinion that opposed the deal was fierce. Thus, although relationship with South Korea has been great, this factor also acted negatively.

5.2. SELLER-RLATED FACTORS

There were compatible goals in making the agreement. Turkey's purposes of the agreement were both to procure superior self-propelled artillery through the main contract, and at the same time to get high technology to strengthen its defense industry through the offset agreement. On the other hand, South Korea's purposes of the agreement were both to open new market in the Middle-East, and to promote its technological reputation in the world arms market. Earning much money through the trade was certainly involved in the purposes of South Korea. Thus, their goals were able to be compatible, and acted positively in making the agreement.

Proactive strategy was existing in South Korean government and Samsung Techwin. They aggressively suggested the contract with better conditions including the technology transfer to Turkey which was negotiating with Germany. Many high-ranking officers' visiting in Turkey and donation to Turkey which was suffering earthquake impacted the agreement. These efforts made an opportunity to see the K-9's performance with Turkey's eyes, and finally eliminated Turkey's uncertainty about the K-9's performance and South Korea's less experience as an exporting country. Thus, this factor affected positively success of the offset agreement.

There was an in-house offset group in South Korean government. After visiting of the Technology Assessment Team in Turkey, the team asked government to organize the project management team(ADD, 2002). The TAT emphasized on necessity to review the draft of MOU, possibility of design change of self-propelled gun, and increase of the staff(ADD, 2002). Existence and activities of the TAT and the project management team positively

worked on the success of the agreement.

Top management was great to inspire other members in driving the offset agreement. Colonel Dong-soo Kim, who had participated in the K-9 project from R&D, was the leader of the project management team(Kim, 2009). Lieutenant colonel Eung-chun Kim, a member of the TAT stated that as a leader, Kim's leadership was a determinant which induced responsibility and solidarity for success of the project(Yoon, 2003). In addition, the Minister of Defense and the Army Chief of Staff tried to succeed in the agreement. Thus, this factor acted positively for success of the agreement.

Many relevant people made a commitment to success of the offset agreement. They never gave up when Germany did not allow supply of the MTU engine. All relevant governmental organizations tried to solve the problem through diplomatic means. In addition, lieutenant colonel Kim stated that the task force members tried to overcome the problem, deciding to take responsibility for the works which could cause diplomatic problems(YOON, 2003). All staff tried to succeed in transferring technology. Therefore, this factor was positive for successful agreement.

However, international offset experience of South Korea was not sufficient. As shown in Table 12 and Figure 10, South Korea had not experienced big offsets until 2001, and the contract was almost the first case for South Korea. Therefore, less experience acted negatively for the success.

In addition, South Korea was not a big seller in the word arms market when comparing with other competitors. Germany and Israel which were competitors in the contract had more diverse products and power in the weapons market. In other word, the compensation practices from South Korea that Turkey could choose were less. Therefore, this factor also acted negatively for success of the offset agreement.

5.3. CONTRACT-RELATED FACTORS

The transferability of obligation could be not studied due to limitation of access to the data. Thus, this paper leaves this factor unsolved.

The agreement was made in two forms of MOU and the main contract. MOU between two countries was made before the main contract. Success of developing a prototype of Turkish self-propelled gun by Korean experts was the prerequisite of the main contract. After making MOU, South Korean experts succeeded in making a prototype, and then the main contract was made. Thus, this factor was positive to successful offset agreement.

The size of the sales was large enough. Because the worth of main contract was $1 billion, this contact was much attractive to South Korea. In addition, the technology was precious because at that time there was no country holding technology to make 155mm /52caliber of self-propelled gun with more than 40 km of striking distance except South Korea and Germany. The contract was attractive to both countries. Therefore, the factor was positive to success of the agreement.

Long payback period and low penalties are not applied to this case. In the deal, South Korea had no obligation to pay back after making the main contract. It was a conditional contract, and after success of developing prototype South Korea had no burden of payback and penalties. Therefore, it is not suitable to apply these factors to this case.

5.4. PRODUCT-RELATED FACTORS

As above mentioned, the technologies transferred were attractive to Turkey, though only some of all were transferred. In the prototype-making process, South Korean experts assured the superiority. They changed hardware and software for Turkish gun, and solved all problems which occurred suddenly. These raised the creditability of Turkey. Thus, this factor acted positively in making the offset agreement.

Uniqueness of the K-9 is also great. Turkey set a priority on mobility of gun, and that of the K-9 satisfied Turkey(ADD, 2002). What Turkey wanted was especially mobility in the severe environment such as extreme coldness. The prototype showed off the satisfactory mobility through tests in Turkey. Long striking distance also satisfied Turkey which should prepare for potential risk from Greece which held PzH2000. In addition, Korean experts constantly revised the performances according to Turkey's requirements and ROC in the prototype-making process. Therefore, this factor acted positively in the success of the agreement.

The most decisive factor affecting the successful agreement was superiority of the K-9. Turkish inspectors recognized the superiority of the K-9 by watching relevant facilities and fire test, when they visited in South Korea. During the biggest crisis, Turkey's serious financial crisis, precise fire power of the K-9 which was broadcasted live nationwide in Turkey weakened the internal public opinion which opposed the project. In other word, what overcame the biggest crisis was just superiority of the K-9. Therefore, the factor acted positively in succeeding the agreement.

5.5. SUMMARY AND FINDING

How the factors affected success of the offset agreement is summarized in table 17. Above all, the determinant of successful agreement is the very product. However, if Turkey had not assured the K-9's superiority, it would not have purchase the product. Despite of South Korea's less offset experience and disadvantageous position in the market, what made an opportunity to see the K-9's superiority with Turkey's eyes was the proactive strategy. The task force, top management, and members' commitment supported the proactive strategy. Contract-related factors did not critically affect success of the agreement. As a result, this case gives a critical implication to South Korea. That is just to sell a superior product with the

proactive strategy.

Category	Factors affecting Success of Offset Agreement	Impact
Factors related to Buyer	International experience (countertrade or especially offsets)	Positive
	Not being viewed as a competitor	Positive
	Technical experience	Positive
	Sufficient financial resources	Negative
	Stable environment (economic, political, social, security-related) and relationship with a exporting country	Negative
Factors related to Seller	Compatible goals(not same)	Positive
	Proactive strategy	Positive
	In-house offset group	Positive
	Top management support	Positive
	Commitment to project	Positive
	International experience	Negative
	Size of seller	Negative
Factors related to Contract	Transferability of obligations	Not Studied
	Dual contracts(main contract and MOU or MOA)	Positive
	The size of the sales	Positive
	Long payback period	Not Suitable for this case
	Low penalties	
Factors related to Product	Mature technology	Positive
	Complexity or uniqueness of product	Positive
	High visibility of product	Positive

Table 17: Factors Affecting Success of Offset Agreement in Case of the K-9 Export

Ⅵ. RECOMMENDATION

As earlier stated in the K-9 export case, the technology transfer is very useful tool to attract potential consumers. There have been many concerns about transferring late technology, but its adverse effect is much smaller than expected. Though the technologies transferred have contributed to development of Turkey's defense industry to some degree, South Korea is still keeping a position of a front-running man. On the one hand, importance of the proactive strategy for South Korea, a beginning seller in the arms market is founded.

Based on such finding, this paper makes 3 policy recommendations.

As the proactive strategy, the technology transfer should be utilized in opening new markets. The Middle-East is the most representative potential market. There have constantly been many disputes in the Middle East, and this market has gradually been westernized, procuring U.S.-origin arms(Cho, Han, Park, Shin & Yang, 2007). South Korea of which weapons have interoperabilities with U.S.'s arms can sell more own products in the market, but exports volume of South Korea to this area is very small(Cho et al., 2007). Thus, South Korea needs aggressive and active strategy to open the Middle-East market(Cho et al., 2007). As the proactive strategy, this paper recommends aggressive search for consumers, and the technology transfer as offsets. Of course, the operation to protect state-of-the-art technology should be built. This strategy should be applied not only to the Middle-East, but to South-East Asia, Eastern Europe, Central/South America, and Africa. Table 18 shows that ranking of attractive markets and their technological levels through scoring each item. Those, of which technological levels are lower, are very attractive to South Korea(Cho et al., 2007). On the other hand, this strategy is not proper to developed countries because those countries, of which overall technological levels are superior, can easily outpace the technological level

even in a self-propelled gun that South Korea has now comparative advantages than them.

	Developed Countries	South East Asia	Middle East	Eastern Europe	Central/South America	Africa
Defense Market's Attraction Ranking	1 (50.1)	2 (31.8)	3 (29.3)	4 (19.0)	5 (18.1)	6 (12.7)
Ranking of Defense Technology	1 (96.0)	3 (83.5)	4 (82.5)	2 (85.7)	4 (82.5)	6 (76.7)

Table 18: Characteristics of Geographical Defense Markets(Cho et al., 2007) with authors adjustment.

In addition, South Korea should stick to a position of supplier of main components instead of transferring technologies. In case of the K-9 export, South Korea can get benefit even if Turkey exports Pirtina, because South Korea holds license and supplies main components. As Turkey sells more Pirtinas, South Korea sells more main components to Turkey. In this regard, when South Korea holds a position of a main supplier, exports of transferee nations become complementary to exports of South Korea. Practical benefits go to South Korea than transferee. On the one hand, this benefit occurs more effectively, when localization level of the weapons is high. For example, localization level of the K-9 was 66.8% in 2000(Baek, 2004). Therefore, South Korea should keep the position of main supplier, and raise localization level of a weapon exported.

Finally, South Korea should prepare relevant law and institution which can foster the defense exports and offsets. Financial supports, marketing activities and etc. were already suggested frequently by other studies. Except those, this paper recommends the strategy to utilize the multiplier and a reporting system like an annual report by the U.S.'s BIS. Utilizing multiplier can minimize actual damage from offsets, especially the technology transfer. In addition, South Korea's has not reporting system regarding offsets yet, while the U.S.'s BIS has annually reported trend and impacts of offsets to its Congress. Such institution is not required right now, because South Korea's exports volume including offsets is still small

enough to easily interpret the trend and impacts without specific reporting system. However, before big growth of the offsets volume achieved by South Korea as a seller, relevant law and institution should be prepared.

Consequently, this paper recommends aggressive use of the technology transfer, maintaining a main supplier position, and relevant law and institution to effectively control offsets. In the world arms market, there is almost no way to sell arms without compensations. A seller should decide what will be provided and what will be protected. From a seller's viewpoint, in order to avoid subcontracting, it will be great that South Korea aggressively proposes the technology transfer prior to a consumer's requirement. For the strategy, relevant law and institution should be prepared.

Ⅶ. CONCLUSION

Until now, this paper has studied an offset trade, especially the technology transfer. Because many importing countries currently utilize offset trades, a seller cannot avoid that. There are many arguments that offsets hurt benefit of sellers, but these arguments are too much generalized. There are several offsetting methods, and each impact of those is different each other. Thus, this paper has focused on the technology transfer, and founded something different from general recognition.

According to recent studies, an offset trade diversely affects on mainly employment, balance of trade, the defense industry, and the defense preparedness. Offsets are beneficial to employment, balance of trade and competitiveness of a prime contractor by increasing its sales, but injurious to those of subcontractors. Offsets can positively affect the defense preparedness by raising capacity utilization rate, but hurt that by deepening foreign source dependency. In addition, impacts of offsets vary according to compensating method and development level of a trade partner. Co-production, subcontracting, and licensed production are harmful things to employment, and direct offsets which developed countries desire. Especially, subcontracting injures employment, trade balance, and greatly the defense preparedness. Purchase is harmful one to trade balance, and representative indirect offsets which LDCs hope.

Among offsets, the technology transfer has been regarded as much dangerous thing for a seller. The most anxious impact of the technology transfer is appearance of a competitor, but some recent studies depreciate the possibility. Although the technology transferred improves technological level of transferee to some degree, the impact is smaller than expected. This situation is generated by lack of an importing country's technological base,

capital and information. In addition, a transferor actually provides only technologies except state-of-the-art technologies, and transferee cannot react effectively because of lack of relevant knowledge. For this reason, the technology transfer strategy is not suitable for developed countries.

Kremer and Sain(1992) suggested 20 factors affecting success in making offset agreement, which are classified into buyer-related, seller-related, contract-related, and product-related factors.

In order to verify findings in literature review, this paper analyzes the K-9 export case. It is estimated that 130 billion won earned by the export makes 17,000 workers, but jobs lost by offsets are small. Through the export, South Korea can get many benefits including diversification of export goods, exploitation of a new market, improvement of reputation, and expectation of exporting relevant arms. Increased capacity utilization rate and protection of experts are also helpful to the defense industry and the defense preparedness. Above all, Turkey cannot become a rival against South Korea in the self-propelled gun market. Importance of maintaining a supplier position of main components is founded. In addition, the case study proves that product-related factors decisively affect the success, and proactive strategy supported by commitment of top-manager and member can make up for some insufficiency of a seller.

As a result, this paper recommends aggressive use of the technology transfer, maintenance of a main supplier position, and relevant law and institution for offsets. South Korea can utilize the technology transfer as the proactive strategy in attracting potential consumers. Becoming supplier of main components mitigates the risk that a transferee becomes a competitor. Relevant law and regulation including use of the multiplier and a reporting system should be made.

Finally, this paper has some limitations to be supplement later if possible. Because

relevant data is correctly not divided into domestic sale and export, this paper uses the simple proportional expression. These nominal impacts have high degree of validity, but are approximate values. Some data are restricted to access because of security problem. In addition, this paper tried to impacts and influence factors of offsets, especially the technology transfer, but the result is rather biased toward offsets with developing or less developed countries. Therefore, if these limitations are made up for, relevant studies will be much more improved.

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