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The Korean Defense Industry 2014: Current Status and its Policy Implications

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Contents

Table Contents

Figure Contents

Abstract

This is the third edition of the KIET Korean defense industry statistics and competitiveness report in 2014. The main purpose of this report is to establish the basis of the Korean defense industrial statistics with an actual survey from 2008 to 2013. Moreover, it also includes the defense SME's statistical analysis for the first time on a basis of an industrial survey in the same period. In a similar vein, it suggests policy implications to boost up the Korean defense industry including its SMEs as new growth engines in the near future.

We have collected a dataset of over 300 domestic defense companies among 700 actual firms in Korea. It accurately analyzes the actual data from the survey results with appropriate statistical methods over a long period of time. Therefore, it could provide a meaningful milestone to increase objectivity and credibility for the defense industry DBs in Korea. Accordingly, the actual sample size has been continuously increasing from 213 to 320 within the recent 6 years.

Here are some of the key results of the Korean defense industry itself. First, the global status of the Korean defense industry is estimated to be 11th in the world as of 2013. The defense budget amount was over $32.8 billion (11th), arms sales volume was over $10.6 billion (10th), arms export amount was over 310 million TIV (or $1.4 bn), the sales of global top 100 Korean companies was over $4.1 billion (12th), and the price competitiveness reached 84% compared to global competitors.

Second, the arms production amount was $10.6 billion[1] and the export volume was $1.4 billion in 2013. However, the export ratio among total sales volume was 13%, which demonstrates the domestic-oriented structure. Compared to only 4% in 2008, the export ratio is highly increasing. However, it should be reached over 30% similar to advanced countries in the near future. The total defense employment is also limited at 33,162 personnel and among them, 24.2% work for R&D sector as well.

Third, over 63.1% of defense sales are composed by a dozen of System Integration (S.I.) companies. It means that the defense SME's sales volume could be increased to strengthen the concrete ecological system of the defense industry in Korea. In addition, the area of artillery and military vehicles consist of over half (53%) the total Korean defense production. The arms sales as a % of total company sales is just 8.6%, which is a 0.8%p increase compared to the previous year, showing a low percentage of arms sales in Korean defense companies. This also indicated that arms sales volume needs to be increased among total company sales with the preparation of a 'fair competition' environment rather than the current 'oligopolistic industry structure'.

Fourth, the Korean arms exports recorded the highest ever with over $1.4 billion in 2013. Its annual increase is also over 28.4% for recent 6 years. With the Korean government's arms export support policy and the continuous effort of defense companies, the export amount was 3.5 times bigger than the amount 6 years ago in 2008. Particularly, S.I. companies led the Korean defense exports over the amount of 71% total. Both warship and military aircraft fields are the main export products,

1) According to the Bank of korea's key Economic indicators, we used $1=1,100 won as an annual average exchange rate in 2013.

over 55.2% of total exports. Otherwise, the area of military vehicles and artillery show dramatic decreasing trends from 58.2% to 39.9% in 5 years.

Fifth, from an employment aspect, the number of defense employee amounts to 33,162 personnel, a 5.6%p increase from the last year. Among the total defense employment, the employment rate of SMEs accounts for 35.0%. In particular, the ratio of R&D personnel is over 24.2%, relatively higher than other sectors. Specifically, people who hold a master's or doctoral degree account for 42.7% of total defense employment.

Sixth, manufacturing costs of weapon systems in Korea are high enough to reach 86.8% of the total. It shows a quite high percentage compared to the costs of commercial manufacturing industries (72.8%). In detail, raw materials are responsible for over 63.5% among total. The operating profit ratio shows 5.5%, which is 0.1% lower than the previous year. However, it is still higher than total defense firms and the commercial manufacturing industry, 3.9% and 5.3% respectively.

Seventh, as far as the operating ratio is concerned, total defense companies are at 57.6%, 0.8%p higher than last year. The low rate of operating ratio implies that an effort for the arms export expansion is necessary to overcome Korean limit of the domestic-oriented demand nature.

Eighth, the sales volume of defense SMEs totaled $2.1 billion, 20.1% of the total in 2013. The export amount is just only $59 million, 4% of the total. However, the ratio of employment reached 34% of the total. Generally, the defense SMEs needs more sales with the pursuit of an export market in the near future. Therefore, it is important to increase the parts localization level from 68% to over 80% in the near future. The support of Government SMEs policy and the expansion of outsourcing by defense S.I. companies are critical factors to boost up defense SMEs

competitiveness.

Lastly, the competitiveness of the Korean defense industry slightly improved compared to the previous year. In particular, both the company and government competitiveness reached 80% and 77% (the Advanced country competitiveness level=100), increasing by 3% and 5% compared to the last year. It fully relies on the increasing importance of arms sales for recent years in Korea. However, the competitiveness of price, technology and quality has not notably increased from 84~88% compared to advanced countries (or competitive products).

This report provides a significant milestone and policy directions for the future development of the Korean defense industry. Korea is the world's 11th largest defense expenditure country and the 4th largest arms buying country within the recent 10 years. However, the Korean defense industry encounters difficulties due to the monopolistic and oligopolistic industry structure today. In particular, it is necessary to improve the current 'defense designated product & companies system' and 'cost subsidy system', which impede the progress of defense industry development. The defense industry could suffer from chronic problems of high production costs, low rate of productivity and operating ratio for a long period of time.

Overall, the Korean defense industry is growing faster than previous years with its sales, export amount, employment and so on. More than anything else, the rate of export volume is highly noticeable over a 28.4% annual increase in the recent 6 years.

It is noticeable that major countries nowadays place great effort on increasing their exports to reach the scale economy and enhance their global competitiveness. We should let these case studies serve as good lessons for us.

In conclusion, in order to achieve the vision of the 'G7 Defense Industry,' which aims to reach exports of $4 billion by 2020, the domestic-oriented monopoly structure must be transformed into a competitive structure that maximizes economies of scale and strengthens the global competitiveness.

I. Introduction[2)]

It is essential to investigate the defense industrial bases through an actual survey for its policy direction set up, industry development, export expansion and SMEs industry structure.

The purpose of this report is to establish the basic defense industrial statistics with an actual survey and also suggest relevant policy implications to develop the defense industry as a new growth engine for Korea.

Therefore, the study conducted by KIET is a survey of defense industrial statistics conducted four times from 2011 to 2014 respectively. The survey target includes defense companies that produce weapon systems and its components in Korea. The total sample size recorded 679 defense companies and the response rate was 53.3%, 320 companies, in 2013.

It is divided into three different groups including system integration (S.I.) companies, designated defense companies and the tier companies as shown below.

Therefore, the main content of the questionnaire was divided into 11 sections including various questions addressing companies' general information, sales revenue, export volume, main products, R&D investment, employment, operating profit ratio and manufacturing costs, and arms sales as % of total sales, outsourcing and its five factors of com-

2) This paper draws heavily on a portion of the research projects, entitled as "The Korean Defense Industry 2013: Current Status and its Policy Implications" and "2014 Defense Industry Statistics and Competitiveness White Paper", which are published in English at KIET, 2014.7. and in Korean at KIET, 2014.12. respectively.

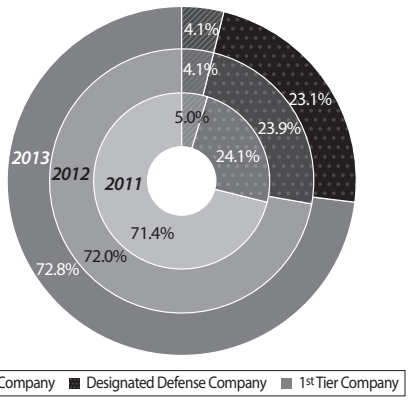
Table 1. The Definition of Defense Company by Type

Type	Definition
System Integration (S.I.) Company	Large defense company that mainly produces weapon systems registered in the Government, Defense Acquisition Program Administration (DAPA)
Designated Defense Company	Defense company that mainly produces components registered in the Government, Defense Acquisition Program Administration (DAPA)
1st Tier Company	Small and Medium Enterprises that mainly produce parts, as a first and second cooperative firms of S.I. companies

petitiveness.

Among the actual response of 320 defense companies in 2013, there are 13 S.I. companies (4.1%), 74 designated defense companies (23.1%) and 233 1st tier companies (72.8%). By size, there are 296 SMEs[3] that account for 92.5% of the total. By weapon system, it consists of 77 artillery

Figure 1. The Ratio of Defense Companies by Type



Source : 2014 KIET Defense Industry Statistics and Competitiveness Paper, 2014. Same as below.
Note : 1) Based on companies with annual defense sales of more than $0.5 million.
2) 290 respondents in 2011, 314 respondents in 2012, and 320 respondents in 2013 respectively.

3) Acronym of Small and Medium Enterprises.

(15.2%), 88 military vehicles (17.4%), and 80 military aircraft (15.8%) companies, which account for 53.3% of total. From the sales revenue, 279 companies with less than $27.3 million account for 87.2% of total. On the other hand, 19 companies with more than $90.9 million account for only 5.9%.

This paper consists of four sections. After a short description with an introduction, some key statistical analysis results of the Korean defense industry are presented with data from the last 6 years. Then policy implications are also suggested for the development of the Korean defense industry. Finally, it ends with a conclusion.

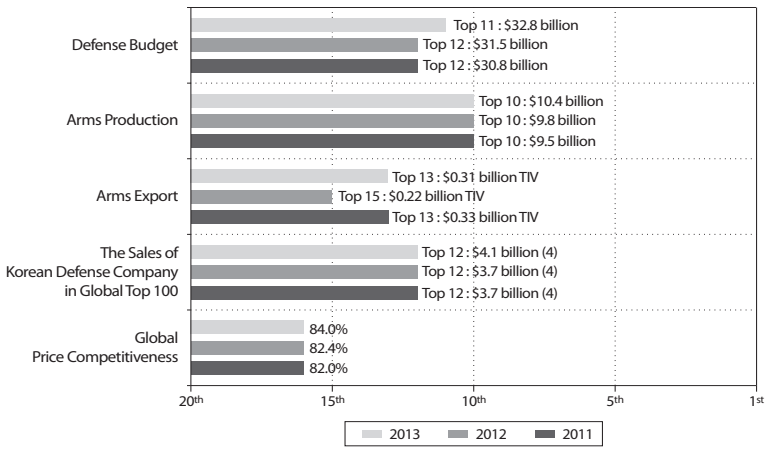
II. Current Status of the Korean Defense Industry (2008~13)

1. The Global Status of the Korean Defense Industry

The sales of the Korean defense industry totaled $10.6 billion in 2013. Correspondingly, it accounted for 2.2% of the world and ranked approximately 10th in the world. At the same year, the Korean national defense budget was over $32 billion, ranking as 11th in the world.

The trade deficit of the Korean defense industry decreased compared to previous years due to the export increase. However, it ranked 13th in the world with a 8.95 billion TIV[4] deficit.

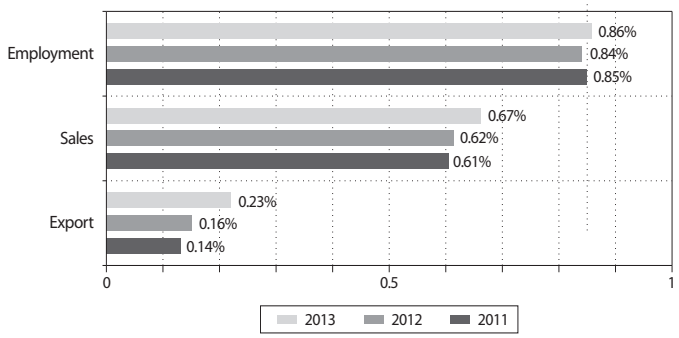
Figure 2. The Global Status of Korean Defense Industry



Note : ( ) is the number of Korean defense firms in Global Top 100 defense companies.

4) TIV is an acronym of Trend Indicator Value and it means a total arms transaction volume.

Figure 3. The Status of Defense Industry compared with Manufacturing Industry



Note : The export amount is based on a delivery basis.

The sales of the Korean top 4 among global top 100 defense companies were slightly over $4 billion in 2013. It includes KAI ($1.4 bn), LIG Nex1 ($1.1 bn), Samsung Techwin ($1.0 bn), and Hanwha ($0.9 bn). In a similar vein, the global price competitiveness of Korean defense industry reached 84% compared to the globally competitive countries (or competitive products). Figure 2 shows the current global status of the Korean defense industry in the world.

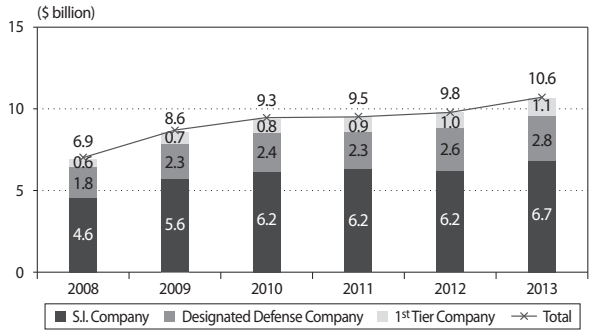
Compared to the Korean manufacturing industry, the production of the Korean defense industry was just 0.67% in 2013. The defense export amount, $1.36 billion, was also only 0.23% of Korean total export volume.

However, the number of total defense employees is over 33,000 personnel, accounting for 0.86% of the total in manufacturing industries and showing a relatively high employment ratio compared to the sales ratio.

2. Arms Production

The sales of the Korean defense industry totaled $10.6 billion in 2013,

Figure 4. *The Sales of Korean Defense Industry*



Note : 213 respondents in 2008, 279 respondents in 2009, 287 respondents in 2010, 290 respondents in 2011, 314 respondents in 2012, and 320 respondents in 2013.

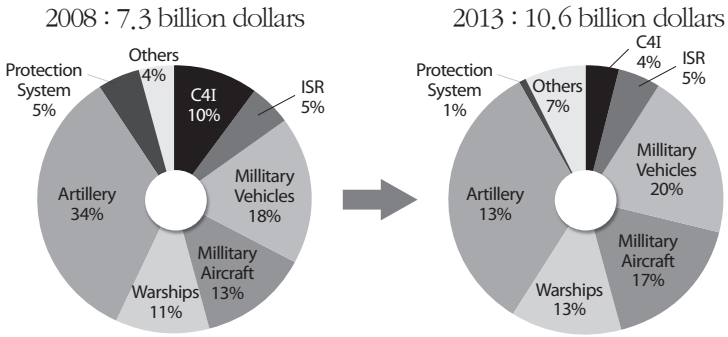
a 8.2% increase compared to a year ago. Defense S.I. companies accounted for 63.1% ($6.7 bn) of total arms sales, while designated defense companies and 1st tier companies produced 36.9% ($3.9 bn). Figure 4 shows the slight increase of Korean defense sales in the last 5 years.

In regards to arms sales, they increased by 53.6% from 2008 to 2013. The growth rate of S.I. sales, especially, shows over 45% during the same period of time. This is because the Big 4 has led the increase of sales recently.[5] The growth rate for 1st tier companies is over 83.3% within the recent 6 years, which is almost double S.I.'s growth rate. The designated defense companies reached over $2.8 billion, which is up to 55.6% during the same period.

By weapon system, artillery's sales in 2013 ranked highest with $3.2 billion (33%). Next, military aircraft and military vehicles ranked 2nd and 3rd with $2.3 billion (20%) and $2.0 billion (17%) respectively. Therefore,

5) Korea Aerospace Industries (KAI) recorded nearly $1.5 billion sales as the top defense company in Korea. The second was LIG Nex1, which was slightly over $1 billion, and Samsung Techwin and Hanwha ranked 3rd and 4th.

Figure 5. The Changes in Arms Sales by Weapon System



Note : 213 respondents in 2008, 279 respondents in 2009, 287 respondents in 2010, 290 respondents in 2011, 314 respondents in 2012, and 320 respondents in 2013.

these three areas consisted of 70% of total arms sales as shown in Figure 5.

During the past 6 years, the defense sales volume has increased constantly mainly due to the rise of government defense expenditure. Actually, it has increased by an average of 52.8% for the past 6 years from 2008 to 2013.

In particular, the arms sales ratio to the total sales[6] was an average of 8.6% in 2013, while the average ratio within the recent 6 years was also

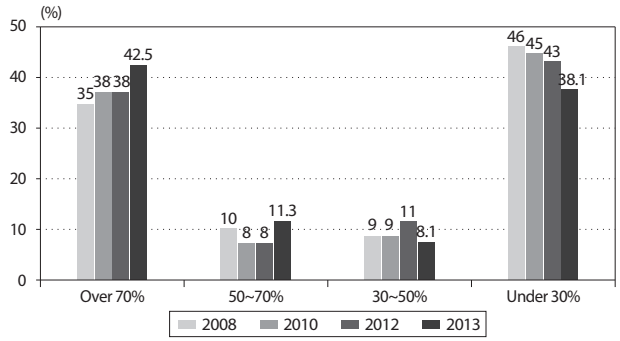
Table 2. The Arms Sales Ratio by Company Type

Unit: %

Type	2008	2009	2010	2011	2012	2013	Average
System Integration (S.I.) Company	7.5	8.4	8.5	7.9	7.8	8.5	8.1
Designated Defense Company	9.7	10.4	9.1	5.8	6.5	7.6	8.2
1st Tier Company	22.3	18.8	18.9	16.2	17.0	13.4	17.8
Total	8.4	9.3	9.1	7.6	7.8	8.6	8.5

6) The arms sales ratio shows companies' dependency on defense products among its total products.

Figure 6. The Ratio of the Number of Companies along with Arms Sales



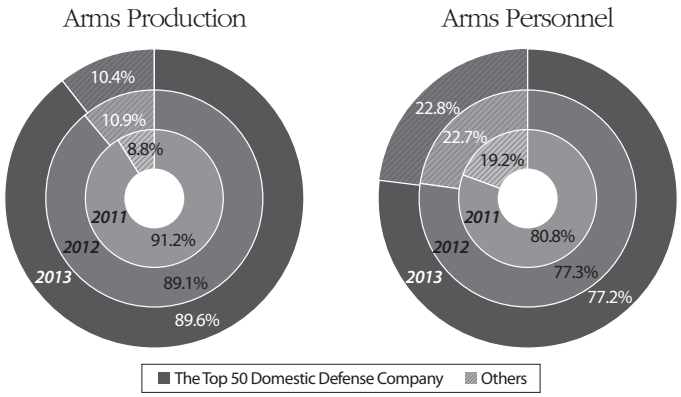
8.5% from 2008 to 2013. The ratio is relatively stable, but there were big differences by company type. Generally, 1st tier companies showed the highest arms sales ratio with 13.4%; however, both S.I. and designated defense companies showed only 8.6% and 7.6%, respectively.

Only three companies, Doosan DST, LIG Nex1 and Samsung Thales, had almost 100% dependence on the defense production. On the other hand, most S.I. companies recorded lower than 10% of their arms sales ratio because of heavy reliance of domestic demand, monopolistic industry structure, and high entry barriers.

The arms sales ratio was poles apart with the number of defense companies in Korea. The companies with arms sales over 70% accounted for 42.5%; those under 30% accounted for 38.1% as shown below in 2013.

The sales of Top 50 defense companies aggregated $9.5 billion in 2013, accounting for 89.6% of the total. Their employment was slightly over 25,500 personnel, which accounted for 77.2% of the total. It also shows that the employment is concentrated on large arms enterprises in Korea. In particular, the Top 10 arms companies' sales volume accounted for 66.6% of the total.

Figure 7. The Status of the Top 50 Domestic Defense Companies



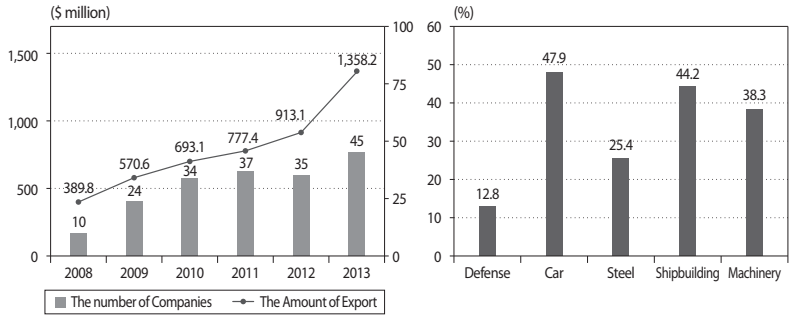
3. Arms Export

The amount of arms exports in 2013 recorded $1.36 billion for the first time since the 1970s.[7] It has rapidly increased by 3.5 times compared to the amount of $0.39 billion in 2008. This is mainly due to both the effort of leading defense companies and the continuous support by the government. The number of export companies increased 4.5 times from 10 to 45 within 6 years.

Despite the huge increase of arms export sales, the ratio is only 0.23% of national export amounts over $560 billion in 2013. Moreover, the arms export ratio as a % of sales reached 12.8% in the same year. It is significantly lower than the ratio of the car industry (48%), shipbuilding

7) KIET's arms export amount is different from the UN Commodity Trade Statistics with HS Code Classification. The UN DB does not fully classify the global arms export due to security issues. Actually, the UN DB presents that the Korean arms sales in 2012 has recorded only $425 million due to the same reason.

Figure 8. *The Status of Arms Export*



Note : The amount of exports is based on a delivery basis.

industry (44%), machinery industry (38%), and steel industry (25%) in Korea. Compared to other countries, Israel's export ratio is over 70% of their total defense sales and Turkey's one is over 30% of the arms export ratio.[8)]

Overall, the rapid increase of Korean arms exports is highly outstanding. The amount of arms export volume needs to continuously increase both to enhance its scale economy and global competitiveness in the near future.

Actually, arms export sales from 2008 to 2013 increased up to 28.4% annually. By company type, S.I. companies covered 71.3 % ($0.97 bn) of the total in 2013. This shows that S.I. companies mainly dominate Korean arms exports. On the other hand, designated defense and 1st tier companies sold their products abroad, recording amounts of $346 million, $44 million respectively.

In particular, the export amount of 1st tier companies covered only 3.3%. However, the export sales of 1st tier companies in 2013 increased

8) IHS Janes, 2013.

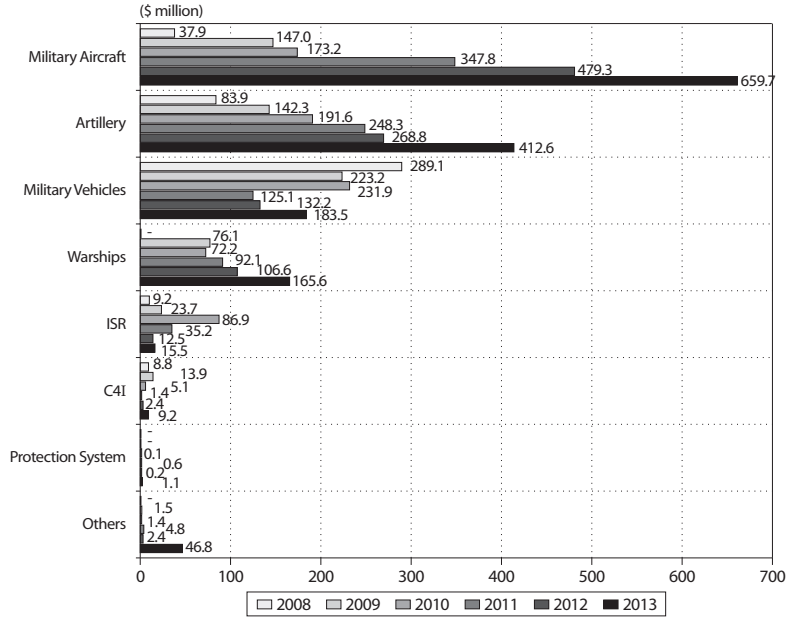
Table 3. The Status of Korean Defense Export

Unit: $ million

Type	2008 (A)	2009 (B)	2010 (C)	2011 (D)	2012 (E)	2013 (F)	Average					
							B/A	C/B	D/C	E/D	F/E	F/A
System Integration (S.I.) Company	384.4 (94.1)	450.8 (75.4)	598.0 (82.4)	657.7 (80.8)	872.8 (83.0)	968.6 (71.3)	17.3	32.7	10.0	32.7	11.0	152.0
Designated Defense Company	24.0 (5.9)	145.6 (24.4)	122.5 (16.9)	150.7 (18.5)	173.5 (16.5)	345.5 (25.4)	506.7	-15.9	23.0	15.1	99.1	1,339
1st Tier Company	-	1.5 (0.2)	5.5 (0.8)	5.8 (0.7)	5.4 (0.5)	44.3 (3.3)	-	266.7	5.5	-6.9	719.9	2,851 3)
Total	408.4 (100.0)	597.8 (100.0)	726.1 (100.0)	814.4 (100.0)	1,051.8 (100.0)	1,358.4 (100.0)	46.4	21.5	12.2	29.2	29.2	232.7

Note : 1) ( ) is the export ratio by company type.
2) F/B instead of F/A as A is none.

Figure 9. The Status of Arms Export by Weapon System



by 8.2 times compared to the last year.

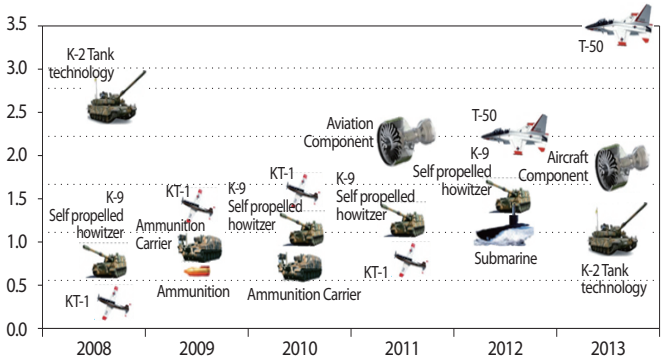
By weapon system, military aircraft placed at the top in the amount of exports with $660 million (44.2%) in 2013. In addition, the export amount of military aircraft sharply rose over 17.4 times compared to 2008. During the same period, the export sales of the artillery field ranked 2nd with $413 million (27.6%), which remarkably increased over 4.9 times compared to 6 years ago, and military vehicles ranked 3rd with $184 million (12.3%). The export sales of warships recently drew attention as 4th with $166 million. By product, mainly KT-50, K-2, aircraft parts and others are exported.

By weapon system, three major fields including artillery, military aircraft and military vehicles account for 84.1%, and especially military aircraft accounts for 44.2%.

In particular, the T-50 developed by KAI, recorded $318 million in export sales. The main reason for the sudden increase in exporting of arms relies on both the effort of the government's export-oriented policy and the increasing number of Korean competitive arms manufacturers.

However, systematical and organizational endeavors to increase de-

Figure 10. *The Status of Arms Export by Product*



fense exports are insufficient. Based on the statistical results, only 14 companies had their own overseas branches with 116 personnel in 2013. By company type, S.I. had 14 overseas branches with 60 employees; designated defense companies and 1st tier companies had only 14 overseas branches with 56 employees.

From the viewpoint of defense offset trade, the total of offset related exports in 2013 recorded $0.18 billion, which constitutes only 13.2% of total export volume. Compared to Israel and Turkey, the ratio of offset related exports is too low. Due to the high entrance wall by major countries, it is quite necessary to increase its export volume for the implementation of an offset contract in the near future.

By company type, S.I. companies covered 92.3% ($0.17 bn) of total exports in 2013, which also covered 98.4% ($0.28 bn) of total offset orders in the same year. This shows that the offset contract needs the SME's allocation to increase their opportunity to enter the global arms market.

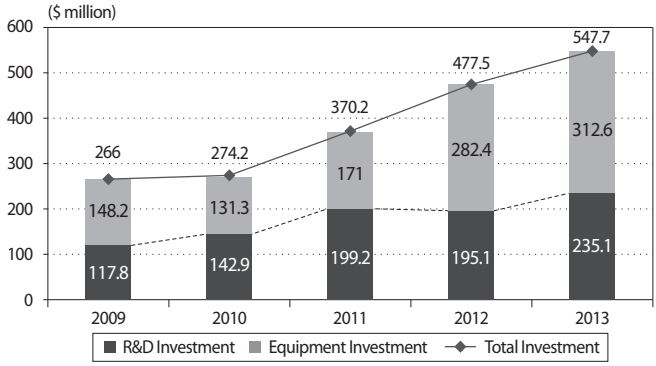
4. Arms Investment and Employment

In 2013, the total investment amount of arms manufacturers in Korea recorded $548 million, which was an increase of 28.1% compared to the last year. In comparison with the related industries, the R&D investment of the defense industry was proportionate to 5.2% of automobile, 11.4% of machinery and 49.1% of the steel industry.

Specifically, the investment amount of R&D and equipment was $235 million (42.9%), 313 million (57.1%) of the total investment in 2013 respectively.

Overall, the total number of employees in defense companies record-

Figure 11. *The Status of Arms Investment*



ed 33,162 personnel in 2013, an increase by 5.6% compared to the previous year. The growth rate was relatively high with 26,424 personnel, which accounts for 25.5% compared to 2008.

The main reason for employment expansion was due to arms sales growth along with the continuous increase of domestic defense acquisition expenditures, and warships, artillery and military vehicles mainly accounted for over 50% of the total.

It was remarkable that R&D personnel occupied a high proportion

Figure 12. *The Status of Defense Employment by Type*

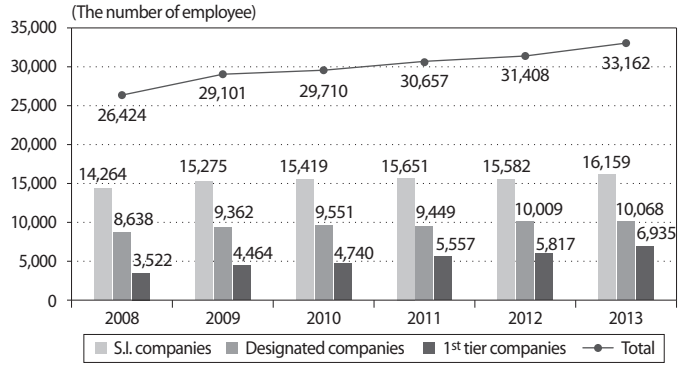
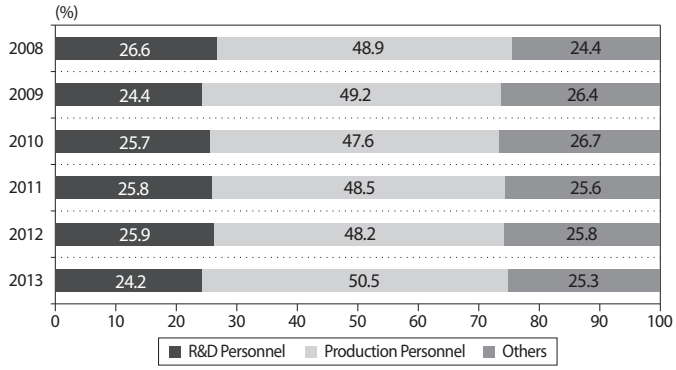


Figure 13. The Ratio of Defense Employment by Sector



in the Korean defense industry in 2013. The high ratio (24.2%) of R&D personnel in the defense industry is over 3 times that of the manufacturing industry (8.0%). The production personnel amounted to 50.5% of employees, followed by the support personnel with 25.3% respectively.

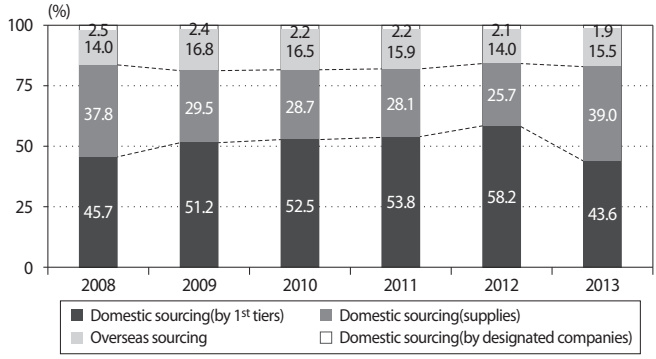
By company type, S.I. companies, designated defense companies and 1st tier companies occupy 26.8%, 19.7%, 24.7% of R&D personnel among the total, respectively. By size, large companies account for 24.7% of R&D personnel while SMEs account for 23.5%.

According to detailed statistics for R&D personnel, 42.7%, the ratio of employees holding either Ph.D. or Master's degrees in 2013 increased by 6.9%p from 35.8% in 2008. This displays a trend for higher educational capability among R&D personnel associated with the defense industry.

5. Outsourcing and Operating Ratio

As of 2013, the ratio of overseas outsourcing for the arms industry accounted for 15.5% of the total, which shows a slight increase from

Figure 14. The Outsourcing Ratio of Korean Defense Industry



Note : 94 respondents in 2008, 200 respondents in 2009, 206 respondents in 2010, 199 respondents in 2011, 232 respondents in 2012, and 163 respondents in 2013.

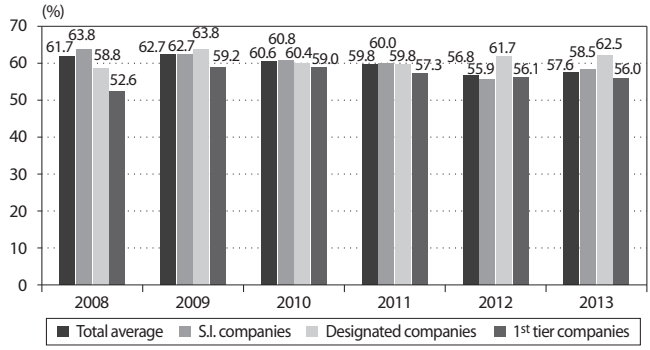
14.0% in 2008. On the other hand, the ratio of domestic outsourcing shows a stable percentage between 84.5~8.6% over the recent 6 years.

In particular, the operating ratio of the Korean defense industry recorded 57.6% in 2013, decreased by 5.1%p over 2009. By company type, S.I companies' operating ratio was 58.5%, whereas designated defense companies' and 1st tier companies' ratios were 62.5% and 56.0% respectively.

The low operating ratio implies that the defense industry does not solely rely on domestic demand itself. A lesson learned is that it is essential to get an economy of scale to raise the exports in the near future.

By weapon system, military aircraft and artillery had the highest operating ratio with 63.7% and 64.6% respectively. The warships' operating ratio showed a remarkable increase from 49.5% in 2012 to 60.5% in 2013 because of recent global market expansion efforts by Korean warship companies.

Figure 15. The Operating Ratio by Company Type



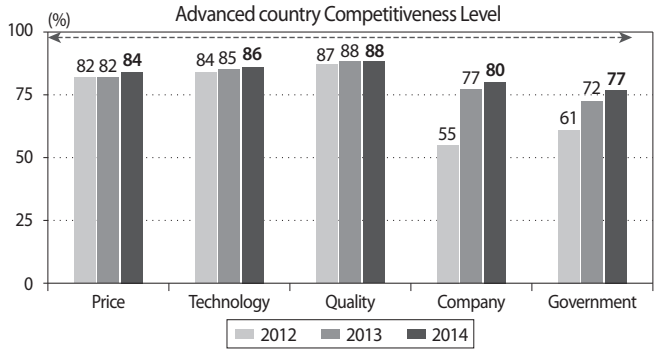
Note : 94 respondents in 2008, 200 respondents in 2009, 206 respondents in 2010, 199 respondents in 2011, and 232 respondents in 2012, and 163 respondents in 2013.

6. Global Competitiveness

According to the 2014 survey, the global competitiveness of the Korean defense industry was relatively low compared to the advanced countries (or competing products) in the world.

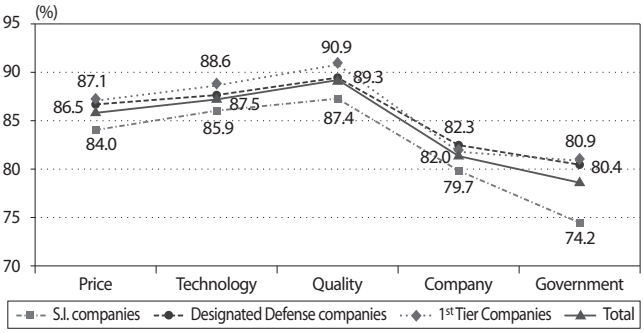
In a detailed analysis, the level of price competitiveness recorded

Figure 16. The Global Competitiveness of Korean Defense Industry



Note : 306 respondents in 2012, 338 respondents in 2013, and 261 respondents in 2014.

Figure 17. The Status of Competitiveness by Company Type

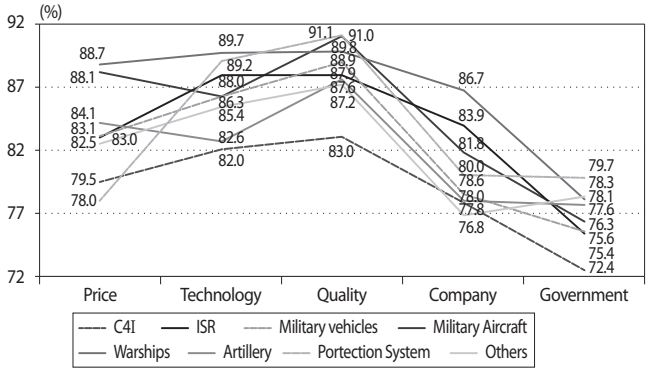


Note : Based on 13 S.I. companies, 76 Designated defense companies, and 126 1st Tier companies.

84%, while technology and quality levels recorded 86% and 88% respectively. Also, the levels of company and government competitiveness were only 80% and 77% each.

By company type, designated defense companies' competitiveness related to the price, technology, and quality ranges from 87% to 91%, while its competitiveness related to the company and government is relatively low with 82% and 81% respectively. Both S.I. and 1st tier com-

Figure 18. The Status of Competitiveness by Weapon System



Note : 306 respondents in 2012, 338 respondents in 2013, and 261 respondents in 2014.

panies' overall competitiveness were lower than that of the designated defense companies.

By weapon system, warship competitiveness was the highest, whereas C4I and ISR competitiveness were relatively low. Overall, there was a large gap between weapon systems from 78% to 91% regarding product competitiveness and from 72% to 87% in terms of company and government competitiveness.

The main reasons for the low competitiveness of the Korean defense industry are the following: the high production costs, the limited capability of core technology development and marketing, the low quality competitiveness and brand value, and the lack of export promotion policy, etc.

Figure 19. The Reasons for the Low Level of Competitiveness

Price competitiveness	Technology competitiveness	Quality competitiveness	Company competitiveness	Government competitiveness
High mass production cost	Limited source technology	Low reliability & availability	Incompetence at the global export market	Lack of export promotion policy
· Lack of the economy of scale · Dependence on import of raw materials	· Mission-critical development work · R&D investment shortage of defense industry	· Limited facilities and employment related to high performance test · Shortage of important elemental technology · Excessive specification · Frequent changes of ROC	· Incapacity of global marketing · Low brand value	· Limit of offering package deal · Insufficiency of offset and export support system

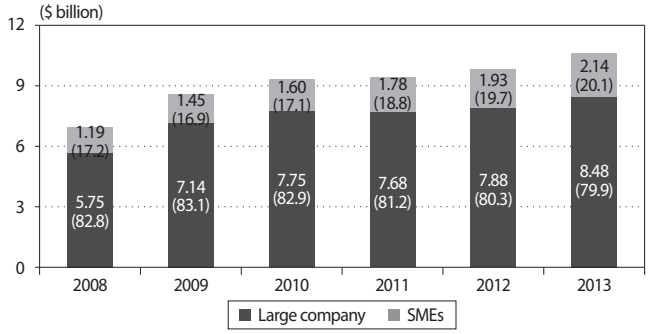
Ⅲ. The Korean Defense SME's Statistical Analysis (2008~13)

1. Arms Production

According to a survey on 2014 KIET Defense Industry Statistics and Competitiveness, the sales of Korean defense SMEs totaled $2.14 billion, accounting for 20.1% of the Korean defense industry's 2013 total sales. Although SMEs sales account for 20% of that of large companies, the SME's annual growth ratio (10.1%) within the recent 5 years (2009~13) amounts to 1.7 times compared to that of large companies (5.9%).

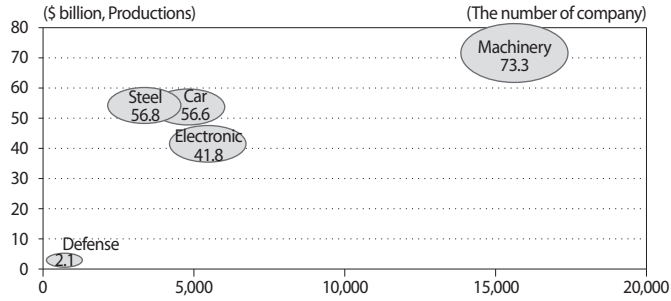
However, the sales of Korean defense SMEs are still insignificant compared to the sales of Korean SMEs in other major industries. During the same year, SMEs production in the machinery industry ($73.3bn),

Figure 20. The Defense SME's Sales by Size



Source : 2014 KIET Defense Industry Statistics and Competitiveness Paper, 2014. Same as below.
Note : 1) 188 SMEs in 2008, 253 SMEs in 2009, 260 SMEs in 2010, 288 SMEs in 2011, 288 SMEs in 2012, and 295 SMEs in 2013.
2) ( ) means the percentage of sales by company size.

Figure 21. The SME Comparison between Defense Industry and Other Industries

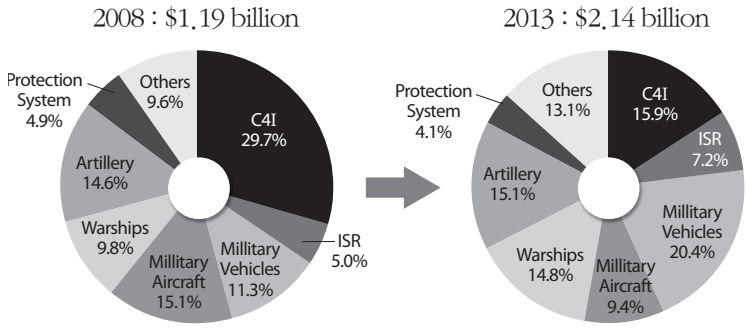


Source : 2014 KIET Defense Industry Statistics and Competitiveness, 2014; KIET Major Industry's Trend Index, 2013; K-BIZ, 2014 Status Index, 2014.
Note : The data on the SMEs in other industries is based on 2012.

steel industry ($56.8bn), car industry ($56.6bn), and electronic industry ($41.8bn) amounted from 20 to 34 times larger than the SMEs production in defense industry.

By product type, the sales volume of military vehicles (20.4%) artillery (15.1%) and C4I (15.9%) accounted for 51.4% in 2013. In contrast with the increase of military vehicle (11.3%→20.4%), artillery (14.6%→15.1%), C4I (5.0%→7.2%), and warship (9.8%→14.81%), the 2013 SME's sales

Figure 22. The Sales Ratio of Defense SMEs by Weapon System



Note : 188 SMEs in 2008 and 295 SMEs in 2013.

Table 4. The Defense SME's Dependence on Defense by Size

Unit : %

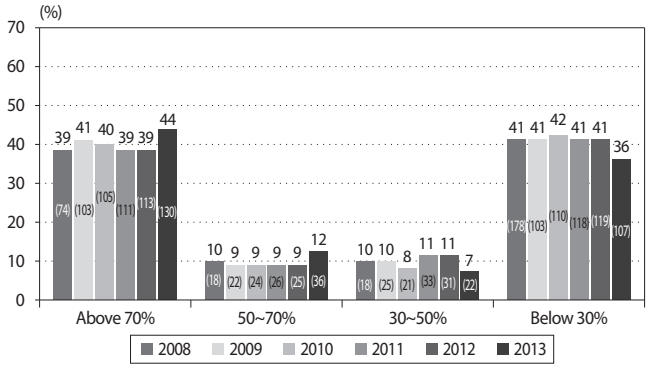
Year	Large Company	SMEs	Total
2008	7.5	23.4	8.4
2009	8.3	23.6	9.3
2010	8.1	23.0	9.1
2011	7.3	9.6*	7.6
2012	7.4	10.2	7.8
2013	7.7	15.2**	8.6

Notes : * H company with the dependence on defense of just 0.11% is included.
** H, D companies with the dependence on defense of just 0.11%, 0.2% are excluded.

portion of military aircraft (15.1%→9.4%) decreased compared to 2008. In particular, C4I mainly consists of SMEs whose defense sales ($0.34 bn) accounts for 69.8% of C4I's 2013 total sales ($0.49 bn).

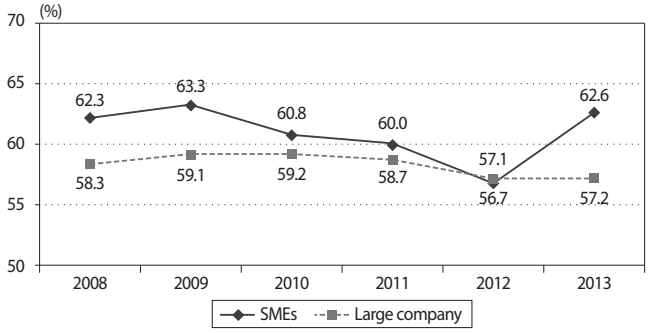
According to the 2013 survey of 296 SMEs, SMEs dependence on defense recorded 15.2% in 2013, with the defense sales ($2.14 bn) among total sales ($14.07 bn). The 2013 dependence on defense, which is about a half 2008's rate (23.4%), represents that the SME's defense sales portion sharply decreased within the recent 6 years. In other words, despite the

Figure 23. The Ratio of the Number of SMEs Companies along with Arms Sales



Note : ( ) stands for the number of companies.

Figure 24. The Defense SME's Operating Ratio by Size



Note : The operating ratio is a ratio of the production performance to the production capability.

quantitative growth of SME's defense sales with a 10.1% annual growth rate, the SME's portion of defense sales decreased with a loss of 8.2%p in the recent 6 years. On the other hand, SMEs dependence on defense was higher than that of large companies by 7.2%p.

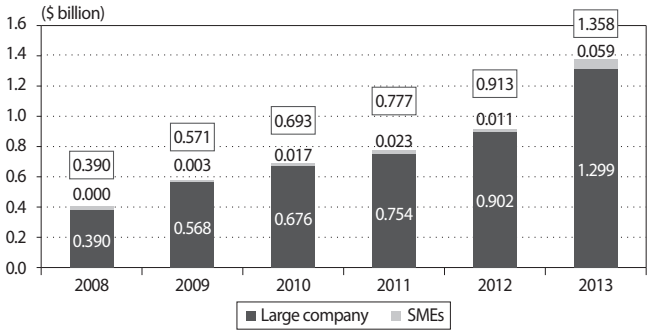
Specifically, the survey result, which shows the number of SMEs with a dependence on defense of over 70% and below 30% is 130 entities (44.1%) and 107 entities (36.3%), respectively, demonstrating that the difference of dependence on defense by company is significant.

On the other hand, the SME's defense operating ratio steadily decreased to 57.2%, 5.4% below by large companies, in 2013. The SME's defense operating ratio, which shows a considerably lower figure than the SME's operating ratio in other industries (71.1%) and the defense-related large companies (62.6%), confirms that the operating ratio is an essential issue to solve in the near future.

2. Arms Export

The Korean arms exports recorded $1.36 billion in 2013 total. In par-

Figure 25. *The Defense SME's Export by Size*



Note : The operating ratio is a ratio of the production performance to the production capability.

ticular, the defense-related SME's arms exports amounted to $588 million, increasing by 4.2 times over the previous year. The export increase of SMEs that deliver parts or components might be due to an export expansion of military aircraft and warship. However, the low ratio (4.4%) of SMEs exports among total defense exports implies that continuous efforts for the SMEs export expansion is necessary.

The SME's sluggish exports arose from the domestic-centered market structure, a production structure dependent on finished goods-oriented exports, the large firms-oriented offset program, and the lack of SMEs

Table 5. *The Status of Defense SME's Export (2013)*

Unit: : $ million

Company	Export	Export Product
Y	8.8	Connector, etc.
I	3.8	Frequency converter, Frequency Transmitter, etc.
H	3.5	Hand grenade, Stray bullet for practice, etc.
K	3.5	Engine Parts, etc.
Other	39.2	Cable assembly, Slipring, Heat resisting material etc.
Total	58.8	-

competitiveness associated with the overseas marketing capability.

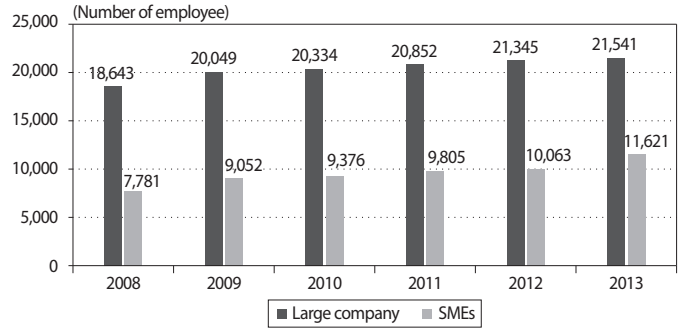
Specifically, the number of defense-related SMEs with the actual export record is 44 entities among 296 entities surveyed in 2013, showing the ratio of just 14.9%. The major export products consist of components or parts such as cable assembly, refractory goods for armored vehicles, precision optical lens, as well as finished goods such as night vision goggles, helmets, gas masks, and UAVs.

3. Arms Employment

The number of employees in Korean defense-related SMEs recorded 11,621 personnel in 2013, covering 35.0% of total employees (33,162 personnel) in the defense industry. Moreover, although the SMEs account for 20.1% of large companies in terms of defense production, the fact that the SME's employment ratio is higher by 14%p than that of large companies indicates that the defense-related SMEs play a pivotal role in job creation.

In particular, the SME's annual employment growth rate within the recent 5 years (2008~12) is even higher by 6.3%p than that of large

Figure 26. The Defense SME's Employment by Size

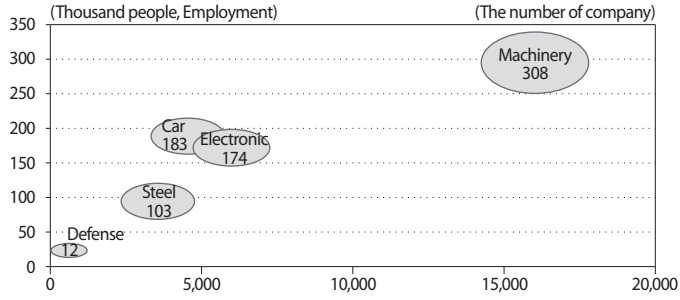


companies (2.4%). It is contributed by the necessity of manpower due to the automation difficulties of components or parts, and the impossibilities of company overseas relocation and foreign labor usage due to the security issues. Accordingly, the job creation through strengthening defense-related SMEs competitiveness helps fulfillment of the employment-centered creative economy.

On the one hand, there is a big difference between the SMEs employment in Korean defense industry and other major industries. SMEs employment in the Korean machinery industry (308,000 personnel), car industry (183,000 personnel), electronic industry (174,000 personnel), and steel industry (103,000 personnel) is about 26.5 times, 15.8 times, 15.0 times, and 8.9 times respectively of the SMEs employment in the Korean defense industry. As such, the deviation of SMEs employment between the Korean major industries is estimated to be 9 to 26 times that of the Korean defense industry.

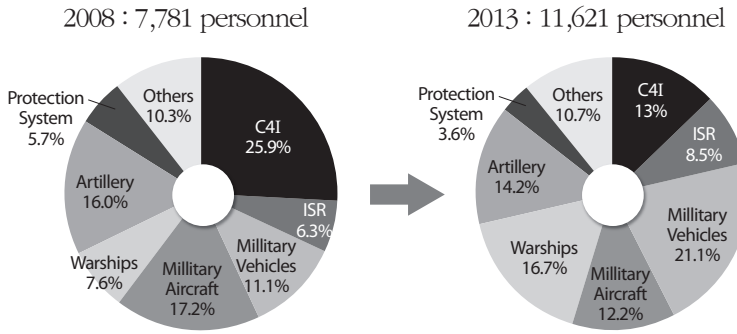
By weapon system, the four fields of military vehicle (21.1%), C4I (13.0%), artillery (14.2%), and military aircraft (16.7%) consist of 65% of

Figure 27. The Defense SME's Employment compared to Other Industries (2013)



Source : 2014 KIET Defense Industry Statistics and Competitiveness, 2014; KIET Major Industry's Trend Index, 2013; K-BIZ, 2014 Status Index, 2014.
Note : The data on SMEs in major industries is based on 2012.

Figure 28. The Defense SME's Employment by Weapon System



Note : 188 SMEs in 2008 and 295 SMEs in 2013.

total employment in the defense industry as of 2013. While the portion of military vehicles (868 personnel (11.1%)→2,451 personnel (21.1%)) and SR (489 personnel (6.3%)→990 personnel (8.5%)) among total employment increased, the portion of C4I (2,024 personnel (25.9%)→1,512 personnel (13.0%)), military aircraft (1,345 personnel (17.2%)→1,417 personnel (12.2%)), and artillery (1,249 personnel (16.0%)→1,643 personnel (14.2%)) decreased by 5.8%p, 3.9%p, 1.8%p respectively compared to 2008.

By sector, for 296 entities surveyed in 2013, the employment in the production sector is the highest with 49.0%, followed by those in others and the R&D sector at 27.6% and 23.4% respectively. Particularly, the SMEs employment ratio in the R&D sector (23.4%) has some differences compared with the large company (24.7%).

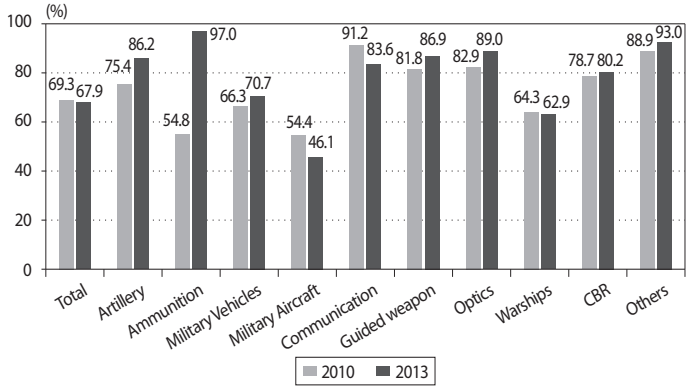
4. Parts Localization

Parts localization refers to the production with the use of domestic technology and labor. Parts localization is necessary in the three per-

spectives of military, economy, and industry. Specifically, it can help to achieve stable procurement and timely supplement to improve the weapon system's operating ratio, import substitution of high-valued parts and the export-led growth, job creation, and improvement of defense-related industries' global competitiveness.

Korea has developed 14,000 units of items through arms parts localization and achieved the success rate of 45.6% with 630 successful companies among a total of 1,380 participating companies. The rate of weapon systems' part localization was estimated as 67.9% in 2013, which decreased by 1.4%p from 2010. By product type, the ammunition field showed the highest localization rate while military aircraft and warship represented low rates compared to an average of total fields by indicating 46.1% and 62.9% respectively. This implies that despite the upswing in exports of finished goods such as the trainer and submarine, the localization rate of essential parts such as avionics equipment and sonar is still low. It indicates that the actual ripple effect of added-value

Figure 29. The Defense SME's Parts Localization by Weapon System



Source : Korea Defense Industry Association, 2014.

Note : Based on the sales, the data tends to decrease compared to the previous year.

through exports is not significantly high. Consequently, the localization of parts firstly with low-rated localization is urgently needed.

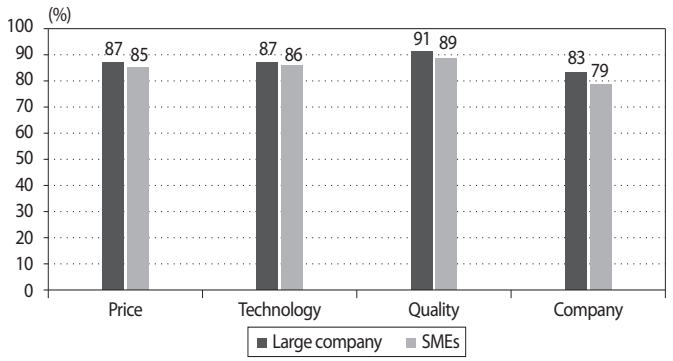
Overall, parts localization has played a positive role on cost reduction in domestic weapon system operation, the improvement of operations, technology, and the spin-off effect.

On the other hand, there are some issues to resolve as follows: the government's support on short-term oriented localization businesses, low financial support for parts localization, low incentives for defense SME, the difficulties of the arms test and evaluation for process, the large companies' avoidance according to the defense-industry cost system, and so on.

5. Global Competitiveness

According to the survey analysis on 216 companies with over $0.5 million of annual sales, the competitiveness level of domestic defense-related SMEs is 79~89%. Specifically, the company competitiveness was the lowest, 79%, while the product competitiveness was 85~89%

Figure 30. The Status of Korean Defense SME's Global Competitiveness (2014)



compared to global competitors. The low company competitiveness is caused by the lack of global marketing capability and brand value due to a market structure dependent on a domestic demand for over 30 years. Therefore, an effort for the enhancement of company competitiveness is necessary for domestic companies to enter the global market.

IV. Policy Implications

1. Summary of the Statistical Results

In summary, these are the key indicators of the Korean defense industry in 2013. The total arms sales have increased by 45.2% compared to 6 years ago. Of these, 63.1% ($6.7 bn) consisted of S.I companies. In terms of weapon systems, the top 3 consists of artillery, military aircraft and military vehicles. Moreover, the ratio of arms sales to the total sales was relatively low at only 8.6% in 2013.

In a similar vein, the arms exports volume has recorded a high figure of $1.4 billion. However, the ratio of arms exports among total sales was only 13.2%, which is relatively low compared to other major countries. The major export items include T-50 trainers, K-9 howitzers, and aircraft parts, which shows a slight change from components to end items within recent years.

Meanwhile, 33,162 personnel work for the Korean defense industry.

Table 6. The Key Indicators of Korean Defense Industry (2013)

Type	Total
Arms Acquisition Budget (A)	$5.9 billion
Arms Sales (B)	$10.6 billion
Arms Export (C)	$1.4 billion
Arms Employment (D)	33,162 employees
Arms Export Ratio (C/B)	13.2 %
Arms Sales Per Capita (B/D)	$320,174

Table 7. The Productivity of Korean Defense Industry (2013)

Unit : %

Type	Total
Manufacturing cost ratio	86.8
Raw material ratio	63.5
Operating profit ratio	5.5
Operating ratio	57.6

Among these, 74.6% work for R&D and production sectors, and 42.7% have either master's or doctoral degrees. The sales per capita recorded $320,174 in 2013.

In productivity terms, the manufacturing cost ratio is 86.8%, which is 14%p higher than the manufacturing industry's average. Among these, 63.5% are composed of raw materials. Also, the ratio of operating profit to sales ratio is 5.5% in the defense sector, which is a decrease of 0.1%p from the previous year. The average operating ratio of the defense industry is 57.6%, composed by S.I. (58.5%), designated (62.5%), and 1st tier companies (56.0%).

2. Policy Implications

(1) Improve toward a 'Market-oriented Defense Industry' Structure

Overall, the Korean defense industry's total sales in 2013 increased 8.2% compared to the previous year. However, the Korean defense industry's annual growth rate is much higher than the commercial manufacturing industry sales growth rate by -1%. Particularly, the 9.9% growth rate of the system integration sector over the previous year, which accounted for 63% of the total arms sales, led the total defense

industry's growth. In terms of weapon systems, the artillery field, which accounts for 33% of the total arms sales, represented a 18% growth from the last year.

However, problems still remains from the perspective of production structure. The Korean defense industry depends on a domestic market, which accounts for 87% of its arms sales. In this situation, its growth rate is likely to be decided by a government budget for arms procurement. Therefore, the growth of the Korean defense industry is limited without the innovative improvement measurements for the defense industrial structure.

Therefore, the Korean government should focus on its stepwise improvement from a domestic-oriented to market-oriented industrial structure in the near future. The current 'defense designated product & companies system' should be abolished without a few strategic arms products, as well.

(2) Expand Arms Export Volume Ratio over 40% among Total arms Sales

The Korean arms export volume in 2013, $1.4 billion, has rapidly increased by 48.8% from the previous year. Moreover, the export sales ratio recorded 13% of total arms sales in 2013, increasing by 3.3 times from 2008, which was just a 4% ratio. It is quite outstanding figure, 48.8%, compared to commercial manufacturing industry, 2.2%.

However, the export ratio among total sales is still insufficient compared to the advanced countries with over 40%. It is crucial to increase export volume to enjoy scale economy effects because of its characteristics of large-scale equipment industry. The lack of export volume was mainly caused by the low global competitiveness of arms products. In

particular, the price competitiveness of Korean defense products was relatively low with 84% of the major advanced countries (or competing global products).

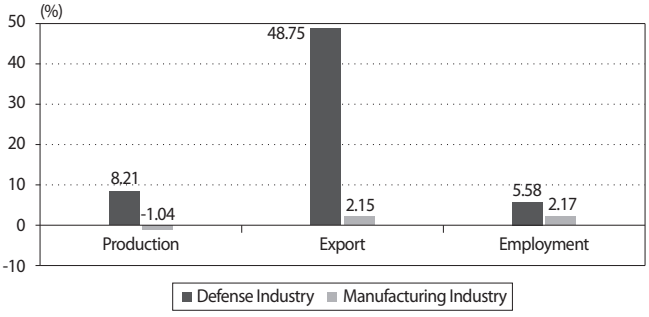
To expand the export volume, it is essential to change the current 'Cost Subsidy Systems', which hinders Korean enhancement of arms price competitiveness. Also, tests on the marketability and the economic feasibility need to be expanded at early phases of the defense program analysis such as 'Defense Acquisition Requirement Verification System' by the Ministry of National Defense.

(3) Increase Arms Employees with Export Volume Expansion

Figure 31 shows that the comparison of growth rate between defense and manufacturing industry in 2013. The defense industry's increase ratio of production is over 8.2% while the manufacturing industry's one is decreased by 1.0%. Also, the defense industry's increase ratio of export is over 22.7 times than the manufacturing industry's one.

The number of arms employees has increased by 5.6% compared to

Figure 31. The Comparison of Growth Rate between Defense Industry and Other Manufacturing Industries (2013)



Source : 2014 KIET Defense Industry Statistics and Competitiveness, 2014.

the previous year. The ratio is more than 5 times higher compared to the ratio of commercial manufacturing industry, 2.2% in the same period. This has mainly resulted in the continuous increase of both arms sales and export volume for the last 6 years. More than anything else, the export contribution ratio among total sales increase, 8.2%, reached over 55% in 2013.

In particular, one of the unique characteristics of the Korean defense industry is the high-quality human resources in the R&D sector, which approximately accounts for 24.2% among the total arms employees. Therefore, the Korean defense industry could play an important role in increasing national job creation and its high value added work forces.

It is crucial to increase employees with the development of a new engine growth such as the defense industry in the near future. From the viewpoint of the currently increasing rate of arms employment, the defense industry will serve an important role for national job creation with its potential development possibility.

Therefore, the arms employment policy should be encouraged by the expansion of arms sales and export volumes in the near future. With the difficulty of increasing the national defense budget, the pursuit of increased export volume should be a key role for the job creation of defense industry as well. It is also quite necessary to boost up the 'outsourcing expansion policy' to develop SMEs capability with the support of parts localization, participation of offset-driven export and so forth.

(4) Boost up Defense SMEs with Expansion of Parts Localization and Outsourcing Policy

The sales of 295 Korean defense SMEs totaled $2.14 billion, account-

Table 8. The Key Performances of Korean Defense SMEs

Unit : Number of company, Number of employee, $ million, %

Classification	SMEs(A)	Large Company(B)	Difference(A/B)
The number of company	296	24	12.3
Production	2,136.9	8,480.7	0.25
Export	58.8	1,299.5	0.05
Employment	11,621	21,541	0.54
Manufacturing Cost	7.6	8.0	0.96
Operating profit ratio	0.4	0.5	0.73
Dependence on Defense	15.2	7.7	1.97
Operational Ratio	57.2	62.6	0.91
Parts Localization	68	N/A	N/A

Note : Based on SMEs with the annual defense sales over $0.5 million.

ing for 20.1% of the Korean defense industry's total sales in 2013. Also, Korean defense SMEs have not represented enough high performances only with exports of $0.06 billion as 4.0% of the Korean defense industry, employment of 11,608 personnel as 33.7% of the Korean defense industry, and the parts localization level of 68%. These are attributed to the limits and regulations of market structure such as the lack of localization strategies, development objects and period.

We suggest some measurements to strengthen the Korean defense SME's competitiveness. First, in order to enhance product competitiveness, we need to reform some impeding factors such as the pressure from large companies, the monopoly market structure through the defense goods designation and the defense-cost reimbursement contract.

Second, a place for SMEs technology-innovation needs to be established by extending the defense-parts localizations, enforcing developments centered on essential parts from an early development stage, and

offering supports and incentives for testing and evaluation. Also, as the defense exports have recently expanded, the defense-related parts development businesses for exports should be initiated with a priority on advanced countries' E/L items.

Third, government efforts are essential for the defense SMEs growth. The government should offer information on foreign defense markets and provide supports for SME's participation in defense-related exhibits where major countries for their exports are likely to get together, and government's implementation of the priority procurement system of Test Bed will help defense SMEs to enter and expand the global market.

Fourth, along with major advanced countries, setting up and managing SME's contract objectives on defense contacts would boost SMEs production. Furthermore, system improvements to increase the outsourcing rate to SMEs by large companies would promote co-prosperity. Moreover, the range and size of the supporting policy for defense SMEs needs to be continuously expanded.

Lastly, the establishment of an intergovernmental conference between DAPA (Defense Acquisition Program Administration), MOTIE (Ministry of Trade, Industry & Energy), and SMBA (Small & Medium Business Administration) aiming for growth in SMEs competitiveness and job creation, is necessary. In addition, the Federation of Korean defense SMEs created by the companies themselves would facilitate them to provide numerous opinions or ideas for their growth and exports expansion.

(5) Others

In the aspects of manufacturing cost and operating profit, the Korean defense manufacturing cost is 86.8% of arms sales, which is higher than

that of the Korean manufacturing industry of 72.8%. Also, the cost ratio of raw materials and others has increased by 4.6%p and 0.5%p over the previous year, while the labor cost has decreased by 3.8%p.

In terms of the operating profit ratio of the defense industry, it has dropped by 0.1%p over the previous year and recorded 5.5% in 2013. The figure of the operating profit ratio from the defense field is lower by 1.7%p than that of the company's whole fields, while it is higher by 0.5%p than that of the manufacturing industry.

This implies that the Korean defense industry still has difficulties from the problem of limited demand. Accordingly, the Korean defense companies have put efforts on increasing their operating profit ratio through diversification within companies over the last decades. In this situation, the defense industry serves as a good window to develop their technology with the use of the government budget and thus, the industry is able to extend their business with intra spin-offing within the companies themselves.

Ⅴ. Conclusion

This statistical report is based on the dataset of the recent arms industry over the last 6 years, and could provide valuable information for the development of the Korean defense industry in the future.

The investigated items for the statistics include the arms production, exports, employment, operational rate, global competitiveness, and others. Consistent with the previous report, it contains the same 24 items with a sample of 320 arms companies including large companies and SMEs to increase its credibility and validity.

The Korean defense industry is rapidly growing, ranked at 11th in defense budgets and 10th in arms production in the world today. Particularly, the arms exports have skyrocketed in recent years with the global ranking of 13th; however, it is just 13% of the total sales and only accounts for 1.5% of the global arms export market. Moreover, the level of Korean defense industry's competitiveness amounts to just 82~88%, 77% and 80% in the aspects of the product, and business and government, respectively.

Accordingly, it is concluded that the Korean defense industry still has a problem of the domestic-oriented market structure with high production costs, low productivity and global competitiveness.

It is noticeable that major countries nowadays place great effort on increasing their exports to reach the scale economy and enhance their global competitiveness. We should let these case studies serve as good lessons for us.

In conclusion, in order to achieve the vision of the 'G7 Defense In-

dustry', which aims to reach exports of $4 billion by 2020, the domestic-oriented structure must be transformed into a competitive structure that maximizes economies of scale and strengthens the global competitiveness.

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[Appendix] Korean Arms Export with HS Code Classification (2000~13)

Weapon System	HS code	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Military Vehicles (1)	871000	1.9	1.2	6.7	12.5	7.2	1.3	4.5	5.8	8.4	23.4	2.0	2.5	10.1	82.4
Military Aircraft (5)	880211	0.0	0.0	0.4	4.3	3.0	0.3	3.8	4.9	0.9	0.0	0.1	0.1	3.2	0.4
	880212	0.1	0.0	0.1	2.7	6.9	0.7	1.2	18.9	5.2	11.4	1.4	5.0	0.0	5.9
	880220	0.2	0.2	0.0	12.0	0.2	0.0	0.3	0.5	0.0	0.0	0.1	0.1	1.6	0.3
	880230	0.8	0.0	0.0	0.3	5.8	1.0	0.6	17.6	0.2	0.8	0.0	2.5	28.7	342.3
	880310	0.8	0.1	0.1	0.0	0.0	0.1	0.4	3.6	1.2	2.2	1.5	0.6	2.7	2.2
War-ships (3)	890610*	1.1	159.2	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.7	3.5	17.9	0.0
	890690*	(1.1)	(159.2)	0.1	38.8	0.3	3.1	0.5	83.2	11.0	21.7	53.8	58.3	1.5	118.4
	901310	10.8	6.3	8.2	7.0	7.1	0.4	0.1	8.4	6.0	9.9	5.3	5.9	6.0	9.8
Ammu-nition (6)	360100	0.1	1.3	0.0	1.8	1.5	1.1	8.4	0.9	1.3	2.2	3.7	3.5	0.0	1.1
	360200	0.2	0.3	0.5	1.2	1.2	1.2	1.7	0.8	0.9	1.2	3.5	0.7	0.9	0.2
	930621	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.5	24.2	47.5	40.9	27.1	41.5	5.7
	930629	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	1.3	0.9	0.8	0.6	0.4	0.1
	930630	10.4	16.4	2.7	7.5	7.7	15.3	13.5	14.2	94.7	56.8	80.5	83.8	173.0	220.7
	930690	15.9	19.3	17.4	21.8	22.1	45.7	49.0	77.0	38.8	29.9	32.8	39.8	28.5	29.1
Artillery (8)	930111*	0.0	0.1	0.0	0.5	0.0	0.0	0.0	0.0	0.5	0.0	1.5	0.0	0.0	0.0
	930119*	(0.0)	(0.1)	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	21.2	19.3	0.0	19.3
	930190*	(0.0)	(0.1)	0.2	0.3	0.9	0.0	1.6	9.3	17.6	0.6	1.6	10.4	3.0	6.5
	930200	0.1	0.3	0.3	0.2	0.6	0.5	0.6	0.5	0.5	0.3	0.0	0.3	0.7	1.2
	930510	0.8	0.9	1.6	1.4	1.6	2.8	4.9	5.5	6.2	11.1	12.5	18.5	37.9	54.4
	930591*	4.1	23.2	23.9	63.8	44.7	31.3	46.5	50.1	45.1	53.7	45.2	43.9	67.2	36.6
	930599*	(4.1)	(23.2)	0.1	0.0	0.1	0.4	1.6	0.3	0.1	7.9	0.4	0.9	0.1	0.0
	930700	0.0	0.0	0.0	0.1	0.1	0.1	0.3	0.8	0.1	0.4	0.1	0.1	0.1	0.1
Missile (1)	930120*	(0.0)	(0.1)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	1.8	0.3	1.1	0.2	1.4
Total (24)	-	47.3	228.8	62.4	176.1	110.9	106.0	140.0	303.9	264.3	283.6	309.9	328.5	425.2	938.1

Source : UN, United Nations Commodity Trade Statistics Database 2000-2013, 2014.