

Trade Structure Analysis in the Auto Distribution Industry between Korea and the U.S.*

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Abstract

Purpose – To accelerate economic cooperation, this study investigates trade structures of Korea and the United States and identifies trade discrepancies. Such discoveries can lead to increases in trade volume by improving policies, eventually uncovering ways for trade expansion.

Research design, data, and methodology – The Index of trade intensity, from trade intensity theory, is used to analyze the trade decision factors. Even though specific factors should materialize in the analysis, realistically, concrete explanations are difficult as there are so many unsolved factors and diversifications.

Results – First, the Index of A value/ B value positions Korean against the United States in terms of market share and Korea against world market share, which thereby reveals comparative market intensity. Second, Korea is taking comparative advantage of export specialization. Third, real comparative advantage indices are considerably improved since early 2000.

Conclusions - This study uses quantitative measurements and trade intensity theory and trade specialization to come up with a comparative advantage index to see how inter-trade relations between Korea and the United States have changed over the past 10 years.

Keywords: Car industry, Intensity, Trade Structure, Trade Specialization, Revealed Comparative Advantage.

JEL Classifications: F14, F17, L62, L92.

1. Introduction

Korea's car output is expected to increase in 2015, according to an industry outlook jointly released by the Ministry of Trade, Industry and Energy(MOTIE) and the Korea Automobile Manufacturers Association. The global automobile industry is showing signs of recovery thanks to US and European economic recovery and steady economic growth in China and India. However, demand could still shrink due to economic recession in emerging markets, the MOTIE said in its statement. In 2015, the country's vehicle production and exports are expected to rise, thanks to continued growth in exports to North America, also a reduction in tariffs on cars, and high domestic demand for replacement of older vehicles. Under the South Korea-EU FTA, tariffs on vehicles with emissions of less than 1500cc will be additionally reduced from 3.3 percent to 1.6 percent from July 2015. Estimated figures show that domestic sales of finished cars increased 8.2 percent in the year to last month thanks to restyling and strong sales of imported cars. Vehicle output and exports decreased 4.7 percent and 4.0 percent respectively in November from a year due to market uncertainty in Eastern Europe and General Motors' withdrawal of its Chevrolet brand from Western Europe. Auto parts sales fell 9.3 percent in November from a year earlier due to continued recession in emerging markets.

In view of our economic situation, economic cooperation in Northeast Asia provide opportunities for industrial technology cooperation with USA while competition between industries is accelerating to diversify our export markets and to save a stable resources a very positive the effect is expected to bring out.

This study is looking for the trade problems to figure out ways to increase the trade between the two countries. Hence, That is the reason why this paper identifies two country's trade structure and to make analysis for the factors that affect trade structure.

This paper is organized as follows. Chapter II will examine statistical data by previous research studies. Chapter III, it will be examined the structural characteristics of the automotive industry between 2 countries by use of general trade statistics. Chapter IV, mutual trade relations will be decomposed and measured through UN Comtrade statistics combined with trade indices, trade specialization index, Revealed Comparative

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Advantage index. Conclusively, Chapter V, this study is summed up and finalized completely.

2. Previous research and statistic data

I analyze trade determinants between 2 countries by using trade intensity index to analyze through taking advantage of Japanese Yamazawa (2010) theory of trade intensity.

To analyze these trade determinant, detailed factor should be identified. However, realistically, there are a lot of unidentified factors including diversity that is much more difficult to show specifically. Therefore, I will review trade structure factor namely, analysis of trade determinant. Research period is from 2000 to 2014 because both 2 countries trade determinant analysis as recent statistical data of international statistical data are hard to obtain.

Per reviewing previous research, Lee(2011), Lee(2012), Jeong(2012) by trade specialization index, there are analysis research for Cha(2013), Lee(2007), Oh(2012) by revealed comparative advantage index and Lee(2012), Jeong(2012), Yu & Han(2012) by trade intensity index. This paper has differentiation by using above mentioned all 3 indexes compared to other papers.

My study was done by empirical analysis according to statistical data, especially, trade analysis between Korea and USA are objective assess. Thus, the position of the two countries, the south Korea will become the standard and then, USA will be reviewed by its results as a counterpart country. The statistical data published by international organization were mainly used. The main data were made based on Standard International Trade Classification, Korea Customs, Korea International Trade Association and UN Comtrade.

3. The Status of Car Industry and Characters between Korea and USA

Korean manufacturing method requires from domestic production oversea production strategy taking advantage of oversea low labor to globalization strategy in pursuit of resource optimal distribution and optimum coupling of manufacturing factor.

These target should be conducted as survival strategy not only continuous Korean economy's increase but also to survive borderless unlimited competition era. This is Korean car industry's urgent assignment. In despite of Korean short car industry history, Korean car industry recorded world rank 5 in 1994 after having been manufacturing independent unique model.

Built-in car export in Korea has been continuously increased up to 300,000 unit in 1986 and over 1 million unit in 1996. Regarding to export market shares, dominating 70-80% north american market in 1980's is abnormally high. It should have been exported to evenly balanced all over world. Regarding to the Korean big 3 car maker, export ratio to production is over

30%. However, only Hyundai has his own brand in 1980 on the contrary, KIA and Daewoo have been business through OEM method. Now, all of manufacturing makers have been exporting through company own manufacturing brand since 1990. In spite of this changed progress, international competitiveness in Korean automobile industry is very vulnerable until now. On the contrary, it is very contrast that Japanese built-in car has evenly balanced market share such as 37% in small car, 27.5% in medium size car, 20.7% in luxury car and 29.4% in sports car in US market with no big differences regardless of their car grade.

<Table 1> Top 10 export item in 2000

Unit: US\$1,000, Ton

| Period | Item | HS code | Export weight | Export amount | Trade balance |
|--------|----------------------|---------|---------------|---------------|---------------|
| 2000 | Electric product | 85 | 2,144,176 | 46,365,814 | 10,854,729 |
| 2000 | Machinery · Computer | 84 | 2,378,653 | 29,732,191 | 8,859,068 |
| 2000 | Car | 87 | 2,778,477 | 15,265,527 | 13,634,266 |
| 2000 | Petroleum · Coal | 27 | 40,003,169 | 9,375,503 | -28,701,630 |
| 2000 | Ship | 89 | 7,216,050 | 8,229,445 | 8,036,911 |
| 2000 | Plastic | 39 | 6,984,473 | 7,279,677 | 4,567,468 |
| 2000 | Steel | 72 | 12,500,325 | 5,954,688 | -35,487 |
| 2000 | Organic compound | 29 | 8,528,903 | 4,969,520 | -1,056 |
| 2000 | Filament fiber | 54 | 1,006,532 | 4,804,218 | 4,017,919 |
| 2000 | Knitting | 60 | 364,402 | 2,522,109 | 2,426,379 |

Source: Customs office 2013

<Table 2> Top 10 export item in 2005

Unit: US\$1,000, Ton

| Period | Item | HScode | Export weight | Export amount | Trade balance |
|--------|----------------------|--------|---------------|---------------|---------------|
| 2005 | Electric item | 85 | 2,379,539 | 80,488,019 | 31,754,060 |
| 2005 | Machinery · Computer | 84 | 3,610,932 | 38,563,249 | 10,584,838 |
| 2005 | Car | 87 | 5,541,103 | 37,491,235 | 33,298,061 |
| 2005 | Ship | 89 | 7,610,949 | 17,231,478 | 16,094,094 |
| 2005 | Petroleum · Coal | 27 | 35,847,748 | 15,709,419 | -51,847,050 |
| 2005 | Plastic | 39 | 9,499,673 | 14,262,514 | 8,861,933 |
| 2005 | Steel | 72 | 15,048,220 | 12,804,737 | -3,555,765 |
| 2005 | Optical instrument | 90 | 165,476 | 11,911,050 | -967,645 |
| 2005 | Organic compound | 29 | 10,905,426 | 10,539,295 | 2,062,227 |
| 2005 | Steel product | 73 | 2,483,584 | 4,425,868 | 1,872,647 |

Source: Customs office 2013

<Table 3> top 10 export item in 2011

Unit: US\$1,000, Ton

| Period | Item | HS code | Export weight | Export amount | Trade balance |
|--------|----------------------|---------|---------------|---------------|---------------|
| 2011 | Electric product | 85 | 2,492,738 | 118,542,862 | 48,794,634 |
| 2011 | Car | 87 | 8,011,982 | 67,096,998 | 57,947,004 |
| 2011 | Machinery · Computer | 84 | 5,965,440 | 59,658,652 | 10,330,096 |
| 2011 | Ship | 89 | 16,200,267 | 54,133,104 | 51,729,626 |
| 2011 | Petroleum · Coal | 27 | 56,597,644 | 53,088,429 | -120,586,577 |
| 2011 | Optical instrument | 90 | 591,264 | 36,499,242 | 19,450,445 |
| 2011 | Plastic | 39 | 11,915,748 | 27,719,360 | 16,869,288 |
| 2011 | Steel | 72 | 26,801,230 | 27,581,063 | -857,152 |
| 2011 | Organic compound | 29 | 15,332,920 | 22,468,839 | 7,604,440 |
| 2011 | Steel product | 73 | 4,645,340 | 11,690,016 | 4,315,843 |

Source: Customs office 2014

<Table 4> Top 10 export item in 2013

Unit: US\$1,000, Ton

| Period | Item | HS code | Export weight | Export amount | Trade balance |
|--------|----------------------|---------|---------------|---------------|---------------|
| 2013 | Electric product | 85 | 772,794 | 41,022,310 | 18,123,810 |
| 2013 | Car | 87 | 2,721,168 | 24,019,422 | 20,799,425 |
| 2013 | Machinery · Computer | 84 | 1,849,268 | 19,645,287 | 4,471,673 |
| 2013 | Petroleum · Coal | 27 | 19,550,412 | 18,647,477 | -44,836,514 |
| 2013 | Optical instrument | 90 | 175,109 | 12,203,470 | 6,643,405 |
| 2013 | Ship | 89 | 4,525,000 | 11,137,928 | 10,484,861 |
| 2013 | Plastic | 39 | 4,476,361 | 10,186,121 | 6,618,144 |
| 2013 | Organic compound | 29 | 5,784,018 | 8,707,390 | 3,706,811 |
| 2013 | Steel | 72 | 8,797,975 | 7,569,296 | 375,169 |
| 2013 | Steel product | 73 | 1,667,706 | 3,542,638 | 830,446 |

Source : Customs office 2014

<Table 5> Top 10 export item in 2014

Unit: USD1,000, TON

| Period | Item | HS code | Export Weight | Export amount | Trade balance |
|--------|----------------------|---------|---------------|---------------|---------------|
| 2014 | Electric product | 85 | 2,490,095 | 138,212,608 | 63,132,553 |
| 2014 | Car | 87 | 8,098,689 | 73,345,214 | 60,030,670 |
| 2014 | Machinery · Computer | 84 | 5,436,811 | 63,040,039 | 14,230,895 |

| | | | | | |
|------|--------------------|----|------------|------------|--------------|
| 2014 | Petroleum · Coal | 27 | 61,059,655 | 52,384,180 | -123,227,927 |
| 2014 | Ship | 89 | 10,312,632 | 38,338,234 | 36,563,988 |
| 2014 | Optical instrument | 90 | 550,431 | 35,901,409 | 18,032,104 |
| 2014 | Plastic | 39 | 13,798,507 | 31,825,944 | 21,121,951 |
| 2014 | Organic compound | 29 | 18,166,998 | 24,330,477 | 10,022,843 |
| 2014 | Steel | 72 | 28,358,198 | 23,943,952 | 1,987,516 |
| 2014 | Steel product | 73 | 6,390,653 | 12,655,474 | 3,751,190 |

Source : Customs office 2014

Per <Table 1> and <Table 2>, among top 10 export products against world market in 2000 and 2005, The proportion of car is US\$15.26 billion and US\$37.49 billion which is rank 3 after electric item and machinery · computer as a promising export item and its export volume is increased more than 2 times after 5 years. Per <Table 3> and <Table 4>, it is almost 2 times increase after 6 years as US\$67.09 billion in 2011, of which automobile export volume indicated brisk however, it is US\$24 billion in 2013 which shows export performance is significantly poor compared to past years as 2nd quarter export data does not come out. This phenomenon is well explained through worldwide economic crisis as well as purchase power of middle & high income groups is shrank because of construction sector's recession with long-term economic depression. This is worldwide trend including Korea.

Per <Table 5>, we can figure out car is second largest export item in the world after electric product. This means that export item car is one of major product to evaluate its country's trade competitiveness and has good reason to compare country's advantage.

Per <Table 6>, it is available to find out USA is second largest trade surplus country after China in the global economy.

Comparing with <Table 7> and <Table 8>, we can figure out Korean car import & export status shows steady growth continues overall from 1995 to 2013. This is export promotion policy starting from the Third Republic. From the early days, the export-oriented strategy is labor-intensive industries such as textiles, footwear, clothing industry and then, from the 1990s, the major export industry is amended to high value-added industry namely, autos, maritime industry, electric-electronics in Korean economy. In reality, Korean current industry is changing from newly industrialized country's, labor-intensive industries to capital-intensive industry. It is not mere industry itself moving. Thanks to a source of national wealth is shifting fundamentally, it is available to see brilliant devotions to increase of national wealth through economic development.

<Table 6> World top 10 trade surplus country in 2014

Unit: USD1,000, TON

| Period | Country | Export weight | Export amount | Import weight | Import amount | Trade balance |
|--------|-----------------|---------------|---------------|----------------|---------------|---------------|
| 2014 | China | 38,350,398 | 145,287,701 | 40,605,310,001 | 90,082,226 | 55,205,476 |
| 2014 | Hongkong | 3,945,232 | 27,256,402 | 253,872,027 | 1,749,889 | 25,506,513 |
| 2014 | USA | 17,886,494 | 70,284,872 | 23,767,993,600 | 45,283,254 | 25,001,618 |
| 2014 | Vietnam | 5,231,375 | 22,351,690 | 6,212,690,521 | 7,990,325 | 14,361,365 |
| 2014 | Singapore | 14,961,379 | 23,749,882 | 4,488,022,300 | 11,303,182 | 12,446,700 |
| 2014 | Marshall island | 2,278,059 | 8,054,891 | 30,432,898 | 63,471 | 7,991,420 |
| 2014 | Mexico | 2,495,742 | 10,846,018 | 2,297,450,508 | 3,268,495 | 7,577,522 |
| 2014 | India | 6,467,910 | 12,782,490 | 5,970,033,176 | 5,274,668 | 7,507,822 |
| 2014 | Philippine | 5,558,746 | 10,032,489 | 1,612,459,550 | 3,331,239 | 6,701,250 |
| 2014 | Turkey | 2,087,216 | 6,664,732 | 258,339,256 | 655,159 | 6,009,573 |

Source: own

<Table 7> Automobile Import & Export Status in Korea

Unit: US\$1,000, Ton

| Period | Item | HS code | Export weight | Export amount | Import weight | Import amount | Trade balance |
|--------|------|---------|---------------|---------------|---------------|---------------|---------------|
| 1995 | Car | 87 | 1,522,325 | 9,358,465 | 146,535 | 2,070,184 | 7,288,281 |
| 1996 | Car | 87 | 1,855,637 | 11,727,309 | 162,991 | 2,256,056 | 9,471,253 |
| 1997 | Car | 87 | 2,161,648 | 12,328,440 | 157,226 | 1,925,629 | 10,402,811 |
| 1998 | Car | 87 | 2,278,000 | 11,433,944 | 66,506 | 813,756 | 10,620,189 |
| 1999 | Car | 87 | 2,519,540 | 13,144,857 | 111,868 | 1,257,748 | 11,887,109 |
| 2000 | Car | 87 | 2,778,477 | 15,265,527 | 160,276 | 1,631,262 | 13,634,266 |
| 2001 | Car | 87 | 2,680,073 | 15,400,570 | 184,952 | 1,804,875 | 13,595,695 |
| 2002 | Car | 87 | 2,899,551 | 17,266,341 | 273,152 | 2,644,369 | 14,621,971 |
| 2003 | Car | 87 | 3,709,790 | 23,024,613 | 286,941 | 3,175,267 | 19,849,346 |
| 2004 | Car | 87 | 5,028,268 | 32,106,170 | 286,051 | 3,584,939 | 28,521,231 |
| 2005 | Car | 87 | 5,541,103 | 37,491,235 | 309,572 | 4,193,174 | 33,298,061 |
| 2006 | Car | 87 | 5,923,470 | 42,605,290 | 393,381 | 5,242,003 | 37,363,287 |
| 2007 | Car | 87 | 6,498,382 | 49,162,180 | 516,193 | 6,658,601 | 42,503,579 |
| 2008 | Car | 87 | 6,360,347 | 48,333,860 | 539,907 | 7,180,813 | 41,153,047 |
| 2009 | Car | 87 | 5,096,608 | 36,531,126 | 419,894 | 5,516,332 | 31,014,794 |
| 2010 | Car | 87 | 6,873,009 | 53,445,487 | 604,719 | 7,867,147 | 45,578,340 |
| 2011 | Car | 87 | 8,011,982 | 67,096,998 | 654,905 | 9,149,995 | 57,947,004 |
| 2012 | Car | 87 | 8,273,480 | 70,074,094 | 651,497 | 9,347,245 | 60,726,849 |
| 2013 | Car | 87 | 2,721,168 | 24,019,422 | 222,851 | 3,219,996 | 20,799,425 |
| Total | - | - | 82,732,858 | 589,815,928 | 6,149,418 | 79,539,392 | 510,276,537 |

Source : own

<Table 8> Automobile Import & Export Status in USA

Unit: USD1,000, TON

| Period | Country | Item | HS code | Export weight | Export amount | Import weight | Import amount | Trade balance |
|--------|---------|------|---------|---------------|---------------|---------------|---------------|---------------|
| 1995 | USA | Auto | 87 | 230,771 | 1,675,912 | 34,107 | 508,078 | 1,167,834 |
| 1996 | USA | Auto | 87 | 253,004 | 1,903,810 | 34,914 | 565,121 | 1,338,688 |
| 1997 | USA | Auto | 87 | 295,433 | 2,122,728 | 33,566 | 504,765 | 1,617,964 |
| 1998 | USA | Auto | 87 | 303,796 | 1,954,161 | 11,475 | 201,446 | 1,752,715 |
| 1999 | USA | Auto | 87 | 597,056 | 3,776,860 | 21,958 | 337,965 | 3,438,895 |
| 2000 | USA | Auto | 87 | 790,866 | 5,552,990 | 22,462 | 340,677 | 5,212,313 |
| 2001 | USA | Auto | 87 | 835,763 | 6,454,229 | 19,632 | 339,176 | 6,115,053 |
| 2002 | USA | Auto | 87 | 982,171 | 7,664,374 | 23,622 | 410,155 | 7,254,219 |
| 2003 | USA | Auto | 87 | 1,142,007 | 9,149,093 | 23,521 | 463,778 | 8,685,316 |
| 2004 | USA | Auto | 87 | 1,394,532 | 11,097,721 | 24,283 | 511,547 | 10,586,174 |
| 2005 | USA | Auto | 87 | 1,322,089 | 10,624,090 | 28,701 | 513,675 | 10,110,415 |
| 2006 | USA | Auto | 87 | 1,382,057 | 11,194,185 | 33,449 | 575,688 | 10,618,497 |
| 2007 | USA | Auto | 87 | 1,368,601 | 10,952,481 | 39,827 | 684,876 | 10,267,605 |
| 2008 | USA | Auto | 87 | 1,199,991 | 9,957,129 | 38,861 | 625,650 | 9,331,479 |
| 2009 | USA | Auto | 87 | 882,135 | 7,521,995 | 28,387 | 419,560 | 7,102,435 |
| 2010 | USA | Auto | 87 | 1,218,312 | 10,681,869 | 45,536 | 723,499 | 9,958,370 |
| 2011 | USA | Auto | 87 | 1,454,766 | 13,661,763 | 51,117 | 820,413 | 12,841,350 |
| 2012 | USA | Auto | 87 | 1,632,923 | 16,139,177 | 74,504 | 1,097,312 | 15,041,865 |
| 2013 | USA | Auto | 87 | 1,765,176 | 18,211,305 | 82,032 | 1,209,093 | 17,002,212 |
| 2014 | USA | Auto | 87 | 2,042,420 | 21,088,455 | 90,242 | 1,370,209 | 19,718,246 |
| Total | - | - | - | 21,093,869 | 181,384,327 | 762,196 | 12,222,683 | 169,161,644 |

Source : Own

On the other hand, per USA from 1995 to the year 2014, as we can figure out easily the trend <Table 8>, export volume is higher than import in the trade balance as a whole except 2009 that the year is US car export is decline which reason is economic crisis worldwide. As we can evaluate total period overview for export volume, even US auto import volumes from foreign countries are not small quantity, lots of foreign auto enter

prises set up their local auto manufacturing companies in USA and they expand their export production volumes that we can understand the elements of trade surplus.

In particular, US auto export volume is continuously increased ever since 2009 that USA is expected to compete with Korea intensely in the future international automobile sales market.

<Table 9> Korean car import & export status against USA and Trade balance

(Unit: US\$)

| Year | 2000 | 2003 | 2005 | 2010 | 2014 |
|---------------|---------------|---------------|----------------|----------------|----------------|
| Export | 5,650,890,618 | 9,249,797,498 | 10,725,959,636 | 10,790,444,938 | 18,441,498,306 |
| Import | 340,678,771 | 463,781,826 | 513,675,905 | 723,501,458 | 1,209,094,288 |
| Trade Balance | 5,310,211,847 | 8,786,015,672 | 10,212,283,731 | 10,066,943,480 | 17,232,404,018 |

Source : Own

As you can see <Table 9>, Korea shows export excess phenomenon as 2 times 18 times larger than import during 2000-2014.

Trade favorable phenomenon between 2 country's industries has been continued, however, after 2010, trade balance drops rather than 2005 which means there was economic crisis worldwide in 2009 as mentioned earlier, it shows that Korean car sales volume has been increased sharply during past 14 years.

4. Structural Analysis for Korea-USA Car Industry

4.1. Empirical analysis model for Korea-USA Car Industry

In order to understand the competitiveness of the automobile industry between Korea and USA, some of the more traditional method of analysis such as trade intensity index, trade specialization index and revealed comparative advantage index are used to conduct this research.

Each measuring index for competitiveness index could be problem is implied because it is fragmentary analysis method to see only one side fact. However, it is helpful to see trade structure resulting from industrial competitiveness.

Trade intensity index analyze interdependence relations of 2 country oversea market by relative trade intensity of competitiveness analysis indicator to consider overall import absorbing power of import country, comparative advantage of export country together with bilateral or global trade flow

Trade specialization index has some problems to consider only bilateral transaction of exporting and importing countries without considering the world's total trade flows.

Revealed comparative advantage index shows realized competitiveness of export country. However, it has theoretical problem that import absorbing power like market condition of import country is not taken into account at all.

Trade is realized when the point that import demand of import country meets supply power of export country.

However, revealed comparative advantage index has disadvantage that the exporting country's the relative export proportion only is considered.

We can examine specific calculation method as well as index derived from mentioned calculation. Trade intensity index presented by I.Yamazawa shows exporting country's export comparative market intensity against importing country. Thus, trade intensity index can be defined as follows;

Economic meaning of trade intensity is if I country's export proportion against j country is bigger or j country's import ratio against world total import is smaller, this index is going up.

$$I_{ij} = \frac{(X_{ij}/M_{jw})}{(X_{iw}/M_{ww})} \text{-----} (1)$$

I_{ij} = I country's trade intensity against j country

X_{iw} = I country's total export

M_{jw} = j country's total import

M_{ww} = World total import (= Total export)

In case j country export ratio among I country's total export is 1% and j country import is 1% against world total import, this index is 1. Therefore, formular<1> can be changed into formular <1'> as follows

$$I_{ij} = \frac{(X_{ij}/X_{iw})}{(M_{jw}/M_{ww})} \text{-----} (1)'$$

numerator of formular(1)' shows I country's share to j country's market and denominator of formular(1)' shows I country's world market share.

Namely, this index means I country's world market share to j country's market share, what we call it comparative market intensity.

Additionally, to make in-depth analysis about Korea-USA complementary relationship, we can measure trade specialization degree through qualitative rather than quantitative indicators.

<Formular> $TSI = \frac{X_i - M_i}{X_i + M_i}$

(X_i : certain industry export, M_i : certain industry import)

As Trade specialization index(TSI) is between maximum value +1 and minimized value -1, in case this index is larger, it means the competitiveness is strong. If it is 0, export amount equals to import volume that means the active intra-industry trade is conducted in reality. On the other hand, if it comes closer into -1 from 0, it means import specialization degree is high and if it is approaching to +1 from 0, it means export specialization degree is high. Moreover, if TSI is +1, we call it perfect export specialization, on the contrary, if TSI is -1, we call it perfect import specialization. As it is indicator of relative comparative advantage in the export, it is another indicator to evaluate designated countries for a specialized zone. TSI is available to evaluate by products, by country at a certain time including time series comparison at the same time which is useful to indicate bilateral trade or labor segregation structure.

Revealed Comparative Advantage index(RCA) is the most widely used index to express export competitiveness of certain goods.

If a country export a particular item of revealed comparative advantage index to other countries some extent large volume product rather than other countries, it is based on assumption that this country has export competitiveness.

RCA index has merit to compare competitiveness between countries that have different economic scale easily.

In case RCA index is larger than 1, which means mentioned product has comparative advantage rather than other products in his own country.

Revealed Comparative Advantage(RCA) index suggested by Balassa(2009), Kojima(2008) can be calculated as following formular.

$$\text{<Formular> RCA}_i = \frac{EX_i / WEX_i}{TEX / TWEX} \times 100$$

EX_i : i industry's export volume from a one country.

WEX_i : i industry's export amount to world market.

TEX : a one country's total export volume.

TWEX : export amount of total products to world.

If RCA index is lower than 1, which means mentioned item has comparative disadvantage rather than other item in his own country.

In the beginning, RCA index is proposed that alternative comparative advantage calculation method under the realistic condition of feasibility to take comparative production cost or comparative price data.

Consequently, it is used comprehensive indicator of comparative advantage possibility according to relative price shift caused by technical factors, factor endowments discrepancy that can be showed comparative accomplishments without attributable to a particular theory of comparative advantage including market share coming from economic size and availability of trade shift.

By taking advantage of above 3 comparative index of competitiveness, let me analyze competitiveness of Korea-USA car industry at next chapter.

4.2. Revealed Comparative Advantage Index for Korea-USA Car Industry

Now, specifically, you can calculate RCA index for Korea-USA Car Industry as follows;

<Table 10> Korean car export amount against USA

Unit: USD

| Period | Trade Flow | Reporter | Partner | HS Code | Trade value |
|--------|------------|---------------|---------|---------|----------------|
| 2000 | Export | Rep. of Korea | USA | 87 | 5,650,890,618 |
| 2005 | Export | Rep. of Korea | USA | 87 | 10,725,959,636 |
| 2010 | Export | Rep. of Korea | USA | 87 | 10,790,444,938 |
| 2014 | Export | Rep. of Korea | USA | 87 | 18,441,498,306 |

Source: own

<Table 11> Car export amount toward world market

Unit: USD

| Period | Trade Flow | Reporter | Partner | HS Code | Trade Value |
|--------|------------|----------|---------|---------|-------------------|
| 2000 | Export | world | world | 87 | 559,262,243,589 |
| 2005 | Export | world | world | 87 | 911,730,908,503 |
| 2010 | Export | world | world | 87 | 1,086,582,689,075 |
| 2014 | Export | world | world | 87 | 1,339,381,730,027 |

Source: own

<Table 12> Korean total export amount against USA

Unit: USD

| Period | Trade Flow | Reporter | Partner | HS Code | Trade Value |
|--------|------------|---------------|---------|---------|----------------|
| 2000 | Export | Rep. of Korea | USA | Total | 37,806,064,725 |
| 2005 | Export | Rep. of Korea | USA | Total | 41,499,402,451 |
| 2010 | Export | Rep. of Korea | USA | Total | 49,991,458,238 |
| 2014 | Export | Rep. of Korea | USA | Total | 62,326,903,271 |

Source: own

<Table 13> All products export amount against world market

Unit: USD

| Period | Trade Flow | Reporter | Partner | Code | Trade Value |
|--------|------------|----------|---------|-------|--------------------|
| 2000 | Export | world | world | total | 6,276,501,601,670 |
| 2005 | Export | world | world | total | 10,149,967,640,408 |
| 2010 | Export | world | world | total | 14,891,135,351,508 |
| 2014 | Export | world | world | total | 17,941,000,881,855 |

Source: own

<Table 14> RCA Index for Korea-USA Car Industry

Unit: USD

| Year | ①Korea auto export against USA/world total auto export | ②Korea total export against USA/world total commodity export | ①/② RCA value |
|------|--|--|---------------|
| 2000 | 0.010 | 0.006 | 1.667 |
| 2005 | 0.012 | 0.004 | 3.000 |
| 2010 | 0.010 | 0.003 | 3.333 |
| 2013 | 0.014 | 0.003 | 4.667 |

Source: own

Per <Table 14>, RCA index is 1.667 in 2000. As that is significantly bigger than 1, Korean car industry is considerably comparative advantage with USA compared to other industries. RCA index is 3,000 and 3,333 in 2005 and 2010 respectively which means it is much bigger than 1, and it is pretty much improved rather than 2000 as well as comparative advantage against USA is also pretty much improved compared to other industries.

RCA index is 4.667 in 2014 which is much bigger than 1 and Korean car industry has been continuously comparative advantage against USA since 2000 compared to other industries. Consequently, it indicates Korean car industry has absolutely comparative advantage against USA car industry.

4.3. Trade specialization index for Korea-USA Car Industry

Per <Table 17>, TSI is 0.852 in 2000, 0.880 in 2005, 0.860 in 2010 and 0.872 in 2014 each one that the index is approaching to +1 throughout whole research period. Even though TSI degree in 2010 is downward compared to that 2005, it is still closer to +1 and TSI degree still bounds to +1 as 0.872 in 2014.

As TSI is between maximum value +1 and minimized value -1, in case this index is higher, it means the competitiveness is strong. If it is 0, export volume equals to import volume. In case it is approaching to -1, it means import specialization degree is high and in case it is approaching to +1, it means export specialization degree is high. Consequently, Korea is comparative advantage of export specialization. On the other hand, USA is comparative advantage of import specialization based on time-serial research analysis method from 2000 to 2014.

<Table 15> Korea's car export against USA

Unit: US\$

| Period | Trade flow | Reporter | Partner | Code | Trade value |
|--------|------------|----------|---------|------|----------------|
| 2000 | Export | Korea | USA | 87 | 5,650,890,618 |
| 2005 | Export | Korea | USA | 87 | 10,725,959,636 |
| 2010 | Export | Korea | USA | 87 | 10,790,444,938 |
| 2014 | Export | Korea | USA | 87 | 18,441,498,306 |

Source : own

<Table 16> USA car export amount against Korea

Unit : US\$

| Period | Trade flow | Reporter | Partner | Code | Trade value |
|--------|------------|----------|---------|------|---------------|
| 2000 | Export | USA | Korea | 87 | 449,960,778 |
| 2005 | Export | USA | Korea | 87 | 682,309,558 |
| 2010 | Export | USA | Korea | 87 | 814,390,503 |
| 2014 | Export | USA | Korea | 87 | 1,257,218,998 |

Source: own

<Table 17> Korea Trade Specialization Index against USA

Unit: USD

| Year | ① Korea Auto export against USA - US auto export against Korea | ② Korea Auto export against USA + US auto export against Korea | ①/② TSI value |
|------|--|--|---------------|
| 2000 | 5,200,929,840 | 6,100,851,396 | 0.852 |

| | | | |
|------|----------------|----------------|-------|
| 2005 | 10,043,650,078 | 11,408,269,194 | 0.880 |
| 2010 | 9,976,054,435 | 11,604,835,441 | 0.860 |
| 2014 | 17,184,279,308 | 19,698,717,304 | 0.872 |

Source: own

4.4. Trade intensity index for Korea-USA car industry

Based on traditional trade theories, we can estimate that international trade is conducted by 2 countries, therefore, it is necessarily existing geographical and institutional barriers such as transportation cost, customs duty does not exist. Under these assumption, international trade is decided through price discrepancy. Traditional theories well verify how this price discrepancy is different under each country's production condition. However, real life that lots of countries are existing has factors(transportation cost, customs tariff) which influence price including non-price factors(cultural homogeneity and historical background) which influence trade flow as well.

Therefore, real life's trade flow is influenced by non-comparative advantage elements. We call it trade intensity analysis which shows us trade flow under lots of countries are existing. Trade intensity analysis has hypothesis that trade flow is influenced by both each country's comparative advantage structure and non-comparative advantage factor. Thus, decisive factor in trade flow explained by reviewing both previous total import & export amount and past total import & export amount. Namely, trade intensity analysis is analytical instrument for bilateral trade flow by contrasting ratio between domestic reporting country and oversea partner in the world trade, shift between domestic export product's structure and partner's import product's structure.

Per <Table 22>, degree of TII 1.259 in 2000 means export ratio of Korea against USA is higher. 1.293 in 2005 and 1.184 in 2010 show that export ratio of Korea against USA is increased until 2005 and then, it falls down in 2010. However, degree of TII bounds back from 2014 as 1.352 significantly with a large extent.

Consequently, we can figure out that trade inter-dependence between Korea and USA is pretty much bigger research period ranging from 2000 to 2014.

<Table 18> Korea's car export against USA

Unit: USD

| Period | Trade flow | Reporter | Partner | Code | Trade value |
|--------|------------|----------|---------|------|----------------|
| 2000 | Export | Korea | USA | 87 | 5,650,890,618 |
| 2005 | Export | Korea | USA | 87 | 10,725,959,636 |
| 2010 | Export | Korea | USA | 87 | 10,790,444,938 |
| 2014 | Export | Korea | USA | 87 | 18,441,498,306 |

Source: own

<Table 19> Korea's auto total export volume to world market

Unit: USD

| Period | Trade flow | Reporter | Partner | Code | Trade value |
|--------|------------|----------|---------|------|----------------|
| 2000 | Export | Korea | World | 87 | 15,265,527,149 |
| 2005 | Export | Korea | World | 87 | 37,491,234,742 |
| 2010 | Export | Korea | World | 87 | 53,445,486,945 |
| 2014 | Export | Korea | World | 87 | 72,771,812,973 |

Source: own

<Table 20> USA's auto total import volume against world market

Unit: USD

| Period | Trade flow | Reporter | Partner | Code | Trade value |
|--------|------------|----------|---------|------|-----------------|
| 2000 | Import | USA | World | 87 | 166,710,857,265 |
| 2005 | Import | USA | World | 87 | 203,247,901,957 |
| 2010 | Import | USA | World | 87 | 186,117,554,679 |
| 2014 | Import | USA | World | 87 | 253,254,439,633 |

Source: own

<Table 21> world car total export = world car total import

Unit: USD

| Period | Trade Flow | Reporter | Partner | HS Code | Trade Value |
|--------|------------|----------|---------|---------|-------------------|
| 2000 | Export | world | world | 87 | 559,262,243,589 |
| 2005 | Export | world | world | 87 | 911,730,908,503 |
| 2010 | Export | world | world | 87 | 1,086,582,689,075 |
| 2014 | Export | world | world | 87 | 1,339,381,730,027 |

Source: own

<Table 22> Korea-USA Trade Intensity Index

| Year | ①Korea export to USA/US car total import amount | ②Korea total export /world total commodity export amount | ①/② TII value |
|------|---|--|---------------|
| 2000 | 0.034 | 0.027 | 1.259 |
| 2005 | 0.053 | 0.041 | 1.293 |
| 2010 | 0.058 | 0.049 | 1.184 |
| 2014 | 0.073 | 0.054 | 1.352 |

Source: own

5. Conclusion

This study empirically analyze how Korea-USA trade dependent relationship is shifted during approximately 15 years(2000, 2005, 2010, 2014) through trade intensity index, trade specialization index and revealed comparative advantage index. By this, we can review import & export structural factor of 2

countries. Let me summarize results from empirical analysis as follows;

First, regarding to trade intensity of Korea-USA car industry, Degree of TII 1.259 in 2000 means export ratio of Korea against USA is higher. 1.293 in 2005 and 1.184 in 2010 show that export ratio of Korea against USA is increased until 2005 and then, it falls down in 2010. However, degree of TII bounds back from 2014 as 1.352 significantly with a large extent.

Consequently, we can figure out that trade inter-dependence between Korea and USA is pretty much bigger research period ranging from 2000 to 2014.

Second, TSI is 0.852 in 2000, 0.880 in 2005, 0.860 in 2010 and 0.872 in 2014 each that the index is approaching to +1 throughout whole research period. Even though TSI degree in 2010 is downward compared to that 2005, it is still closer to +1 and TSI degree still bounds to +1 as 0.872 in 2014.

As TSI is between maximum value +1 and minimized value -1, in case this index is larger, it means the competitiveness is strong. If it is 0, export volume equals to import volume. In case it is approaching to -1, it means import specialization degree is high and if it is approaching to +1, it means export specialization degree is high. Consequently, Korea is comparative advantage of export specialization. On the other hand, USA is comparative advantage of import specialization based on time-serial research analysis method from 2000 to 2014.

Third, regarding to RCA index, Per <Table 14>, RCA index is 1.667 in 2000. As that is significantly bigger than 1, Korean car industry is considerably comparative advantage with USA compared to other industries. RCA index is 3,000 and 3,333 in 2005 and 2010 respectively which means it is much bigger than 1, and it is pretty much improved rather than 2000 as well as comparative advantage against USA is also pretty much improved compared to other industries.

RCA index is 4.667 in 2014 which is much bigger than 1 and Korean car industry has been continuously comparative advantage against USA since 2000 compared to other industries. Consequently, it indicates Korean car industry has absolutely comparative advantage against USA car industry.

We can figure out that this type of business should transfer their business into USA to get profitability of enterprise.

This research conducted by 3 theories, of which Trade Specialization Index and Revealed Comparative Advantage Index resulted in same conclusions. However, Trade Intensity Index did not satisfy practical verification crystal clearly that is this research's limitation. Therefore, mentioned limitation should be overcome by means of inter-industry trade index in the next research.

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