

# 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.

&lt;Table 6&gt; 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

&lt;Table 7&gt; Automobile Import &amp; 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<sub>i</sub> : i industry's export volume from a one country.

WEX<sub>i</sub> : 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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