

Examination of Trade Imbalance between Korea and Mexico from Global Value Chain Perspective

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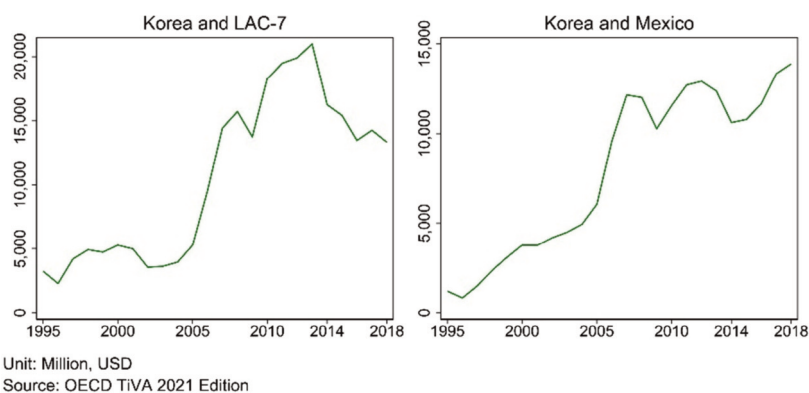
Abstract This paper analyzes the long-standing trade imbalance between Korea and Mexico based on the Global Value Chain (GVC) perspective comparing to gross exports. By decomposing gross exports into 16 value-added terms from OECD Trade in Value-Added database, various features about the trade relation between Korea and Mexico are identified. First, it is reasonable for Mexico to be dissatisfied because Korea had never recorded a trade deficit in terms of the GVC from 1995 to 2018. Second, the value-added that Korea actually obtained from trade was smaller than in terms of gross exports. Third, Mexico benefited more in terms of efficiency of trade, as the share of value-added in gross exports was larger than Korea. Fourth, the manufacturing industry was the most influential factor that caused the overall trade imbalance, while the bilateral trade relation in the service sector was the most balanced. Finally, this paper provides implications that trade policies or strategies should be established considering not only gross exports, but also value-added terms.

Key words Korea, Mexico, Trade Imbalance, Value-added, Global Value Chain

I. Introduction

Trade imbalance between countries has been one of the main topics in international economics. As seen from the US currency manipulator list of 12 countries, including Korea, Japan, China, and Germany, the trade imbalance is strongly relevant to the macroeconomic situation of a country. In particular, this issue is critical in that it is not only unsustainable, but also can cause severe economic problems such as international financial market's instability or distortion of domestic macroeconomic policies. In addition, the trade imbalance stimulates political, social, and economic conflicts between those who gain and those who lose from trade, and causes a decrease in utility because of reduced spending and consumption due to accumulation of debt. Thus, the trade imbalance between countries is one of the main issues that must be resolved.

From this perspective, it is necessary to examine the trade relation between Korea and Latin America, because it is highly imbalanced as seen in the left panel of Figure 1. The trade balance of Korea with the 7 Latin American countries, which are Argentina, Brazil, Chile, Mexico, Peru,



<Figure 1> Trade Balance of Korea with LAC-7 and Mexico

Colombia, and Costa Rica (LAC-7)¹⁾, was constantly positive from the sample period between 1995 and 2018. Furthermore, the amount of trade surplus increased from 3,231 million in 1995 to 13,328 million in 2018. Among the LAC-7, Mexico has the largest trade deficit with Korea as seen in the right panel of Figure 1. Surprisingly, the volume of trade deficit increased about 1,058% from 1,199 million in 1995 to 13,885 million in 2018. In particular, unlike the trade surplus of Korea with the LAC-7, which peaked in 2013 and turned downward, the trade deficit of Mexico with Korea continued to deteriorate. Thus, Mexico has considerable dissatisfaction with Korea in terms of trade, which hinders the development of economic relation between Korea and Mexico. For example, according to Biblioteca del Congreso Nacional de Chile (2007) and Ko, Mi-Hye (2021), the large amount of trade deficit of Mexico with Korea is one of the main reasons why the Free Trade Agreement (FTA) between them has not been completed for 16 years.

However, it is highly likely that an actual benefit from trade will be under or overestimated when the trade imbalance is analyzed on the basis of gross exports as shown in Figure 1. This is because the value-added included in the export of final products is composed of various countries, as the production network has been internationally divided since the 1990s, which is called Global Value Chain (GVC). One of the best examples to explain this phenomenon is the iPhone exports from China to the US. If analyzing the iPhone exports with the traditional approach such as Figure 1, the winner of the trade is China, not the US. However, by looking at the iPhone trade from the GVC perspective, the amount of China's trade surplus with the US on the iPhone decreases significantly.

1) The share of the LAC-7 in Latin America's GDP is 78.2% in 2020, and in Korea's total exports and imports to Latin America are 74.8% and 92.2% in 2019, respectively. Thus, this paper assumed that the LAC-7 represent the Latin America region.

This is mainly for two reasons. First, the iPhone exports of China include the value-added from various countries such as Korea, Japan, and Germany, in addition to the US and China. Second, the US is in charge of an industry that creates greater value-added than China in the iPhone production process. Thus, one of the lessons from the iPhone exports case is that trade relations should be analyzed in terms of value-added, not the gross exports, in the GVC era. If the structure of value-added between countries is not accurately captured, there is the possibility that a country's trade policy is established in the wrong direction.

Based on the GVC perspective, this paper aims to examine the long-standing trade imbalance between Korea and Mexico. The main contributions of this paper are summarized as follows. First, compared to Korea's trade relationship with the LAC-7, this paper identifies the characteristics of the trade imbalance with Mexico in terms of gross exports and GVC, respectively. Second, to deeply understand the structure of trade imbalance between them, it applies a couple of GVC indicators. Third, this paper identifies which industries have a larger impact on the trade imbalance. Fourth, it tries to provide implications that trade policies or strategies should be established considering not only gross exports, but also value-added terms.

The remainder of this paper is organized as follows. Section II introduces previous literatures. Section III documents the data and methodology to solve the research question. Section IV shows analyzed results, and Section V draws implications.

II. Literature Review

Regarding the trade relationship between Korea and Mexico, most of the previous studies focused on the necessity of economic cooperation

between them in the direction of economic growth in Mexico through Korea's development experiences (Reyes and Alegría, 2004; López Jiménez *et al.*, 2012; Romero Castilla, 2012; Merritt Tapia, 2012; Berasaluce and Romero, 2017). Reyes and Alegría (2004) argued that Korea is considered one of the most important partners to Mexico, and it is necessary to expand their economic cooperation towards more diverse fields such as technology. Merritt Tapia (2012) analyzed that most Mexican industries, which were dominated by low-tech and low-skilled labor, require more innovation because the degree of technology transfer from Korea to Mexico was not as significant as expected. In other words, Mexico should continue to learn more diverse experiences through cooperation with Korea.

There are several literatures regarding the negotiation of FTA between Korea and Mexico. Mun and Quintana (2003) stated that Mexico was one of the means to enter the North American Market for Korea, since Mexico is a member of the North America Free Trade Agreement. Contrary to the studies that the completion of the FTA with Korea would have a positive effect on Mexico (Palacios, 2012; Quintana *et al.*, 2020), other literatures analyzed the reasons why the FTA was not concluded (López Aymes, 2011; López and Díaz, 2012; Santa Gadea, 2015; Montes Incin, 2016). They argued that a few Mexican industries opposed the realization of the FTA because of the concerns about the increase of Mexico's trade deficit with Korea, due to the low competitiveness of production and the uncertain effect of technology transfer from Korea to Mexico. In particular, López Aymes (2012) documented that the conclusion of the FTA only made it easier for Korean companies to enter the US market. That is, the FTA was not beneficial to Mexico. Lopez and Díaz (2012) indicated that negotiation between Korea and Mexico was not successful due to the perception of Mexican business groups about

their weakness to the competition of Korean industries. This was confirmed with increased volume of trade imbalance and the attitude of Mexican business groups towards any type of trade agreement.

When it comes to the trade imbalance, most previous literatures documented that trade imbalance caused various conflicts between those who gain and those who lose from trade (Frieden, 2009; Kim, Dong-Hun, 2011; Cho, Jong-Hwa *et al*, 2014; Park, Sang-Chul, 2018; Kim, Hee-Jun and Pak, Myong-Sop, 2020). Park (2018) figured out that the countries with trade surplus tended to maintain their political measures to sustain the amount of surplus, whereas the countries with trade deficit shifted their policies from strengthening free trade to increasing protectionism, causing trade conflicts. Kim and Pak (2020) found that trade disputes could hinder the overall global economic flow, in addition to negative effects between countries.

In terms of the GVC approach, most studies introduced the concept of value-added as a new trade measurement methodology (Lee, Woo-Ki *et al*, 2013; Elms and Low, 2013; Koopman *et al*, 2010; Xu, 2012; Kim, Il-Gwang, 2017; Lim, Sang-Soo and Lee, Jong-Ha, 2021; Ahmad, 2013; Javorsek and Camacho, 2015; Stehrer, 2012). They showed that there were large differences between the trade balances measured by gross exports and value-added, respectively. Given that trade disputes may come from trade imbalance, it is essential to evaluate trade relations in terms of value-added, not gross exports.

In summary, since the transactions among countries proceed under the GVC system, the use of value-added criteria, rather the traditional gross exports approach, accurately captures the effects from trade. Therefore, the trade relationship between Korea and Mexico should be analyzed from the GVC perspective.

III. Data and Methodology

In this section, this paper documents the most suitable database for this research, how to extract the pure amount of value-added terms in its gross exports, and which GVC indicators were selected.

There are various databases that provide an international input-output table, which is essential when deriving value-added terms. Among the major databases such as World Input-Output Tables (WIOT), OECD Trade in Value Added (TiVA), and Eora Multi Region Input-Output (MRIO), this paper selected the recent TiVA published in 2021, which covers 45 unique industrial sectors²⁾ and 66 countries from all over the world between 1995 and 2018. The reasons are as follows.

First, the TiVA database has a good balance between the number of industries and countries. In terms of industries, the WIOT with 56 industries was the best. However, since 28 out of 43 samples were European countries in the WIOT, the proportion of developing countries was relatively small; no Latin American countries were included, except for Brazil and Mexico. When it comes to countries, the MRIO with 190 countries was more inclusive than the TiVA, whereas the number of industries in the MRIO was only 26, which was about 57.8% of the TiVA.³⁾ Second, the TiVA includes several relatively important Latin American countries from the economic perspective, which are Argentina, Brazil, Chile, Mexico, Peru, Colombia, and Costa Rica.

To decompose gross exports into value-added terms, this paper applied the methodology developed by Wang, Wei, and Zhu (2013) among other techniques, because it is the best method to analyze bilateral trade relations

2) Please refer to Appendix A to see 45 industries covered in the TiVA database.

3) To extract the exact amount of value-added of a country, it is advantageous to have a large number of industries.

from the value-added perspective. Other methodologies, such as Johnson and Noguera (2012) and Koopman, Wang, and Wei (2014), do not guarantee the consistency of aggregate of all value-added terms at the bilateral level. For example, in the case of Koopman *et al.* (2014), gross exports are divided into 9 value-added terms. However, when combining all 9 value-added terms, the aggregate frequently exceeds its gross exports within the bilateral level. Thus, this paper used the methodology by Wang *et al.* (2013) to solve this inconsistency.

The decomposition methodology is briefly introduced as follows. It is assumed that the world's trade consisted of N countries and K industries. The decomposition matrix is constructed as

$$\begin{bmatrix} X^1 \\ X^2 \\ \vdots \\ X^N \end{bmatrix} = \begin{bmatrix} Z^{11} & Z^{12} & \dots & Z^{1N} \\ Z^{21} & Z^{22} & \dots & Z^{2N} \\ \vdots & \vdots & \ddots & \vdots \\ Z^{N1} & Z^{N2} & \dots & Z^{NN} \end{bmatrix} + \begin{bmatrix} \sum_{r=1}^N Y^{1r} \\ \sum_{r=1}^N Y^{2r} \\ \vdots \\ \sum_{r=1}^N Y^{Nr} \end{bmatrix} \quad (1)$$

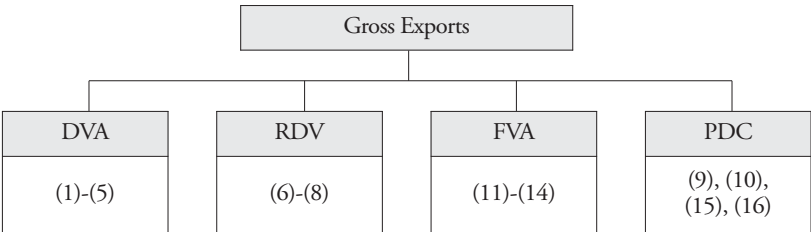
where X^s is the $K \times 1$ industrial output vector of country $s \in N$, Z^{sr} is the $K \times K$ industrial intermediate transaction matrix of country s to $r \in N$, and Y^{sr} is the $K \times 1$ industrial final demand vector of country s to r .

After dividing the right matrix in Equation (1) into the $K \times K$ input coefficient matrix of country s to r (A^{sr}) and the $K \times 1$ global final demand vector of country s (Y^s), if using the Leontief inverse function and substitution method, Equation (1) is finally derived as follows:

$$\begin{bmatrix} B^{11} & B^{12} & \dots & B^{1N} \\ B^{21} & B^{22} & \dots & B^{2N} \\ \vdots & \vdots & \ddots & \vdots \\ B^{N1} & B^{N2} & \dots & B^{NN} \end{bmatrix} = \begin{bmatrix} I - A^{11} & -A^{12} & \dots & -A^{1N} \\ -A^{21} & I - A^{22} & \dots & -A^{2N} \\ \vdots & \vdots & \ddots & \vdots \\ -A^{N1} & -A^{N2} & \dots & -A^{NN} \end{bmatrix}^{-1}$$

where B^{sr} is the $K \times K$ output multiplier matrix of country s to r , and I

is the $K \times K$ identity matrix.⁴⁾ Consequently, gross exports are divided in 16 value-added terms as shown in Appendix B, and they are summarized in the 4 categories, which are Domestic Value-Added (DVA), Returned Domestic Value-Added (RDV), Foreign Value-Added (FVA), and Pure Double Counted Terms (PDC) in Figure 2. The DVA represents the value-added contribution of home country to the exports. The RDV means the value-added that is exported from home country and returned back to the same home country. Third, the FVA shows the value-added portion of home country's exports contributed by foreign countries. Fourth, the PDC represents the amount of double counting that occurs when intermediate goods cross multiple borders and stages of production.



Note: The numbers in parentheses indicate each of 16 value-added terms.

<Figure 2> 4 Categories in Gross Exports

Since the objective of this paper is focused on the examination of the trade imbalance and relationship between Korea and Mexico in terms of the GVC, the following indicators were used. First, the DVA is the key indicator for this paper⁵⁾, because the difference of trade imbalance

4) The detailed explanation of the methodology is not the objective of this paper. Please refer to Wang *et al.* (2013) for the entire process of decomposition.

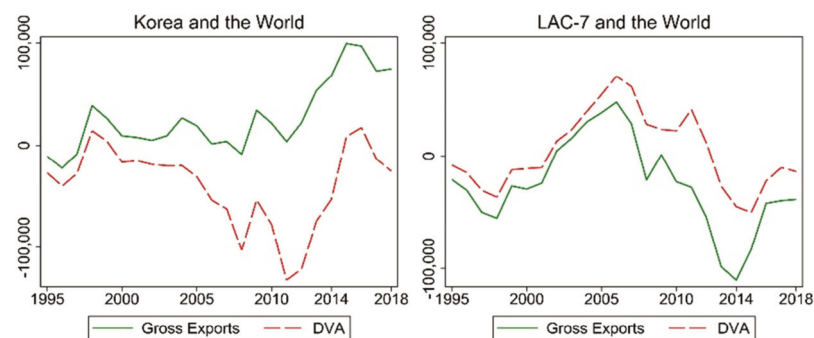
5) Instead of using DVA, the sum of DVA and RDV can be regarded as the value-added created by home country. However, since the amount of RDV is substantially small compared to other value-added terms, this paper did not consider RDV.

between gross exports and value-added perspective is the main interest. Second, to analyze the value-added trade relationship in depth, this paper additionally reports the FVA, the Value-Added Exports Ratio (VAX), which is the share of value-added created by a country in gross exports.⁶⁾

IV. Results

1. Analysis Results for the Whole Industry

Before examining the bilateral trade imbalance between Korea and Mexico in detail, this paper briefly demonstrates the trade relations of Korea and the LAC-7 with the world as shown in Figure 3. In terms of gross exports (green solid line), while Korea had a trade surplus during the sample period between 1995 and 2018, the LAC-7 had a trade deficit in general.⁷⁾ However, from the DVA (red long-dash line) perspective, the results are totally different. In most cases, Korea had a trade deficit with



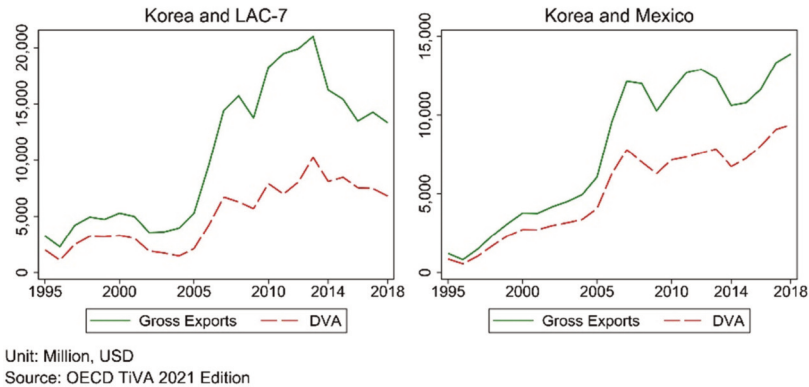
Unit: Billion, USD

Source: OECD TIVA 2021 Edition

<Figure 3> Trade Imbalance of Korea and the LAC-7 with the World

6) Since the amount of RDV is small, this paper the VAX ratio as equal to DVA ratio.

7) Please note that the trade relations constructed by this paper, which calculate the difference between exports of home country and of partner country, are slightly different from the commonly used ones, which subtract imports from exports.



<Figure 4> Trade Imbalance of Korea with LAC-7 and Mexico

the world, whereas LAC-7's deficit turned into a surplus, or the amount of trade deficit decreased. In addition, the gap between gross exports and DVA trade imbalances is larger in Korea than the LAC-7.

Figure 4 shows the trade imbalances of Korea with the LAC-7 and Mexico, respectively. Some remarkable features are as follows. First, in terms of gross exports, the results of Figure 4 are similar to the trade pattern between Korea and the world. That is, Korea had a significant trade surplus from trade with the LAC-7 and Mexico. However, while Korea had a trade deficit with the world from the DVA perspective, Korea had never recorded a trade deficit with the LAC-7 and Mexico during the entire sample period of 24 years. Thus, it is reasonable for the LAC-7 and Mexico to be dissatisfied with the trade with Korea. In other words, the LAC-7 and Mexico are lucrative markets for Korea.

Second, according to Table 1, the gap between gross exports and DVA trade imbalances with Mexico is smaller than with the LAC-7. For example, from 2016 to 2018, the VAX of Korea is 68.4% on average, which is 15.3% higher than the LAC-7. This has two implications. On the one hand, the amount of trade imbalance between Korea and Mexico

<Table 1> Trade Imbalance of Korea with LAC-7 and Mexico

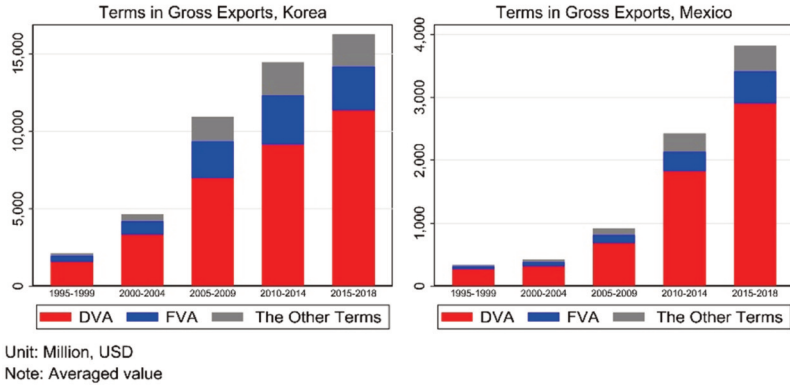
Year	With LAC-7			With Mexico		
	Exports	DVA	VAX (%)	Exports	DVA	VAX (%)
1995	3,231	1,991	61.6	1,199	848	70.7
1996	2,277	1,098	48.2	813	549	67.5
1997	4,196	2,490	59.3	1,481	1,039	70.2
1998	4,920	3,201	65.1	2,360	1,709	72.4
1999	4,725	3,173	67.2	3,096	2,324	75.1
2000	5,275	3,276	62.1	3,770	2,722	72.2
2001	4,990	3,033	60.8	3,755	2,711	72.2
2002	3,555	1,891	53.2	4,178	2,986	71.5
2003	3,617	1,725	47.7	4,494	3,165	70.4
2004	3,952	1,462	37.0	4,945	3,373	68.2
2005	5,268	2,104	39.9	6,052	4,064	67.2
2006	9,536	4,214	44.2	9,571	6,265	65.5
2007	14,422	6,710	46.5	12,149	7,816	64.3
2008	15,716	6,272	39.9	12,006	7,013	58.4
2009	13,747	5,689	41.4	10,272	6,283	61.2
2010	18,264	7,904	43.3	11,551	7,150	61.9
2011	19,482	6,967	35.8	12,700	7,336	57.8
2012	19,907	8,043	40.4	12,902	7,604	58.9
2013	21,005	10,233	48.7	12,365	7,854	63.5
2014	16,252	8,095	49.8	10,617	6,728	63.4
2015	15,417	8,455	54.8	10,786	7,245	67.2
2016	13,477	7,535	55.9	11,648	8,068	69.3
2017	14,267	7,476	52.4	13,326	9,090	68.2
2018	13,328	6,801	51.0	13,885	9,387	67.6

Unit: Million, USD

Source: OECD TiVA 2021 Edition

decreased from the GVC perspective. That is, the value-added that Korea actually obtained from trade with Mexico was smaller than the traditional approach. On the other hand, Korea still created more value-added with Mexico compared to the LAC-7.

Third, the difference between gross exports and DVA trade imbalances increased from 1995 to 2013, and then decreased slightly to 2018. This



<Figure 5> DVA, FVA, and the Other Terms in Gross Exports

trend is in line with structural changes in the GVC. In general, the GVC expanded largely from 1990s to 2010s, and stagnated from 2010s to 2020s.

Then, why did the amount of trade imbalance between Korea and Mexico decrease in terms of the GVC compared to the traditional approach? As shown in Figure 5, the volumes and ratios of the 3 value-added terms in gross exports, the DVA, FVA, and the other terms, of Korea and Mexico are different. According to the left panel in Figure 5 which represents Korea's exports to Mexico, the amount of DVA steadily increased for the sample period. However, the VAX decreased from 73.4% in 1995-1999 to 69.9% in 2015-2018, and the percentage was the lowest at 63.3% between 2010 and 2014 as shown in Table 2. This is because of the increase of both the FVA and the other terms. When it comes to Mexico's exports to Korea, the absolute amount of DVA was smaller than Korea's DVA. However, as the VAX was larger than Korea for the entire sample period, Mexico benefited more than Korea in terms of efficiency of trade.

<Table 2> 3 Value-added Structure of Korea and Mexico

Year	Korea to Mexico			Mexico to Korea		
	DVA	FVA	The Others	DVA	FVA	The Others
1995-1999	1,558 (73.4)	395 (18.6)	169 (8.0)	264 (79.6)	46 (14.0)	22 (6.5)
2000-2004	3,306 (71.2)	880 (18.9)	459 (9.9)	314 (75.6)	68 (16.3)	34 (8.2)
2005-2009	6,967 (63.7)	2,405 (22.0)	1,559 (14.3)	679 (73.8)	127 (13.8)	115 (12.5)
2010-2014	9,160 (63.3)	3,128 (21.6)	2,172 (15.0)	1,826 (75.0)	307 (12.6)	302 (12.4)
2015-2018	11,352 (69.9)	2,813 (17.3)	2,069 (12.8)	2,905 (76.0)	500 (13.1)	419 (11.0)

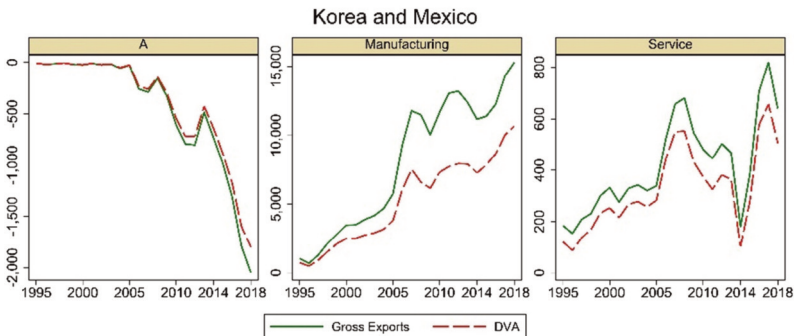
Note: Parentheses are the VAXs in gross exports.

Unit: Million, USD

Source: OECD TiVA 2021 Edition

2. Analysis Results for the Classified Industries

To deeply understand the structure of trade imbalance between Korea and Mexico, this paper further reports the trade relationship in terms of 3 classified industries from Figure 6, which are agriculture, forestry, fishing, and mining (A), manufacturing, and service. Before looking at Figure 6, this paper introduces 2 steps for the classification. First, the 45 industrial



Unit: Million, USD

Note: A denotes Agriculture, forestry, fishing, and mining industries

<Figure 6> Trade Imbalance in terms of Classified Industries

<Table 3> The 4 Categories corresponding to KSIC

N.	Categories	KSIC	Industries
1	Agriculture, forestry, fishing, and mining industries	A	Agriculture, forestry, and fishing
2		B	Mining and quarrying
3	Manufacturing	C	Manufacturing
4	Service	D	Electricity, gas, steam, and air conditioning supply
5		E	Water supply; sewage, waste management, materials recovery
6		F	Construction
7		G	Wholesale and retail trade
8		H	Transportation and storage
9		I	Accommodation and food service activities
10		J	Information and communication
11		K	Financial and insurance activities
12		L	Real estate activities
13		M	Professional, scientific, and technical activities
14		N	Business facilities management and business support services; rental and leasing activities
15		O	Public administration and defense; compulsory social security
16		P	Education
17		Q	Human health and social work activities
18		R	Arts, sports, and recreation related services
19		S	Membership organizations, repair and other personal services
20	Etc.	T	Activities of households as employers; undifferentiated goods-and services-producing activities of households for own use

Source: KSSC (<http://kssc.kostat.go.kr>, 2022.01.10.)

sectors provided by the TiVA corresponded to 20 Korea Standard Industry Code (KSIC) as shown in Appendix A. Second, the 20 industries were reclassified into the 4 categories in Table 3.⁸⁾

The major features of each category are as follows. When it comes to

8) In this paper, the values corresponding to the etc. was not reported, because there was no value in the etc. in the trade relation between Korea and Mexico.

<Table 4> Trade Imbalances by 3 Classifications

Year	A		Manufacturing		Service	
	GE	DVA	GE	DVA	GE	DVA
1995	-7	-7	1,022	734	184	120
1996	-20	-19	680	481	153	87
1997	-14	-13	1,286	915	209	137
1998	-6	-6	2,135	1,545	231	170
1999	-22	-20	2,818	2,110	301	233
2000	-25	-23	3,463	2,492	332	253
2001	-10	-9	3,490	2,505	275	215
2002	-25	-23	3,874	2,741	329	268
2003	-17	-15	4,168	2,903	343	277
2004	-58	-52	4,682	3,167	321	258
2005	-28	-25	5,741	3,806	339	283
2006	-261	-233	9,311	6,056	521	443
2007	-291	-262	11,783	7,528	657	550
2008	-159	-142	11,485	6,602	681	553
2009	-329	-297	10,056	6,148	545	432
2010	-607	-546	11,676	7,322	482	375
2011	-793	-721	13,047	7,731	446	326
2012	-802	-720	13,201	7,942	503	382
2013	-484	-427	12,381	7,917	469	364
2014	-731	-640	11,168	7,266	180	102
2015	-983	-885	11,386	7,853	384	277
2016	-1,307	-1,174	12,248	8,664	707	577
2017	-1,793	-1,598	14,299	10,032	820	657
2018	-2,050	-1,799	15,295	10,680	640	506

Note: GE denotes Gross Exports.

Unit: Million, USD

Source: OECD TiVA 2021 Edition

the (A), Korea had a trade deficit with Mexico in terms of both gross exports and value-added for the sample periods, unlike the other categories. The amount of DVA trade deficit expanded from 7 million USD in 1995 to 1,799 million USD in 2018 as shown in Table 4. In addition, the gap between gross exports and DVA trade imbalances was

small compared to the others. In the case of the manufacturing, Korea had the largest amount of trade surplus from both gross exports and GVC perspectives. That is to say, the manufacturing was the most influential factor that caused the overall trade imbalance between Korea and Mexico for the entire sample periods. The volume of trade imbalance increased about 14.6 times from 734 million USD in 1995 to 10,680 million USD in 2018 in terms of the GVC. Also, there was a large difference between gross exports and DVA trade imbalances, and the gap widened over time. In other words, although Korea had a large surplus with Mexico, the actual benefit that Korea obtained from trade was less than it appeared. Regarding the service category, the amount of trade imbalance in terms of both gross exports and value-added was less than the (A) and manufacturing. That is, the bilateral trade relation in the service sector is the most balanced among the 3 categories between Korea and Mexico. In addition, there were large fluctuations in the service sector. Thus, a specific dynamic pattern could not be found unlike the generally decreasing trend of the (A) and increasing trend of the manufacturing.

This paper additionally documented the trade imbalances between Korea and Mexico for the 17 industries related to the manufacturing, which had the greatest influence on the overall trade imbalance, in Table 5 and Figure 7. The main results are summarized as follows.

First, the computer, electronic and optical equipment (26), the machinery and equipment (28), and the motor vehicles, trailers, and semi-trailers (29) had the greatest impact on the trade imbalance between Korea and Mexico in the manufacturing from both gross exports and DVA perspectives. In particular, the amount of trade imbalance of the computer, electronic and optical equipment (26) was the largest among the 17 industries. This suggests that resolving the trade imbalances in these 3 industries is important for the overall trade relationship between Korea and Mexico.

<Table 5> Trade Imbalances of 17 Industries in Manufacturing

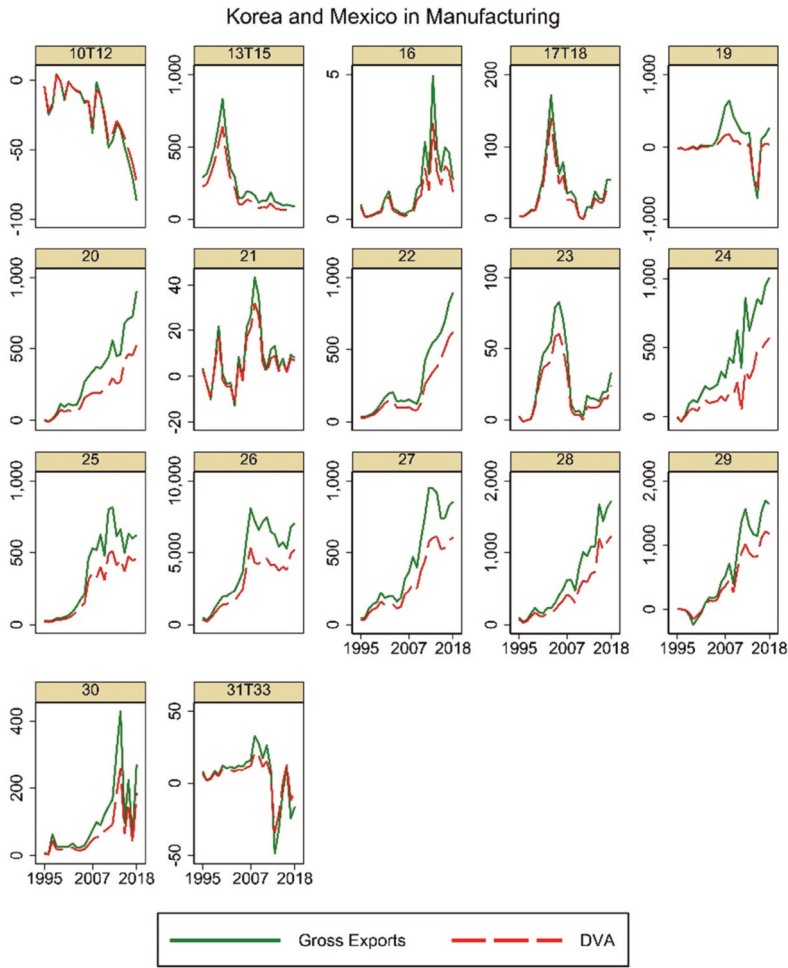
Code	Name	1995		2007		2018	
		GE	DVA	GE	DVA	GE	DVA
10T12	Food products, beverages, and tobacco	-4	-4	-38	-33	-87	-73
13T15	Textiles, textile products, leather, and footwear	287	225	186	127	90	59
16	Wood and products of wood and cork	1	0	0	0	1	1
17T18	Paper products and printing	3	2	34	26	53	42
19	Coke and refined petroleum products	-14	-14	562	170	266	38
20	Chemical and chemical products	3	-3	341	192	906	525
21	Pharmaceuticals, medicinal chemical and botanical products	4	3	26	21	8	7
22	Rubber and plastics products	40	29	157	107	897	619
23	Other non-metallic mineral products	3	2	49	34	33	24
24	Basic metals	-1	-8	282	113	1,008	567
25	Fabricated metal products	529	359	623	460	506	358
26	Computer, electronic and optical equipment	506	358	8,053	5,331	7,019	5,226
27	Electrical equipment	45	32	365	239	857	606
28	Machinery and equipment	101	74	624	415	1,724	1,227
29	Motor vehicles, trailers, and semi-trailers	5	4	521	367	1,641	1,170
30	Other transport equipment	8	5	75	47	272	186
31T33	Manufacturing; repair and installation of machinery and equipment	8	7	16	12	-16	-5

Note: GE denotes Gross Exports.

Unit: Million, USD

Source: OECD TiVA 2021 Edition

Second, the chemical and chemical products (20), the rubber and plastics products (22), the basic metals (24), the machinery and equipment (28), and the motor vehicles, trailers, and semi-trailers (29) had significant increase in trade imbalance in 2018 compared to 2007. Among these 5



<Figure 7> Trade Imbalances of 17 Industries in Manufacturing

industries, the machinery and equipment (28) and the motor vehicles, trailers, and semi-trailers (29), are specifically important for the development of trade relations between Korea and Mexico because they increased rapidly from 2007 to 2018, and the volume of the imbalance was significantly large.

Third, unlike the pattern of trade imbalance in the manufacturing, there were also industries where trade relations were fairly equitable, which were the wood and products of wood and cork (16), the paper products and printing (17T18), the pharmaceuticals, medicinal chemical and botanical products (921), the other non-metallic mineral products (23), and the manufacturing; repair and installation of machinery and equipment (31T33).

Fourth, contrary to the trend of trade imbalance in manufacturing, Korea had a trade deficit in the food products, beverages, and tobacco (10T12). Also, the fact that the amount of trade deficit expanded over time is noteworthy that it is differentiated from the other industries. In addition, in the case of the manufacturing; repair and installation of machinery and equipment (31T33), the trade relationship turned from a surplus in 2007 to a deficit in 2018.

V. Concluding Remarks

This paper examined the long-standing trade imbalance between Korea and Mexico on the basis of the GVC perspective compared to the gross exports. By using the TiVA database and the decomposition methodology developed by Wang, Wei, and Zhu (2013), this paper identified various features about the bilateral relations as follows.

First, from the DVA perspective, it is reasonable for Mexico to be dissatisfied with the trade with Korea, because Korea had never recorded a DVA trade deficit with Mexico for the entire sample periods of 24 years. Second, the amount of trade imbalance between Korea and Mexico decreased from the GVC perspective. Third, the value-added that Korea actually obtained from trade with Mexico was smaller than the traditional gross exports approach. The reason was because the VAX of Mexico was

larger than Korea for the entire sample periods. In other words, Mexico benefited more than Korea in terms of efficiency of trade. Fourth, when it comes to the 3 classified industries, Korea had the largest amount of surplus from both gross exports and GVC perspectives in manufacturing. In terms of DVA, the volume of trade imbalance increased about 14.6 times from 1995 to 2018. That is to say, the manufacturing was the most influential factor that caused the overall trade imbalance. Fifth, the bilateral trade relation in the service sector was the most balanced among the 3 classifications. Sixth, in terms of both increasing rate and the volume of trade imbalance, the machinery and equipment, and the motor vehicles, trailers, and semi-trailers are specifically important for the development of trade relations between Korea and Mexico. Seventh, unlike the pattern of trade imbalance in the manufacturing, there were also industries where trade relations were fairly equitable. Finally, contrary to the trend of trade imbalance in manufacturing, Korea had a trade deficit in the food products, beverages, and tobacco.

In conclusion, this paper demonstrated that the interpretation of trade imbalance based on gross exports could erroneously measure the actual benefits between countries. In fact, the degree of trade imbalance between Korea and Mexico significantly decreased from the GVC perspective. Therefore, when establishing policies or strategies based on trade relations between them, it is necessary to look at it from the GVC perspective in addition to the gross exports.

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Appendix A. Correspondence Table between KSIC and TIVA Database

KSIC	TIVA		KSIC	TIVA	
	Code	Name		Code	Name
A	01T03	Agriculture, hunting, forestry	D	35	Electricity, gas, steam, and air conditioning supply
	03	Fishing and aquaculture	E	36T39	Water supply; sewerage, waste management and remediation activities
B	05T06	Mining and quarrying, energy producing products	F	41T43	Construction
	07T08	Mining and quarrying, non-energy producing products	G	45T47	Wholesale and retail trade; repair of motor vehicles
	09	Mining support service activities		49	Land transport and transport via pipelines
	10T12	Food products, beverages, and tobacco		50	Water transport
	13T15	Textiles, textile products, leather, and footwear	H	51	Air transport
	16	Wood and products of wood and cork		52	Warehousing and support activities for transportation
	17T18	Paper products and printing		53	Postal and courier activities
	19	Coke and refined petroleum products	I	55T56	Accommodation and food service activities
	20	Chemical and chemical products		58T60	Publishing, audiovisual, and broadcasting activities
	21	Pharmaceuticals, medicinal chemical and botanical products	J	61	Telecommunications
	22	Rubber and plastics products		62T63	IT and other information services
	23	Other non-metallic mineral products	K	64T66	Financial and insurance activities
C	24	Basic metals	L	68	Real estate activities
	25	Fabricated metal products	M	69T75	Professional, scientific, and technical activities
	26	Computer, electronic and optical equipment	N	77T82	Administrative and support services
	27	Electrical equipment	O	84	Public administration and defense; compulsory social security
	28	Machinery and equipment	P	85	Education
	29	Motor vehicles, trailers, and semi-trailers	Q	86T88	Human health and social work activities
	30	Other transport equipment	R	90T93	Arts, entertainment, and recreation
	31T33	Manufacturing; repair and installation of machinery and equipment	S	94T96	Other service activities
			T	97T98	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use

Note: Author's construction.

Source: KSSC (<http://kssc.kostat.go.kr>, 2022.01.10.) and OECD (<https://www.oecd.org>, 2022.01.10.)

Appendix B. 16 Value-added Terms in Gross Exports from Country s to r

Term	Label	Description
1	DVA_FIN	DVA embodied in final exports
2	DVA_INT	DVA in intermediate exports used by direct importer r to produce local final products
3	DVA_INTTrexI1	DVA in intermediate exports used to produce intermediates that are re-exported to third countries for production of local final products
4	DVA_INTTrexF	DVA in intermediate exports used by r to produce final products that are re-exported to third countries
5	DVA_INTTrexI2	DVA in intermediate exports used by r to produce intermediates that are re-exported to t for the latter's production of final exports that are shipped to other countries except country s
6	RDV_FIN	DVA that returns home via its final imports from r
7	RDV_FIN2	DVA that returns home via final imports from third countries
8	RDV_INT	DVA that returns home via its intermediate imports and used to produce domestic final products
9	DDC_FIN	DVA embodied in its intermediate exports to country r but returns home as its intermediate imports, and used for production of its final exports
10	DDC_INT	DVA in intermediate exports to country r that returns home as intermediate imports and used for production of its intermediate exports
11	MVA_FIN	FVA from the importer r embodied in final exports
12	OVA_FIN	FVA from other countries t embodied in final exports
13	MVA_INT	FVA from the importer r embodied in intermediate exports, which are then used by r to produce its domestic final goods
14	OVA_INT	FVA from third country t embodied in intermediate exports, which are then used by country r to produce its local final goods
15	MDC	FVA from the importer r embodied in intermediate exports to produce its exports
16	ODC	FVA from third country t embodied in intermediate exports to produce its exports to the world

Note: This paper organized this table referring to Wang *et al.* (2013).

Examinación del Desequilibrio Comercial entre Corea y México desde la Perspectiva de las Cadenas de Valor Mundiales

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Abstract Este documento analiza el desequilibrio comercial entre Corea y México en la perspectiva de las Cadenas de Valor Mundiales (GVC) comparado a las exportaciones brutas. Al descomponer las exportaciones brutas en 16 términos de valor agregado con la base de datos de OECD Trade in Value-Added, se determinan varias características sobre la relación comercial entre Corea y México. Primero, es razonable que México este insatisfecho porque Corea nunca había registrado un déficit comercial en términos de la GVC desde 1995 a 2018. Segundo, el valor agregado que Corea obtuvo realmente del comercio fue menor que en términos de exportaciones brutas. Tercero, México se benefició más en términos de eficiencia comercial, en el sentido que la porción del valor agregado en las exportaciones brutas fue mayor que la de Corea. Cuarto, la industria manufacturera fue el factor que más influyó en el desequilibrio comercial en general, mientras que la relación comercial bilateral en el sector de los servicios fue las más equilibrada. Finalmente, este documento brinda implicaciones de que las políticas o estrategias comerciales deben establecerse considerando no solo las exportaciones brutas, sino también el valor agregado.

Palabras clave Corea, México, Desequilibrio Comercial, valor Agregado, Cadenas de Valor Mundiales