

# **The Impacts of the COVID-19 Pandemic on Automobile Production and the Global Value Chain of Automotive Parts**

Toshiyuki BABA, Hosei Univ

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COVID-19, The Global Financial Crisis, Global Value Chain, Automotive Parts, Supply Chain, Trade

## **1. Purpose of Study**

This study aims to analyze the impact of the coronavirus disease 2019 (COVID-19) pandemic on the global value chain (GVC) of the automobile industry. Notably, the first COVID-19 case was reported in China in December 2019. The ferocity of the COVID-19 pandemic acts upon every human activity nowadays, especially since 2020. The automotive industry has also been significantly greatly influenced by this pandemic. According to OICA, automobile production in 2019 was 91,786,861 units in worldwide, and it decreased to 77,621,582 units in 2020. Comparing 2020 with 2019, automobile production shrank by 15%. The automotive industry is notable for its huge GVC. This 15% reduction in automobile production is expected to significantly affect the GVC of the automotive industry. In recent times, the GFC had a substantial impact on the automotive industry. In this study, we endeavor to comprehensively analyze the influence of the COVID-19 pandemic on the GVC of the automotive industry in every country, while comparing the findings with the GFC. The GFC was occasioned by the collapse of Lehman Brothers in 2008, which massively affected the automotive industry in 2009.

## **2. Method of Study**

To evaluate the influence of the COVID-19 pandemic on the GVC of the automotive industry, we adopt two approaches. We calculated the influence on automobile production using raw data from OICA<sup>i</sup>. Furthermore, we calculated the influence on the GVC of automotive parts with raw data from Comtrade<sup>ii</sup>. We focus on two periods: one is from 2019 to 2020 to observe the influence of the COVID-19 pandemic, while the other period is from 2008 to 2009 to appraise the GFC.

Regarding trade data, we use Harmonized Commodity Description and Coding

System Codes (HS codes)—HS 8708—which is the representative code of automotive parts. Notably, HS 8708 includes several components, such as bumpers, seat belts, body parts, brakes, gear boxes, driving axles, wheels, suspensions, radiators, exhausts pipes, clutches, huddles, air bags, and various other automotive parts. We will observe all the countries involved in the GVC of automotive parts and select the top 20 countries.

To evaluate the influence of the COVID-19 pandemic on the GVC of the automotive industry, we observe four sides of the GVC: a supply side, a demand side, a total trade size, and a characteristic of trade. A supply (demand) side is observed via an export (import) statistic, while a total trade size is an export plus import. To observe a characteristic of trade, we use the trade specialization index (TSI). The TSI formula is presented as follows:  $GCI = (\text{export} - \text{import}) / (\text{export} + \text{import})$ . The TSI takes values from -1 to +1. A TSI value of zero implies that the export and the import are the same in that country. As the TSI approaches +1, the export is larger than the import in that country. A TSI value of +1 means that only export and no import occur in that country. As the TSI approaches -1, the import is larger than the export, and a TSI value of -1 means only import and no export transpire in that country.

Regarding monetary value, we assumed that the 2008 and 2009 values were the same. Similarly, we assumed that the 2019 and 2020 values were the same.

### **3. Prompt Results**

In 2019, the number of participating countries in the GVC of automotive parts GVC was 153, and it dropped to 137 in 2020, owing to the COVID-19 pandemic. In 2008, the number of participating countries in the GVC of automotive parts was 171, and this rose to 173 in 2009, indicating that the number was almost same in the GFC period.

In 2019, the GVC of automotive parts amounted to a total (export +import) of US\$ 791 billion, and it dropped to US\$ 680 billion, as seen in Table 1. The COVID-19 influenced a 14% decrease in the GVC of automotive parts. However, in 2008, the total GVC of automotive parts amounted to US\$ 589 billion, and it dropped to US\$ 436 billion in 2009. The GFC influenced a 26% decrease in the GVC of automotive parts. Regarding the GVC of automotive parts, the influence of the GFC exceeded that of the COVID-19 pandemic.

The degrees of decrease in the change rates of both the export global total (75%) and the import global total (74%) were almost the same as the total of 74% in the GFC period. In the COVID-19 period, those of both the total export (87%) and total import (85%) were almost the same degree as the total (86%). Both the GFC and COVID-19 pandemic had the same degree of influence on export and import.

Table 1. The Impacts of Two Crisis on the GVC of Automotive Parts.

	(B. US\$)		CR	(B. US\$)		CR
	2008	2009	2009/2008	2019	2020	2020/2019
Export	297	221	75%	393	341	87%
Import	292	215	74%	398	339	85%
Total	589	436	74%	791	680	86%

Author calculated from Comtrade data

Table 2 shows the total automotive part GVCs, change rates for 2019, rank of Top 20s, and TSIs in the COVID-19 period. In the top 20 countries, Group 1 consisted of only UK (74%), but this value (i.e., 74%) was just under the border of Group 2. Group 2 included 17 countries in the top 20. Most top 20 countries were categorized in this group. They include Canada (76%), Sweden (80%), Japan (82%), Austria (83%), USA (83%), France (83%), Mexico (84%), Poland (85%), Spain (86%), Italy (86%), Thailand (87%), South Korea (87%), Germany (87%), Czechia (87%), Romania (90%), Hungary (92%), and Slovakia (96%). Group 3 includes two countries. They are China (100%) and Belgium (105%). China's total GVC was the same as that of 2019, and Belgium slightly increased its total GVC in the COVID-19 period.

To check the relation between a trade type and the influence of the COVID-19 pandemic, we also calculated the TSIs. As the TSI approaches +1, it implies that such a country undertakes more export than import. Conversely, as the TSI approaches -1, that country carries out more import than export. In the case of a zero TSI, the import and export of that country are the same. According to the TSIs listed in table 4, it seems that many countries under the global average of the change rate (86%) have import tendency (TSI <0), whereas those countries over the global average of the change rate seemingly have export tendency (TSI >0). Though we calculate correlation coefficient between change rates and TSIs, we cannot obtain solid evidence of their relation statistically.

Table 4. Auto Parts GVC, Change Rates from Previous Year, and Rank (COVID-19).

	Total GVC Value(B. US\$)		CR	Rank		TSI		
	2019	2020	2019/2020	2019	2020	2019	2020	
UK	22.3	16.6	74%	13	13	-0.42	-0.40	Group 1
Canada	30.6	23.4	76%	7	8	-0.29	-0.23	
Sweden	11.5	9.2	80%	18	20	-0.09	-0.11	
Japan	40.8	33.3	82%	5	5	0.60	0.62	
Austria	11.0	9.1	83%	20	21	-0.14	-0.11	
USA	112.7	93.2	83%	1	1	-0.24	-0.29	
France	30.6	25.5	83%	6	6	-0.09	-0.01	
Mexico	58.0	48.7	84%	4	4	0.06	0.10	
Poland	22.7	19.2	85%	11	12	0.26	0.28	
Spain	27.4	23.6	86%	8	7	-0.23	-0.23	Group 2
Italy	22.7	19.6	86%	12	11	0.28	0.28	
Thailand	13.5	11.7	87%	15	17	0.09	0.14	
South Korea	22.8	19.8	87%	10	10	0.66	0.59	
Germany	102.5	88.9	87%	2	2	0.21	0.23	
Czechia	26.3	22.9	87%	9	9	0.15	0.15	
Romania	11.1	10.1	90%	19	18	0.24	0.23	
Hungary	13.4	12.3	92%	16	16	0.10	0.08	
Slovakia	16.8	16.3	96%	14	14	-0.40	-0.39	
China	58.8	58.7	100%	3	3	0.14	0.12	Group 3
Belgium	13.2	13.9	105%	17	15	-0.18	-0.16	
Global Total	791.2	679.7	86%					

Author calculated from Comtrade data

## References

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- i OICA: International Organization of Motor Vehicle Manufacturers, <https://www.oica.net/>
  - ii Comtrade: UN Comtrade Database, <https://comtrade.un.org/>