



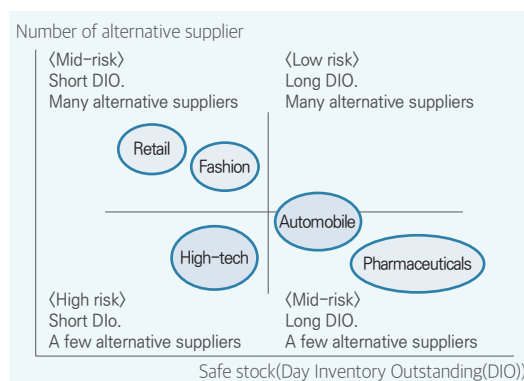
The impact of COVID-19 on manufacturing industries and post strategies

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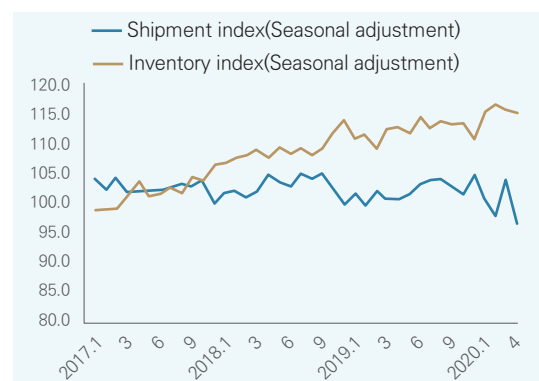
COVID-19 shock on industries

- Due to the impact of COVID-19 across the economy, the shock on the demand and also supply weakened the manufacturing activities.
 - Leading industries in Korea are highly dependent on specific trading partners thus, the manufacturing industry in Korea is vulnerable to the supply chain crises. On the demand side, high dependence on global market and sharp decline in exports led to the contraction in production.
 - As of April 2020, manufacturing production decreased by 4.5% YoY and 6.0% MoM, and exports decreased 25.1% YoY and 21.1% MoM.
 - Investment sentiment is also greatly reduced, with the Business Survey Index(BSI) falling 15.7% MoM and 21.9% MoM, raising concerns that the sustainable economic growth engine will weaken in the future.
 - The domestic market is contracting as a result of social distancing and a decline in economy activity, and increases in inventory are becoming a burden due to the sharp consumption decline demand in global markets.
 - Some disruptions have occurred in the global subsidiary system of the manufacturing industry, such as the difficulty in supplying parts due to movement restrictions or containment measures as a response to COVID-19

[Figure 1] Exposure to supply chain crisis



[Figure 2] Shipment and inventory index trend of Korea's manufacturing industry

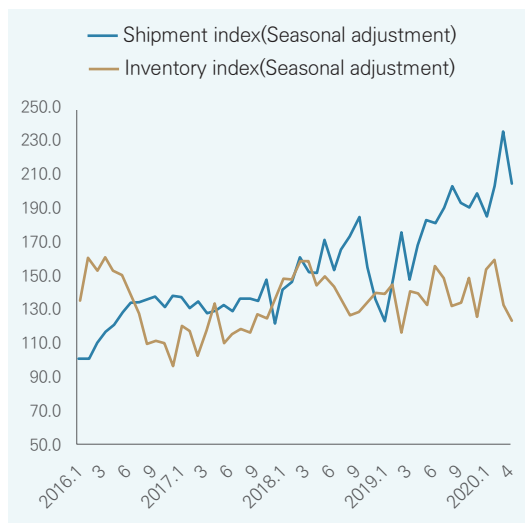


The impact on major economies

- **Semi-conductor : The increase in contactless activities caused by COVID-19 offset the decline in demand in the mobile sector with prioritized demand for server semiconductors. There are, however, concerns about shrinking facility investment sentiment as the export outlook worsens.**

-As the demand for network and computing servers increases, the negative impact in the short term is limited. Growth is expected to be limited due to weakness in the system semiconductor market

[Figure 3] Shipment and inventory index trend of semiconductor industry



[Table 1] Export Business Survey Index for the semiconductor industry

2020 Q2	
Export contract	73.5 (-47.0)
Export payability	70.3 (-44.6)
Economy of the exporting countries	76.4 (-31.5)
International supply and demand	70.4 (-48.9)

The figure in the bracket indicates the increase and decrease rate compared to the previous quarter, %

- The Export Business Survey Index(EBSI) for the semiconductor industry in the second quarter of this year was 77.0, which fell sharply from 136.1 in the first quarter, and facility investment is expected to shrink.

※ The EBSI is an economic outlook index based on surveyed domestic export companies, and if the index is more than 100, it is predicted that industrial conditions will improve. If it is less than 100, it signifies that the industry will likely deteriorate in the future.

- **Automobiles : An industry with a significant connection between finished cars and parts manufacturers. For domestic producers, a rapid decline in exports due to reduced demand in the global market is a big blow rather than disrupting supply chain.**

- Domestic sales increased as of April 2020 due to new car launches and policies such as a consumption tax reduction. Exports decreased by more than 40% compared to April 2019, and the index of producer's shipments fell significantly (-17.2%). Meanwhile, the inventory index rose sharply in March and April.

[Figure 4] Export and domestic demand growth rate of automobile industry



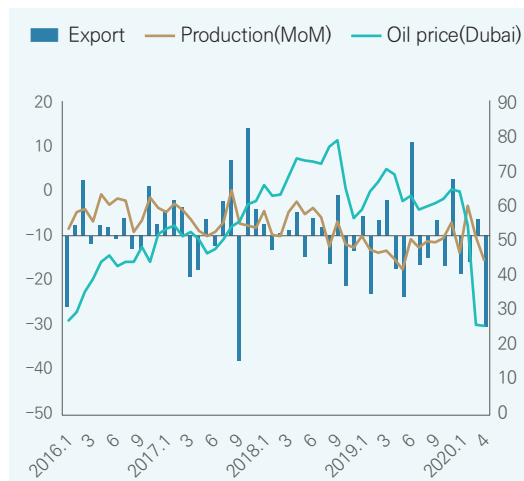
[Figure 5] Shipment and inventory index trend of automobile industry



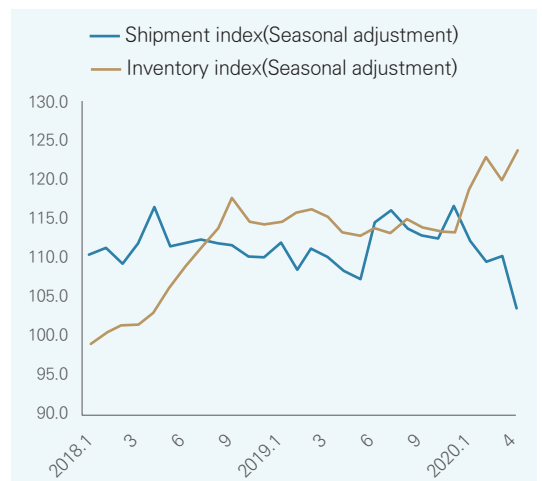
● **Petrochemical : The procurement cost of raw materials has fallen due to the fall in oil prices resulting from COVID-19. Exports have decreased significantly as a result of the global economic contraction, increasing inventory burdens.**

- As of April 2020, exports decreased by 20% and production index decreased by 5.7% compared to the same month last year.
- Due to the nature of the petrochemical product process, it is not easy to control supply in response to significantly reduced consumption. Industrial profitability has deteriorated due to price fall from oversupply.
- Additionally, as investment is expanding in production facilities domestically in emerging countries including China¹⁾. Thus, resolving current oversupply is expected to be difficult after the COVID-19 crisis.

[Figure 6] The export of petrochemical products and crude oil price trend



[Figure 7] Shipment and inventory index trend of petrochemical products



1) China has steadily invested in production facilities to increase the production of petrochemical products (Aiming to increase their production scale from 1.5tpa in 2010 to 3.5tpa in 2022 based on ethylene standards), and petrochemical plants are being established in both Vietnam and Indonesia.

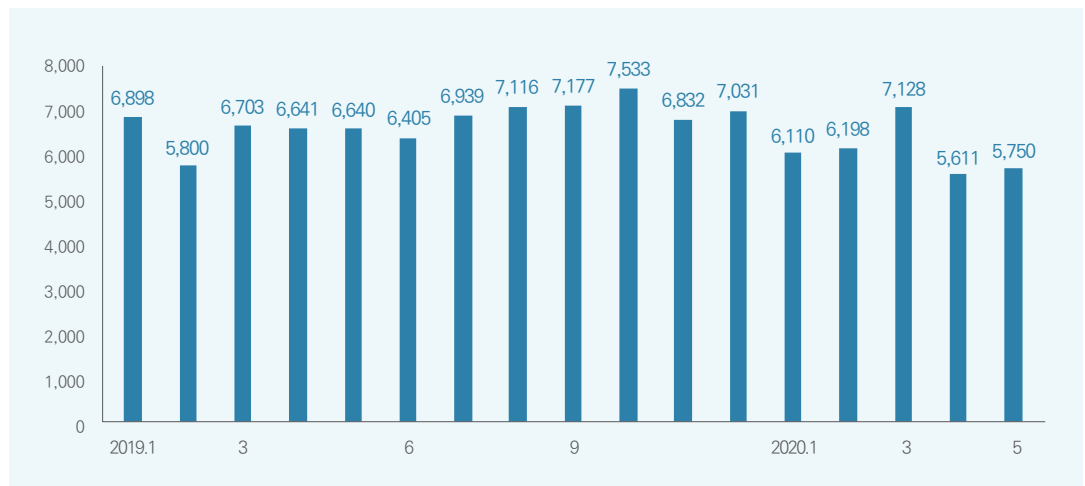
- **IT(excluding semiconductors): The expansion of contactless economic activities led to rapid growth in IT-related markets and the industry has become a leading field for the new economic system. Securing a stable profit structure through exports in the domestic IT manufacturing sector, however, is insufficient.**

- With the growth of non-face-to-face activities, socio-economic fields as well as IT-related production grew rapidly by converging IT technology and services in the first quarter of 2020. The export sector, however, showed sluggish growth.

- Compared to the same month of the previous year, exports of the IT industry were 6.3% in March 2020, and -15.5% and -13.4% in April and May, respectively.

[Figure 8] The amount of exports in IT industry(Semiconductor is not included)

(Unit: 1M dollars)



Implications

- **Overcome crises and promote sustainable growth with flexible responses to changes in life pattern and production environment caused by COVID-19**

- In terms of demand, secure high value-added technologies, respond to changes in demand due to rapid increase in non-face-to-face economic activity, and develop new markets.

- To secure technologies required in advance for the AI and big data industries, not only R&D but open innovation (technology acquisition) should also be activated.
- Due to the high global market dependence nature of the domestic industry, a strategy is required to prepare for demand shocks from new market development.

- In terms of supply, diversify supply chains that are too dependent on specific countries, and strengthen the flexibility of production systems to respond to diverse situations

- **In respond to post COVID-19 era, it is necessary to prepare for changes in the industrial topography, such as creating synerge effects by fostering new industries and converging between industries rather than sticking to existing flagship items.**
 - In case of semiconductors, efforts are required to strengthen the sluggish non-memory semiconductor market, which is expected to grow in relation to AI technology after COVID-19 crisis.
 - As of 2019, the global market share of domestic semiconductor companies in memory semiconductors was the highest at 51.8%, but only 4.5% in system semiconductors where demand is expected to rapidly increase in the future.
 - The AI-related semiconductor market in 2020 is \$12.1 billion and is expected to be \$34.3 billion by 2023.
 - The automobile industry needs to overcome the declining sales that has continued before Corona 19 and secure new growth engines by preoccupying the rapidly growing electric vehicle sector and the mobility market.
 - Not only the size of the electric vehicle market, but the size of the personal mobility market is expected to grow at an annual rate of 40% or more by 2040.
 - Along with the rapid growth of the bio pharmaceutical industry, the chemical industry is expected to see an increase in future corporate value. Thus, nurturing new industries through restructuring is required.
 - Specifically, as the demand for COVID-19 diagnostic kits in Korea increases, the international reliability of Korea's pharmaceutical sector is expected to rise, which will have a positive effect on attracting global investment.
 - Korea's IT industry has the world's best technology infrastructure, but the high value-added market in the software field is in its infancy, so creating an industrial environment to enhance competitiveness is required.
 - A strategy for creating an industrial environment that can nurture a startup to a globally competitive company requires the expansion of venture investment and the activation of M&A between companies.