



The Decline of Korean Industrial Vitality as Shown by the Structural Change Index

| Summary |

- The proportion of added value in Korean manufacturing has remained stable without major changes since the 1990s, and the same was true for the nation's service sector in the 2010s.
- The structural change index (SCI), which measures the vitality or dynamism of industry as a whole, shows that the extent of structural change in domestic sectors has steadily declined over time.
 - During the 2010s, the SCI of Korean sectors fell to under half their levels of the 1970s. Recently, however, levels have remained consistently similar to those of the Group of Seven (G7) economies.
- An assessment of absolute and relative SCI values shows that structural change in manufacturing since the 1990s no longer resembles "expansion" but rather "restructuring."
- The continued decline in the indexes could sap Korean industry of its vitality and have a negative impact on productivity and economic growth through lower efficiency of resource distribution.
 - An empirical analysis of the 30 member countries of the Organization for Economic Cooperation and Development (OECD) showed a relatively strong positive correlation between SCI levels and the rate of economic growth.
- Raising the efficiency of resource distribution and boosting industrial and corporate vitality will first and foremost require the swift restructuring of underperforming companies, along with diverse policy actions to raise productivity throughout all sectors.

■ Change in industrial structure and economic growth

- Typically, the more an industrial structure is predicted to change rapidly, the more brisk and dynamic an economy becomes as companies in all sectors enter, exit, expand, and collapse.
 - Overall productivity rises along with economic growth when domestic resources are redistributed from relatively unproductive sectors to those with high productivity through smooth restructuring.
 - Conversely, when resources are not efficiently reallocated from low- to high-productivity sectors due to market rigidity, political resistance, social opposition and other factors, the economy as a whole is likely to suffer from low efficiency and stagnant growth.
- The relationship between change in industrial structure and the economic growth rate has long been discussed, with a close correlation observed between the two.¹⁾
 - This relationship is determined by a diverse set of pathways, with the direction of their causal correlation remaining unclear.
- Korea's industrial structure has rapidly changed over the past several decades amid a sharp increase in absolute economic scale, but the speed of change has diminished markedly in recent years amid stagnant growth and deferred corporate restructuring.
 - The following sections examine trends in changes to Korea's industrial structure since the 1970s, exploring how the shifts have differed in pace and direction of change from those in major advanced economies, and the implications carried by those differences.

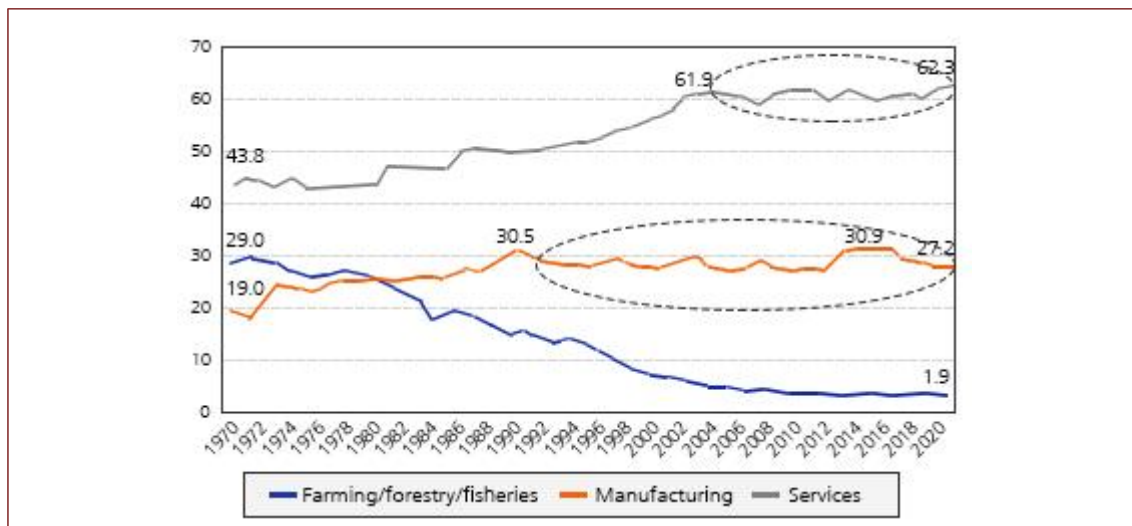
■ No major changes in the proportion of added value in manufacturing since the 1990s or in the service sector since the 2010s

- A look at changes in Korean industry between 1970 and 2020 shows that the proportion of added value (nominal) of manufacturing rose from 19 percent in 1970 to 30.5 percent by 1988, but has since hovered at a slightly lower level.

1) Aiginger, K. (2001), "Speed of Change and Growth of Manufacturing." In M. Peneder, K. Aiginger, G. Hutschenreiter, and M. Marterbauer, *Structural Change and Economic Growth*, edited by WIFO, study commissioned by the Ministry of Economics and Labour, Vienna.
Peneder, M. (2003), "Industrial Structure and Aggregate Growth," *Structural Change and Economic Dynamics*, 14 (2003), 427-448.

- In 2011, manufacturing briefly recovered to a record-high added-value proportion of 30.9 percent, but the more recent pattern is a cycle of modest rises and falls, with 2020 seeing 27.2 percent.

Figure 1. Trends in Korean Sectors as Proportion of Added Value



Source: Calculated and compiled based on national account figures from the Bank of Korea's Economic Statistics System (ECOS).

- The added-value proportion of the service sector rose steadily from 43.8 percent in 1970 to 61.9 percent in 2008, falling for a time before slightly rising to 62.3 percent between 2019 and 2020.
- Conversely, the proportion of value added by farming, forestry, and fishing declined consistently over the same period, from 29 percent in 1970 to 1.9 percent in 2020.

■ Continued slowing of change in Korea's industrial structure

- The magnitude of structural change was indexed to more concretely assess changes in industrial structure.
 - While many methods can assess structural change indexing, the magnitude of the changes in Korea's industrial structure was calculated here by using an SCI, or a slightly modified form of the Michaely/Stoikov index.²⁾³⁾
- The SCI (σ) can also vary due to the decline of a given industry or the exits of

2) For the purposes of this study, the SCI is defined as follows:

companies from a sector. This means that the index does not necessarily reflect innovation per its commonly understood sense.

- Instead, the SCI is properly viewed as an indicator of overall economic vitality or dynamism, representing all changes to industrial structure up to and including contractions.
- Figure 2 shows trends in the SCI for Korean industry calculated with the proportion of added value (nominal) for 28 sectors, including 13 in manufacturing and 11 in services, between 1970 and 2020.⁴⁾
 - SCI values were generally higher in the 1970s and 80s than afterwards due to active restructuring, primarily in the manufacturing industry during Korea’s early period of rapid industrialization.
 - Volatility shot up amid corporate restructuring and major domestic and overseas crises, including the two oil shocks of the 1970s, the Asian financial crisis of the late 1990s, and the dotcom crash and global financial crisis of the 2000s.
 - The extent of volatility in the SCI has slightly diminished over time, and this could reflect both an improved capacity to weather external shocks in line with the economy’s maturation and a faster recovery from such shocks.
- Figure 3 shows the SCI values (annual average) by period when divided into decades.⁵⁾
 - A comparison of such values for each decade showed a continued decrease in the

$$\text{Structural change index } (\sigma) = 0.5 \times \frac{\sum_{i=1}^n |w_i^{t2} - w_i^{t1}|}{T} \quad (\text{Equation 1})$$

represents the proportion of total added value accounted for by industry i during period t . T represents the period (in years) between $t1$ and $t2$, and n represents the number of industries. Thus the second part on the right side of the above formula divides the absolute magnitude of changes to industrial structure between $t1$ and $t2$ by the corresponding period, giving the average magnitude of change over a one-year period. Since the calculation here includes duplicate changes for all percentages, use of the multiplier 0.5 standardizes the absolute value of change as equivalent to 1.

While the SCI is used in this study for convenience, Young (1992) and Wölfl (2005) also used the terms “structural transformation rate” and “speed of structural change” to refer to similar concepts. Lee Gyeong-tae (1993) used a similar indicator, the industrial adjustment index, to analyze restructuring trends in Korean industry between 1974 and 1988.

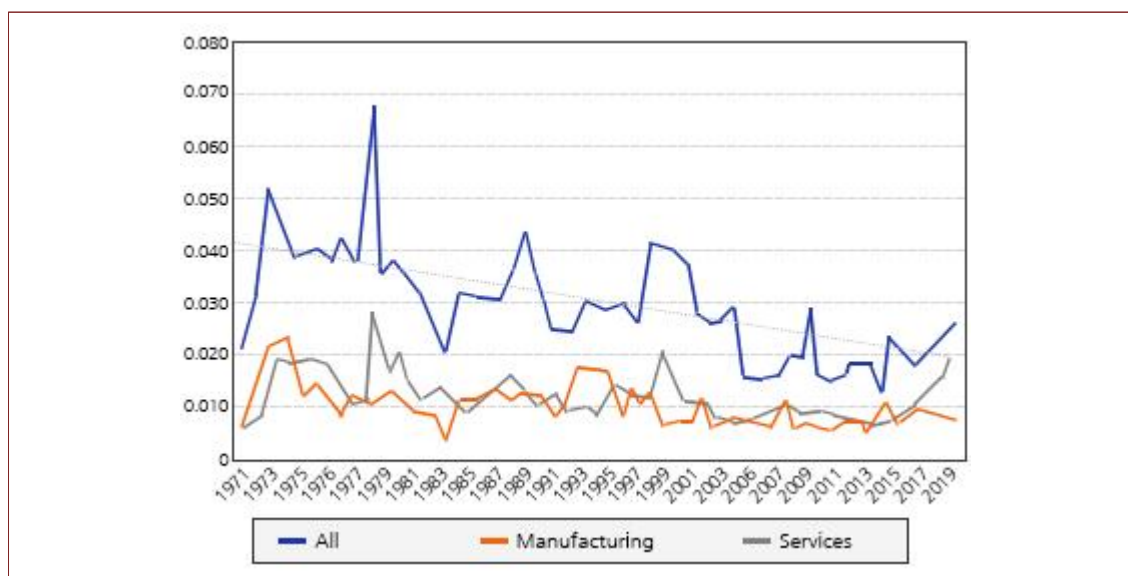
Lee Gyeong-tae (1993), *Characteristics of South Korean Industrial Structure through International Comparison*, Research Report No. 290, KIET (in Korean)

- 4) Because SCI values vary according to industrial classifications, this study used the same number of industry classifications (28) to calculate such values not only for Korean industries, but also for those in major advanced economies to be discussed later.
- 5) Because the value of the SCI by period calculated with Equation 1 is heavily dependent on comparison and standard years, it can inadequately reflect structural changes in other years within the same period. For this study, the index’s values in individual years were simply averaged for a given period.

speed of structural change in Korean industry, which averaged 0.018 during the 2010s, or down 46.2 percent from the 0.039 figure posted during the 1970s.

- Declines of SCI were observed in manufacturing from the 2000s and in the service sector from the 1990s. The index for the former sector was found to be similar to or slightly smaller than the latter.
- The fall in the SCI's average value appears connected to declining rates of annual growth since the 1990s as Korea's accelerated manufacturing-based rise ended and a stable growth period ensued.
 - Productivity growth substantially slowed due to high entry barriers and other forces based on market regulations that inhibited corporate dynamism and delayed the exit of underperforming or nonviable companies, as well as due to a nosedive in the birth rate and the rapid aging of the population. The combination of these factors is believed to have slowed the rate of structural changes.
 - The correlation coefficient between the GDP growth rate and SCI was 0.77 for the period from 1971 to 2020, a relatively strong positive correlation between the two figures.⁶⁾

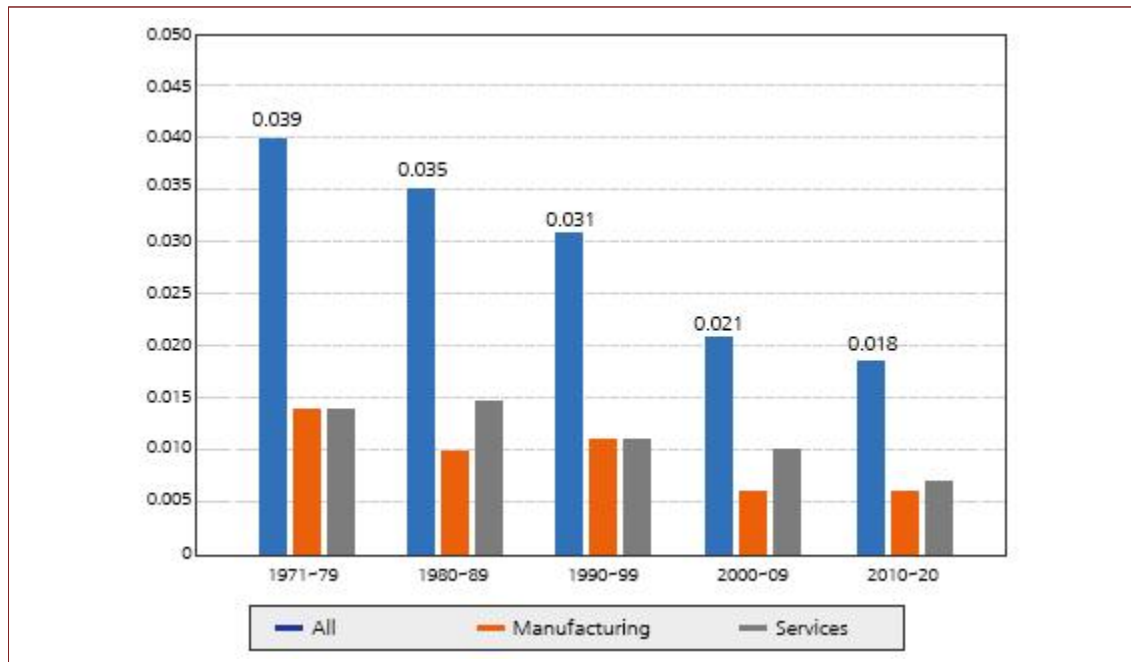
Figure 2. Trends in Korean Industry's SCI



Source: Calculated and compiled based on national account figures from Bank of Korea's Economic Statistics System (ECOS)

6) Excluded in the correlation coefficient calculations for the period between 1971 and 2020 were the years 1980, 1998, and 2020, all three of which saw the economy contract.

Figure 3. SCI of Korean Industry by Decade



Source: Calculated and compiled based on national account figures from Bank of Korea's Economic Statistics System (ECOS)

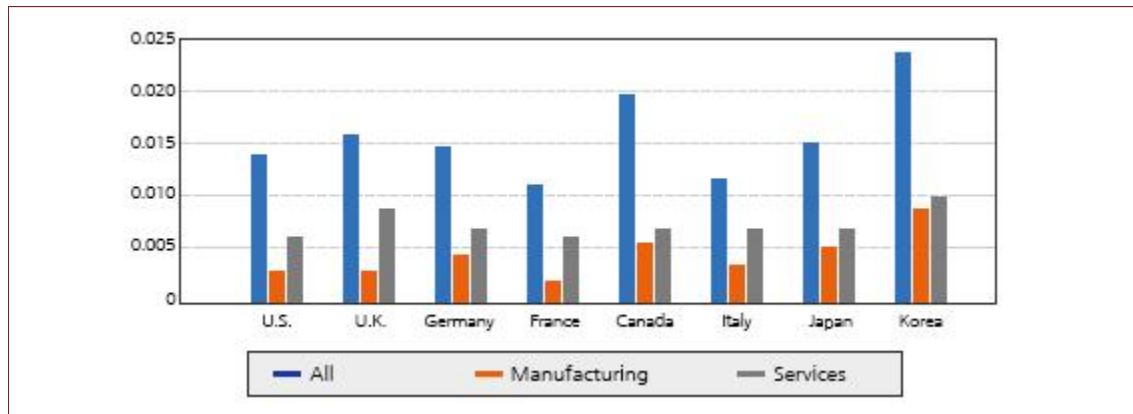
Note: SCI levels for each decade represent simple averages.

■ **Korean industry SCI now similar to those of major advanced economies**

- A comparison of industry SCI between Korea and G7 member countries showed that Korea had the highest average level for all sectors since the 1990s. Canada was second, followed by the U.K., Japan, and Germany (see Figure 4).
 - Canada had the second-highest manufacturing SCI after Korea, while France had the lowest. Korea and the U.K. both had high indexes for services, while all other countries showed roughly similar levels.
- Figure 5 compares changes in the indexes for industry in Korea and G7 member states since the early 1990s to more closely illustrate the characteristics of changes in industrial structure by country.
- The indexes of countries were strongly affected by the dotcom crash in 2000 and the global financial crisis of 2008. Korea also greatly suffered from the 1997-98 Asian financial crisis in addition to the two aforementioned shocks.
 - On average, the SCI for Korean industry remained quite high throughout the 1990s but has since seen a consistent decline, reaching a level similar to those of G7 countries by the late 2010s.

- For both the G7 and Korea, index levels were higher for services than for manufacturing, with higher volatility.
- Industry SCI in Korea, Germany, France, and Italy showed slight declines amid periodic fluctuations due to domestic and external factors.

Figure 4. SCI Levels of G7 Countries and Korea



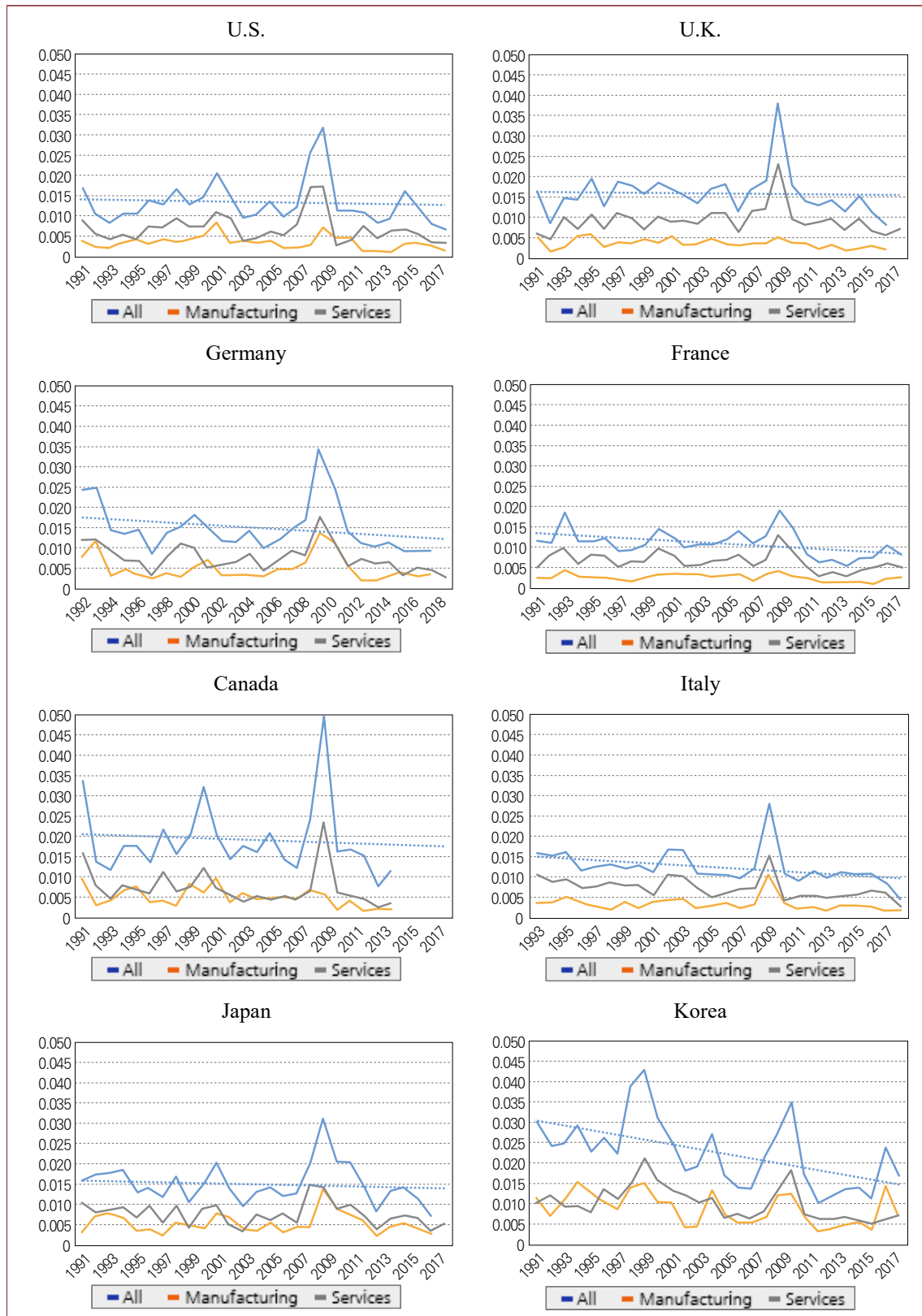
Source: Calculated and compiled from STAN Database (2020 ed.), OECD

Notes: (1) Simple average of annual levels of structural change index for 1990-2018

(2) U.K.: 1991-2017, Germany: 1992-2017, Canada: 1990-2014, Italy: 1993-2018, Japan: 1991-2017

- Korea saw the fastest decline in SCI.
- In contrast, industrial indexes in the U.S., U.K., Canada, and Japan showed general stability despite occasionally sharp fluctuations.

Figure 5. SCI by Sector for G7 Member States and Korea



Source: Calculated and compiled from STAN Database (2020 ed.), OECD

■ Structural transition in manufacturing from “expansion” to “restructuring”

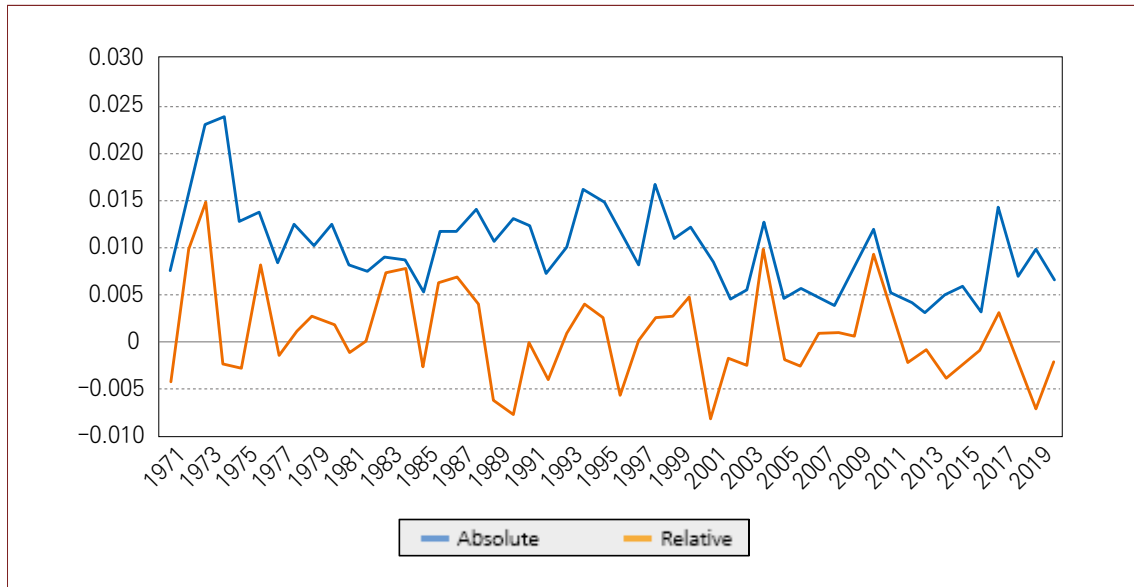
- The SCI figures examined above represent the absolute values of changes in the proportion of added value in a sector. While helpful in estimating the magnitude of structural change, the index is limited in its ability to establish a direction.
 - For instance, a large absolute value of the SCI would appear even with “negative restructuring,” in which the proportion of manufacturing industries declines amid a general production slowdown.
 - Observing both the magnitude and direction of structural change requires a comparison of indexes represented by both absolute and relative values.⁷⁾
- Figure 6 shows index values for Korean manufacturing for the period from 1970 to 2020, distinguishing between absolute and relative values.
- The late 1980s saw index values for manufacturing remain generally positive apart from the period immediately after the two oil shocks and 1984, a year in which exports were particularly sluggish, showing that sectors seeing growth outweighed those experiencing decline.
 - From this, changes in the Korean industrial structure over this period can be seen to have occurred amid an expansion in manufacturing.
- Since the 1990s, relative SCI values have repeatedly undergone temporary fluctuations due to external factors such as the 2000 dotcom crash and the 2008 global financial crisis, but on average the value has remained close to zero (see Figure 7).
 - This shows that the period saw steady restructuring among growing and declining industries in manufacturing, while the sector overall accounted for a fixed percentage.
- Structural change can be categorized into four main types per the magnitude of the index’s absolute and relative values: expansion, contraction, restructuring, and structural stagnation.⁸⁾

7) To calculate the relative values of the SCI, Equation 1 was used from footnote #2 but with the absolute value symbol removed.

8) Devising a similar concept to this study’s SCI with his industry adjustment index, Lee Gyeong-tae (1993) defined four types of industry adjustment: (1) positive absolute and relative values, with more industries growing by percentage than decreasing (manufacturing expansion); (2) positive absolute and negative relative values, with more industries falling in percentage than increasing (contraction); (3) positive absolute and relative values approaching zero, with restructuring proceeding smoothly with manufacturing output resources moving smoothly from declining to growing industries (restructuring); and (4) absolute and relative values both approaching zero, with almost no change to the proportions represented by industries (structural stagnation).

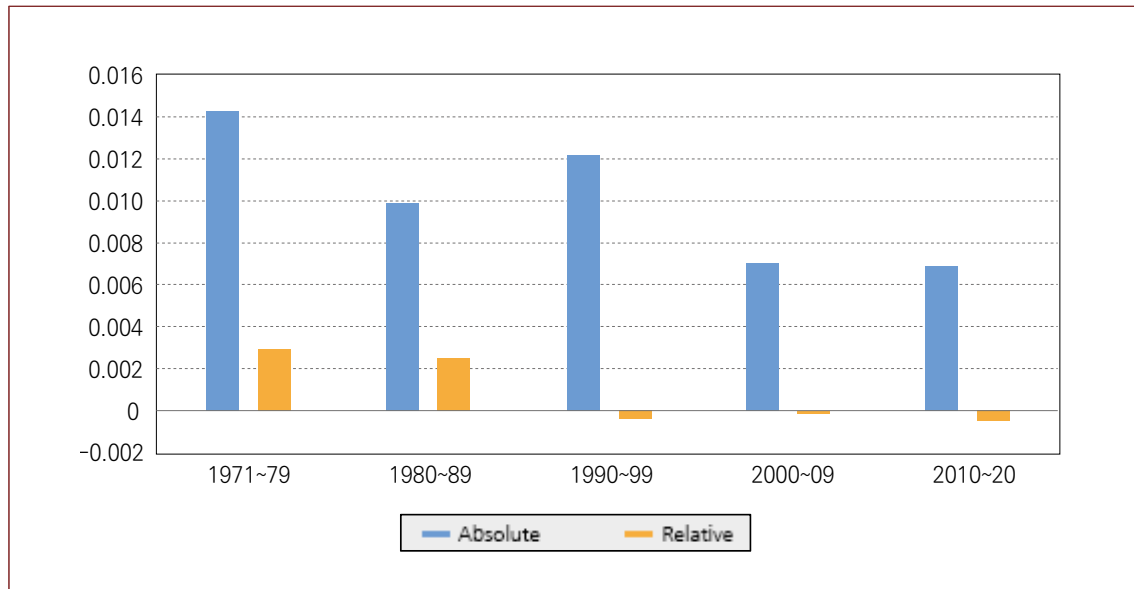
- In this case, structural change in Korean manufacturing can be viewed as having shifted from expansion through the late 1980s to something closer to restructuring since the 1990s.

Figure 6. Trends in SCI for Korean Manufacturing: Absolute vs. Relative Values



Source: Calculated and compiled from STAN Database (2020 ed.), OECD

Figure 7. SCI for Korean Manufacturing by Decade: Absolute vs. Relative Values



Source: Calculated and compiled from STAN Database (2020 ed.), OECD

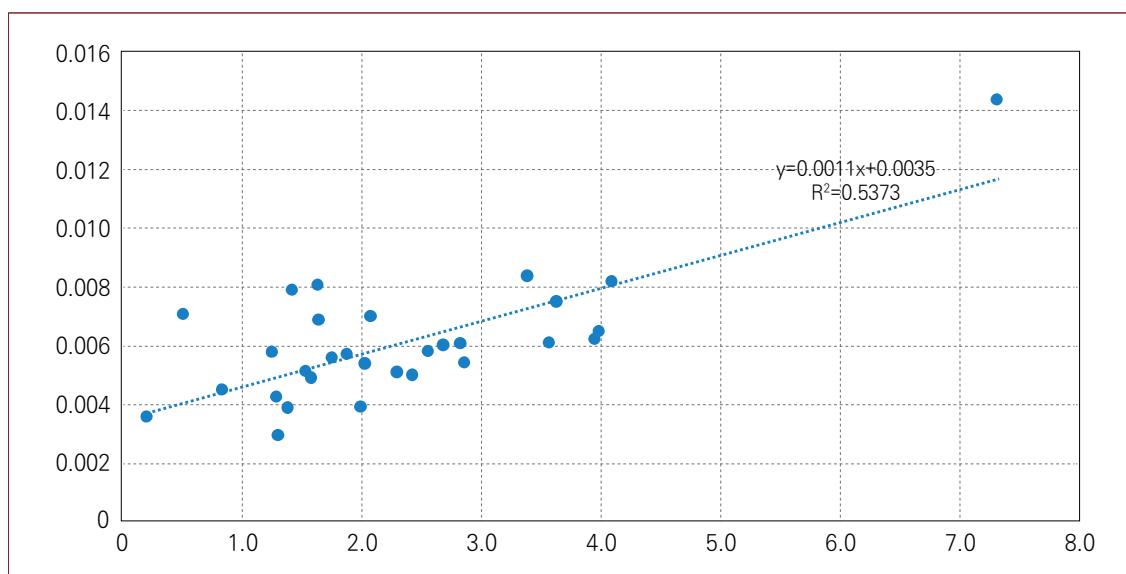
Note: Levels of the SCI for each decade represent simple averages.

See Lee Gyeong-tae (1993), 50-53.

■ Relatively strong long-term correlation between rates of economic growth and change in industrial structure

- To reexamine the correlation between the rates of change in industrial structure and economic growth, Figure 8 shows the relationship between SCI value and average GDP growth from 2000 to 18 for 30 OECD member countries.
 - Not only did SCI values and the rate of economic growth exhibit a positive correlation, but their overall explanatory power was found to be relatively high.
 - These results showed renewed support for the timeliness of discussions on how economic growth tends to be higher in countries with a more rapid rate of change in industrial structure.
- The major factors determining this correlation remain unclear, especially pertaining to the causal relationship between the two.
 - If industrial restructuring is accompanied by a shifting of resources toward sectors with higher productivity growth, this raises the economic growth rate. Rising income levels in line with higher economic growth also encourage industrial restructuring through factors such as higher final demand.

Figure 8. Correlation between SCI Value and Economic Growth Rate (2000–18)



Source: Calculated and compiled from STAN Database (2020 ed.), OECD and GDP (constant dollars) according to Annual National Accounts

Notes: (1) Represents 30 OECD member countries for which statistics could be obtained

(2) For Germany, Japan, Latvia, Lithuania, Luxembourg, Norway, Portugal, Switzerland, and the U.K., the period from 2000 to 2017 was studied. Other periods included 2006–17 for Australia, 2000–14 for Canada, 2011–16 for Israel, 2005–18 for New Zealand, and 2009–15 for Turkey.

■ **Urgent need for diverse policy efforts toward swift corporate restructuring and higher productivity**

- The decline in industrial restructuring in Korea could be seen as a universal phenomenon in a maturing economy, but fundamentally reflects the failure of efficient resource redistribution of sectors due to structural defects specific to the Korean economy.
 - This incurs high risk of diminishing vitality across industries and negatively impacting economic growth.
 - Korea's potential growth rate has shown continued decline,⁹⁾ which appears related to the slowdown in industrial restructuring.
- Bolstering the efficiency of resource distribution and the vitality of industries and companies fundamentally requires diverse policy efforts to promote swift restructuring of underperforming or nonviable businesses and higher productivity.
 - Delayed corporate restructuring and the ensuing rise of underperforming businesses are major factors behind the Korean economy's lower economic growth and productivity.
 - Demand for restructuring is expected to grow as declining sales and profits due to the COVID-19 pandemic cause many businesses to suffer deteriorating financial soundness.
- To quickly revamp underperforming businesses, constant and post-restructuring systems centered on the market are needed through supplementation of the Act on the Promotion of Corporate Restructuring, whose implementation is on a limited-time basis through 2023 after multiple readoptions.
- For companies not yet at the underperforming stage but revising their business models to mitigate oversupply, expand to new sectors, or boost vitality in regions where industry is threatened, the functions and role of the Corporate Revitalization Act need upgrading to an industrial policy approach for preemptive and autonomous restructuring.
 - The industrial diagnostic system also needs expansion to swiftly assess industrial and business underperformance and competitiveness, with active applications by companies in developing preemptive restructuring strategies and by the

The Bank of Korea said the potential growth rate of the economy has declined from the annual average range of 5–5.2% in the early 2000s to 2.7–2.8% in the late 2010s.

government in formulating restructuring policy.

- Improving productivity throughout all sectors will require policy action that actively reflect rapid changes to the economic environment while overcoming the limitations of material inputs. The approaches to these ends include expansion of investments in human capital and intangible assets, deregulation of industry-technology convergence, removal of entry barriers, and acceleration of the digital transition.
 - Specifically, discriminatory regulations should be aggressively rolled back to stimulate domestic and foreign investment and improve productivity in the service sector, which is 50 percent less productive than manufacturing.
 - Overall technological competitiveness and innovation should also get a boost through methods such as the stimulation of R&D investment and the use of information and communications technology (ICT).

Lee Geonwoo, Senior Research Fellow

Center for Economic Outlook and Statistical Analysis

gwlee@kiet.re.kr | 044-287-3250



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EDITOR-IN-CHIEF **Kim, Youngsoo**

ASSISTANT EDITORS | **Jeong, Gyeonghee & Jo, Gyehwan**

COPY EDITOR **Aaron Crossen**

370 Sicheong-daero, Sejong City, 30147, Republic of Korea

Tel. 044-287-3114 Fax. 044-287-3333 www.kiet.re.kr

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