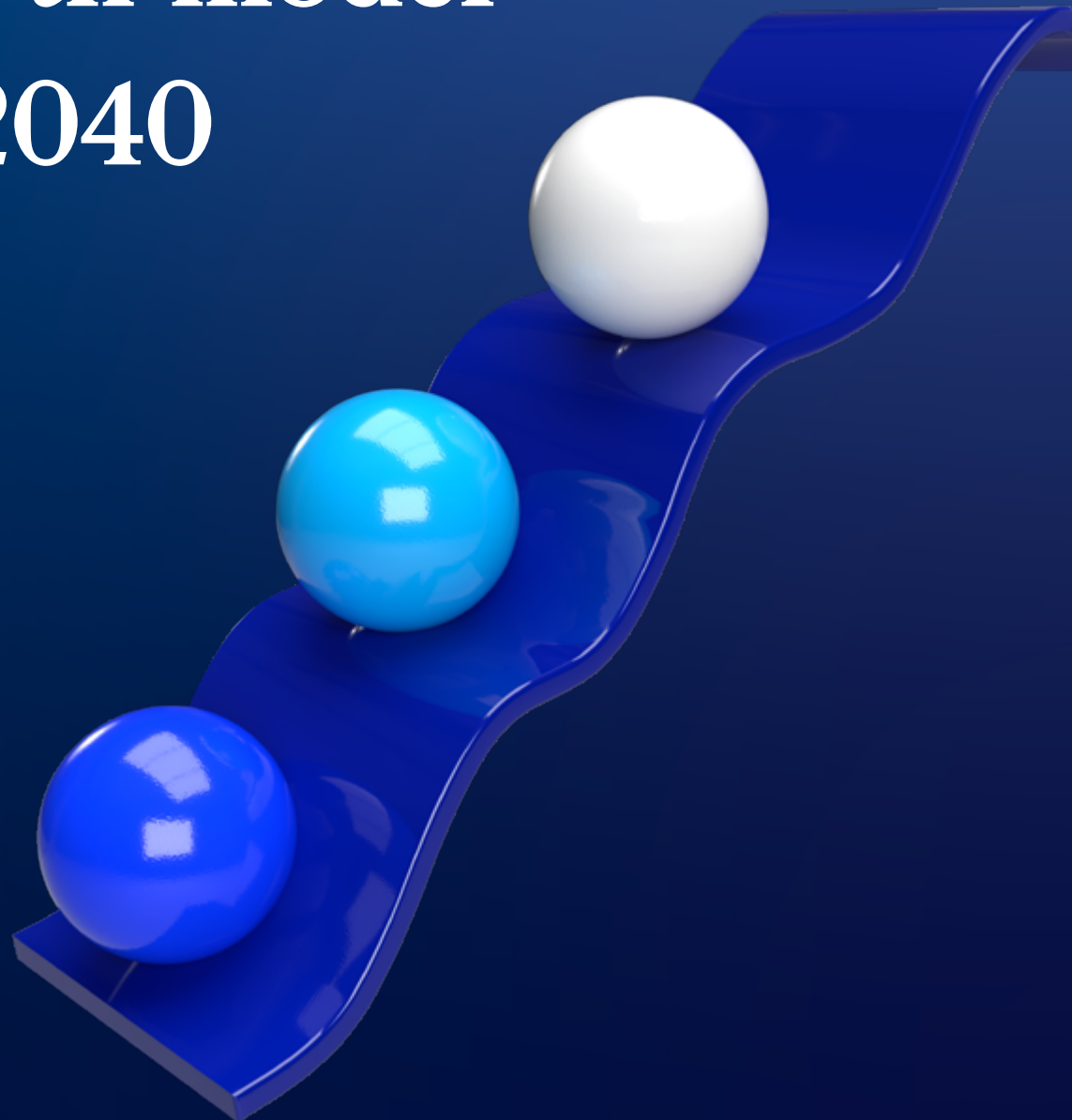


McKinsey Korea Report 2023

Korea's next S-curve: A new economic growth model for 2040

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Preface

South Korea is at a crossroads. Once a high-growth economy, its growth has plateaued, and it can either continue a slow, downhill slide or choose to change direction and take a leap forward to become a fast-growing economy again.

From being the poorest country in the world immediately after the Korean War (1950 to 1953), South Korea successfully transitioned to an export-oriented economy and experienced its “first S-curve” (a steep upward growth trajectory) from the 1960s to the 1980s, centered on the heavy and chemical industries. Since then, the country has achieved its “second S-curve,” leading to what is commonly referred to as the “Miracle on the Han River,” a record-breaking phase of industrialization created by expanding to high-tech and manufacturing industries. South Korea became a top ten global economy in the 2000s,¹ and currently, the country is securing global leadership positions in key future global industries such as semiconductors, secondary cell batteries, and automobiles.

However, rapidly changing internal and external factors, such as trade tensions between China and the United States, the conflict in Ukraine, and the risk of continued declining competitiveness in key industries, are daunting challenges that create obstacles to the country’s growth trajectory. South Korea enjoyed a high average growth rate of 10 percent and 9 percent during the 1970s and 1980s, and 7 percent and 5 percent in the 1990s and 2000s, respectively. However, growth started to stagnate in the 2010s to 3 percent annually.² The growth rate dropped even further to the 1 percent range in Q4 2022, and to less than 1 percent in Q1 and Q2 2023.³ This continuous low growth rate and the start of the population decline in 2021 are indicative of some of the many hurdles the country faces.⁴ Bold determination and a deliberate change of mindset are required to regain significant growth—something South Korea has proven it is capable of in the past.

South Korea’s slowing economy is now in need of a third upward growth curve. To investigate how that could be achieved, we have collated this report on “South Korea’s Next S-Curve,” a decade after McKinsey published a similar report in 2013.⁵

In this report, we examine South Korea’s macroeconomic situation and assess the path the country could choose for its next steep growth. We then present key issues for consideration through three pillars (restructure, shift, cultivate) and eight actions by which the country could implement a new economic growth model, with the goal of becoming one of the top seven economies by 2040.

¹ *GDP (constant 2015 US\$), World Bank national accounts data and OECD national accounts data files*, World Bank Open Data, 2023.

² *GDP (constant 2015 US\$), World Bank national accounts data and OECD national accounts data files*, World Bank Open Data, 2023.

³ Quarterly economic growth is real GDP growth year-on-year; *GDP and economic growth, e-country indicators*, Official Government Work Conference, Statistics Korea, 2021.

⁴ “Total population of the Republic of Korea data set,” The World Bank, October 2023.

⁵ “*Beyond Korean style: Shaping a new growth formula*,” McKinsey Global Institute, April 1, 2023.



Chapter 1

Challenges surrounding South Korea

The McKinsey Global Institute has characterized the world's economic growth to date in three distinct phases: the Postwar Boom, from 1944 to 1971; the Era of Contention, from 1971 to 1989; and the Era of Markets, from 1989 to 2019. During the Era of Markets—a progressive deepening of global connections—South Korea experienced notable success, with a compound annual growth rate (CAGR) of around 5 percent in real GDP growth.⁶

Over the same period, a time marked by low inflation and interest rates, the country flourished by leveraging trade and digital spread—its exports in 2019 stood at \$540 billion, a nine-fold increase from \$62 billion in 1989.⁷ Continuing its trend of economic prosperity, South Korea achieved significant economic gains with a GDP per capita of \$30,000 in the latter part of the 2010s; in 2021, it placed fifth on the Global Innovation Index. This was underscored by a substantial and unprecedented investment in R&D that exceeded \$90 billion.⁸

However, this period of high growth started to shift due to three main challenges. The resulting period of low growth at 2 percent caused South Korea to drop out of the global top ten countries by GDP. These challenges are:

1. **Labor:** Accelerating demographic imbalance and low efficiency in labor productivity.
2. **Capital:** Lack of attractiveness of the listed stock market and lack of dynamism in the venture capital market.
3. **Industrial competitiveness:** Intensified competition in national pillar industries, and a persistent productivity gap between large and small and medium-sized enterprises (SMEs).

1. Labor

The booming growth of South Korea's population, which jumped around 60 percent from about 32 million in 1970 to 52 million in 2020, has come to an end. This has resulted in the country needing to resolve two challenges—an accelerating demographic imbalance and a lack of efficiency in labor productivity.

1.1. Accelerating demographic imbalance

Despite the government's efforts to boost population growth through targeted policies—such as childcare support and fertility treatments—the overall birth rate continues to drop. Starting at 4.5 in the early 1970s, there was a steady decline and by 2018 it had dropped to below 1.0.⁹ By 2020, South Korea was the only country among the Organization for Economic Co-operation and Development (OECD) countries with an overall birth rate below 1.0, and the rate continues to decline.¹⁰ By 2025, it is projected to be 0.77.

⁶ GDP (constant 2015 US\$), National accounts data and OECD National Accounts data files, World Bank Open Data, October 2023.

⁷ Import and export management, Global trade statistics service K-stat, Korea International Trade Association (KITA), September 2023.

⁸ "Gross domestic spending on R&D (indicator)," OECD data set, November 17, 2023.

⁹ "The average number of babies a woman is expected to have in childbearing age (ages 15-49)," Statistics Korea, November 10, 2023.

¹⁰ Organization for Economic Co-operation and Development (OECD) Family Database, 2022, November 10, 2023.

South Korea's population growth trajectory mirrors its declining birth rates. The size of the country's population peaked in 2020 and has since experienced a decline, with a projected population of 45 million by 2050.¹¹ Its working-age population (aged 15–64 years) is expected to be 46.1 percent of the country's total population by 2070—the lowest among OECD countries and significantly lower than the 72.1 percent recorded in 2020 (Japan is expected to have the second-lowest proportion at 50.5 percent in 2070).¹²

Further, more than half of baby boomers (born between 1955 and 1963) will be part of the population of older adults by 2025.¹³ The total dependency ratio, which measures the number of young people under 14 years and older people over 65 compared to the working-age population, is expected to increase from 39 in 2020 to over 100 in 2056, reaching 117 in 2070. In comparison, by 2070, Japan is expected to have a dependency ratio of 98, Germany 81, the United Kingdom 73, and the United States 71.¹⁴

South Korea's growing demographic imbalance creates a domino effect of challenges. A declining population usually leads to lower consumption and a downturn in the domestic market, which in turn increases the fiscal burden on governments having to support an aging population. This increased financial burden is then passed on to the working-age population, potentially leading to conflict between older generations and their younger counterparts, who have to take on more responsibility for more people.

1.2. Low efficiency in labor productivity

Given the compounding challenges of population decline, including a low birth rate and high dependency ratio, South Korea needs innovative productivity gains to maintain or accelerate economic growth. However, a gap currently exists between the country and other advanced economies in terms of labor productivity.

On average, in 2023, South Koreans work 36.9 hours a week, surpassing the United States (34.6), Japan (31.2), the United Kingdom (29.3), and Germany (25.7). Despite a higher weekly working average, South Korea's labor productivity (GDP per hour worked) in 2023 has been \$52.4 (measured in international dollars and at purchasing-power parity), considerably lower than Germany (\$87.3), the United States (\$87.2), the United Kingdom (\$74.3), and Japan (\$55.6).¹⁵

Labor productivity requires urgent attention. Despite aiming for a “productivity revolution,” South Korea's productivity stands at approximately 70 percent of average mature economies, including France, Germany, the United Kingdom, and the United States.

In light of these economic realities, South Korea's current economic growth strategy needs to change if it wishes to achieve another productivity transformation that will give it a substantial economic boost. The country's global economic competitiveness is at stake, and the gap is only going to widen if action is not taken soon.

2. Capital

Financial depth—issuances of public and private equity, corporate bonds, financial institution bonds, and securitization as a percentage of GDP—is a measure of capital size and maturity. South Korea's financial depth is not only on a downward trajectory but is also lower than in other developed countries. The country's financial depth stood at 10.9 percent in 2018 and 8.2 percent in 2022. This decline in financial depth is due to challenges within the listed equity markets and venture capital markets (Exhibit 1).

¹¹ World Bank data, August 11, 2023.

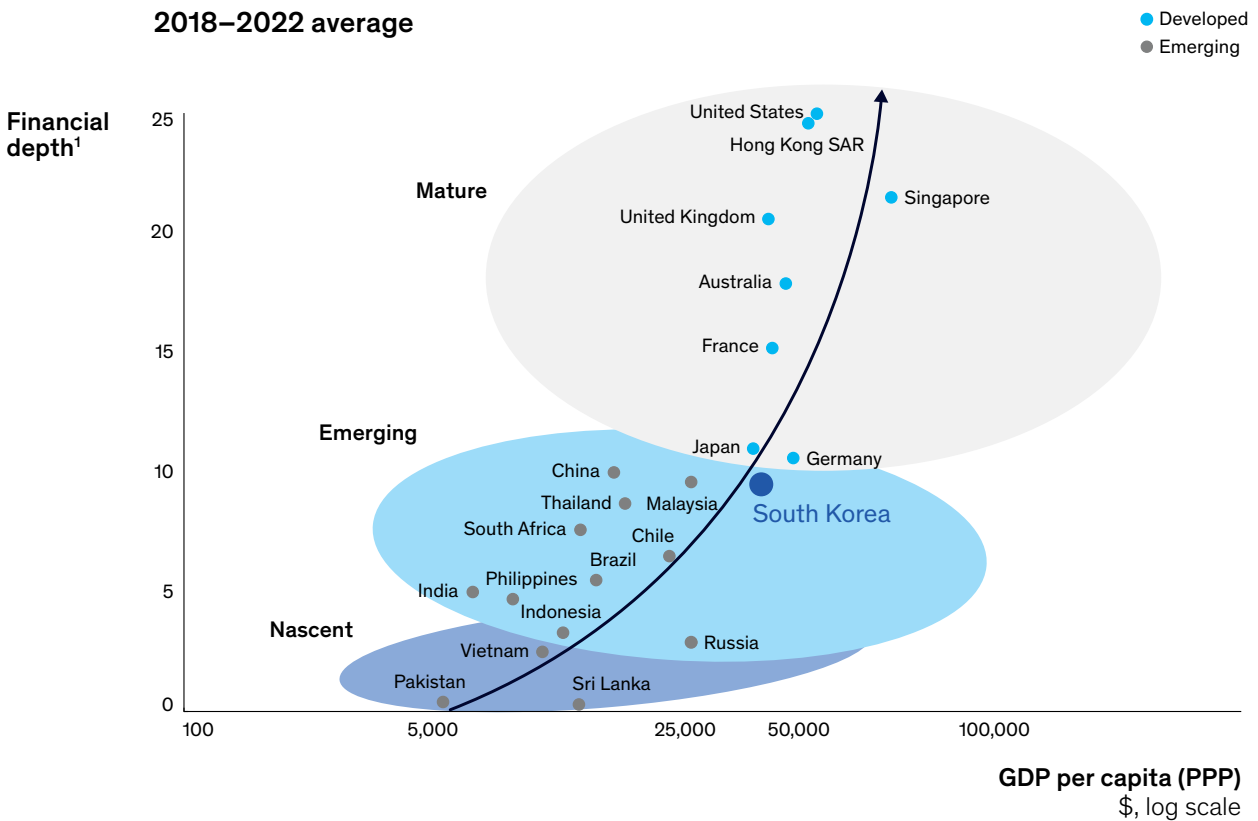
¹² “Future population projections: 2020–2070,” Statistics Korea, December 9, 2021.

¹³ Lee Jee-hyun, “Drive for more medical school ... Confirmed in the first half of next year,” *E-daily*, October 26, 2023.

¹⁴ “Future population projections: 2020–2070,” Statistics Korea, December 9, 2021.

¹⁵ GDP calculated by considering the price level of each country, which represents the actual purchasing power of each country by adjusting the GDP by the purchasing power of money.

South Korea’s financial depth is lower than that of developed countries.



¹ Issuance of private and public equity, corporate and FI bonds, syndicated loans, and securitized products as a percentage of GDP. Source: EIU; ION Analytics-Dealogic; Prequin; World Bank

2.1. Lack of attractiveness of the listed stock market

Investors have undervalued South Korea’s company stocks compared to other countries, leading to the term “the Korea discount.” According to the Korea Capital Market Institute, based on the past ten years (2012 to the end of 2021), South Korea’s price-to-book ratio averaged 1.2, significantly lower than advanced countries at 2.2, emerging countries at 2.0, and the Asia–Pacific region at 1.7. In addition, the price-to-earnings ratio is at 49 percent that of the top five countries globally (France, Finland, Italy, Singapore, and the United Kingdom) and 81 percent that of the sample country average over the same ten-year horizon (2012 to 2021).¹⁶

This “discount” is in part attributed to corporate governance in South Korea where some companies may have less incentive to grow their share price to pay less tax when gifting or inheriting financial assets. An assessment by the Asian Corporate Governance Association in 2020 ranked South Korea ninth out of 12 Asian countries, the same position as in 2016 and 2018. This is mainly due to the assessment that dividends, rules on the composition of nomination committees for outside directors, and auditor appointment standards contribute more to the maintenance of controlling shareholders than minority shareholders.

If the market does not trust corporate governance of listed companies, despite improvements in the capital market system, the attractiveness of the South Korean market will likely continue to remain low.

¹⁶ Junseok Kim and Kang Sohyun, *Analysis of Korea discount causes*, Issue Report 23-05, Korea Capital Market Institute, 2023.

2.2. Lack of dynamism in the venture capital market

Similar challenges to those the public equity market faces can be found in the venture capital market.

First, the South Korean venture capital market lacks the participation of certain types of investors found in other countries, such as foundations and family offices.¹⁷ Furthermore, start-up funding rounds are challenging. Venture capital funding does not stop at early-stage rounds; mid-to-late and follow-up stage funding rounds are also important to the sustained growth of start-ups. Yet, as of 2021, the proportion of follow-up investment by South Korean venture capital companies amounted to 71.2 percent, trailing significantly behind the United States at 92.6 percent. Therefore, after having obtained initial funding from domestic venture capital sources, local “unicorns” often have to rely on foreign investors to attract large-scale capital and support for growth to become a high-value enterprise.¹⁸

This lack of dynamism in the venture capital market stems not only from the investor side, but also from the attractiveness of start-ups to invest in. Technology-based start-ups¹⁹ in various fields represented approximately 16 percent of new start-ups from 2017 to 2022.²⁰ In 2021, the percentage of global unicorns located in South Korea was approximately 1 percent, in contrast to the United States at about 51 percent and the United Kingdom at about 11 percent. The contrast is even more pronounced in the case of artificial intelligence (AI) unicorns—globally, about 45 percent are from the United States and about 27 percent are from China, while none are from South Korea.²¹

3. Industrial competitiveness

During South Korea’s first S-curve of economic development (1960–80) and its second (1980–2000), the country successfully established and grew key industries centered on conglomerates; their vital contributions to the economy should not be overlooked. However, given the increasing competition in the country’s pillar industries and the persistence of the large-scale SME productivity gap, South Korea needs to develop new growth engines.

3.1. Intensified competition in national pillar industries

Traditional industries such as automotive, chemicals, and semiconductors, which contribute significantly to South Korea’s GDP, are in need of new growth engines. In fact, some of these core industries have recorded negative growth in their market shares, while new entrants from China have rapidly increased their growth.

In the automotive industry, Hyundai Motor Group ranked third globally in sales as of 2022, but the competition with traditional European original equipment manufacturers (OEMs) and newly emerging OEMs, mainly based in the United States, is intensifying amid the trend toward electric vehicles (EVs).²²

South Korean semiconductor companies have had a strong presence in memory chips—essentially a high-volume industry with cycles of demand, supply, and price, and a product that is a commodity in nature. But in non-memory sectors such as logic, foundry, and packaging, South Korean companies have only a 3 percent market share.²³

¹⁷ Yongrin Park, *Measures to promote the supply of venture capital*, Korea Capital Market Institute, October 13, 2022.

¹⁸ A unicorn is a start-up whose value is considered to be over \$1 billion; Yongrin Park, *Diagnosing the causes of the recent decline in venture investment and future development tasks for the venture capital market*, Capital Market Focus, No 13, Korea Capital Market Institute, July 11, 2023.

¹⁹ Manufacturing, information and communication, education, health and social welfare, creation, and art and leisure services.

²⁰ “Announcement of annual start-up business trends in 2022 by the Ministry of SMEs and start-ups,” Korea Development Institute (KDI), March 3, 2023.

²¹ *Current status and implications of the world’s top five countries producing unicorn companies*, The Federation of Korean Industries (FKI), August 26, 2021.

²² Lee Sae-rom, “Hyundai Motor Group has become one of the ‘Big 3’ automakers,” *Yonhap News Agency*, March 15, 2023.

²³ Kyung Hee-kwon and Kim Sang-hoon, “Global non-memory semiconductor market terrain and policy implications,” Korea Institute for Industrial Economics and Trade (KIET), August 29, 2023.

As many countries attempt to localize their semiconductor value chains, and as companies in China and Taiwan continue to expand their presence in the face of diminishing market opportunities, a new breakthrough in the South Korean semiconductor market is needed.

In the petrochemical industry, China is also rapidly expanding its influence based on growing domestic demand, cost-competitiveness, and government support. From 2001 to 2019, China accounted for about 50 percent of total domestic petrochemical exports. However, China's self-sufficiency rate for most basic chemicals and intermediate raw materials is expected to exceed 100 percent by 2025, which is part of the reason why South Korea's share of exports to China has been declining since 2020.²⁴

As competing pillar industries rapidly grow in other countries, South Korea needs to actively think about a new growth formula.

3.2. Persistent productivity gap between large enterprises and SMEs

From 2017 to 2021, the revenue of the top ten "chaebols" in South Korea consistently accounted for around 60 percent of the country's nominal GDP.²⁵ Among these, the single largest conglomerate alone accounted for approximately one-fifth of the total nominal GDP.²⁶ While 80 percent of Korea's total workforce works for SMEs, the value created per person employed is significantly lower due to the low productivity of SMEs.

The OECD average productivity ratio of SMEs to large firms is around 50 percent, but in South Korea, the ratio is around 30 percent, which is the fourth-largest productivity gap among OECD countries, after Ireland, and Mexico. According to the Korea Federation of SMEs, the number of R&D employees in SMEs decreased from 5.7 per company in 2012 to 3.8 in 2020; in 2021, in terms of educational attainment, the proportion of workers with a college degree or higher was about 42 percent in SMEs versus 61 percent in large enterprises, widening the gap from 2011. From 2010 to 2020, R&D expenditures in SMEs and large enterprises increased at an average annual rate of 5.0 percent and 6.4 percent, respectively, and the gap continues to widen. Meanwhile, the planned amount of capital investment by SMEs continued to decline from around \$31 billion in 2014 to around \$15 billion in 2022.

The low productivity of SMEs will lead to a deepening dependence on large enterprises in the overall economy, as well as slowing economic growth and increasing wage inequality.

Choosing the road to growth for the next S-curve

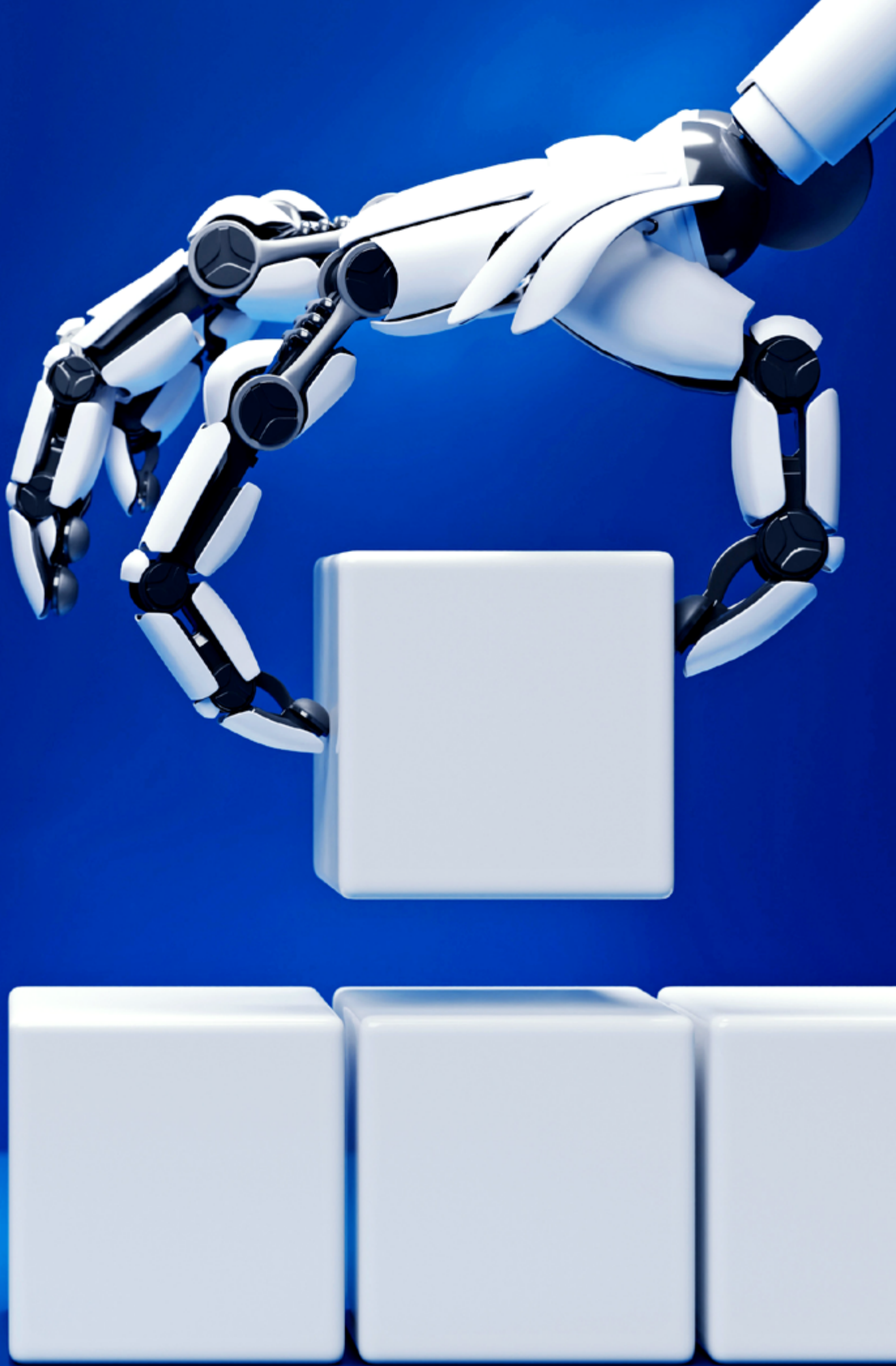
The South Korean economy is facing new challenges in all aspects of GDP growth (labor, capital, and industrial competitiveness). In addition, the current geopolitical situation requires a more delicate approach for South Korea, which has a highly trade-dependent economy (it had an average trade dependency of about 85 percent from 2018 to 2022). As the world shifts to a multipolar system, it is even more important for South Korea to diversify its strategic economic partnerships while maintaining an economic and security balance between the two major powers of China and the United States.

At the same time, however, South Korea has the potential to transform these challenges into opportunities to better utilize its workforce, increase investment capital, and improve industrial productivity. South Korea is at a crossroads where challenges and opportunities coexist. The country should immediately embark on a journey to chart the next S-curve.

²⁴ "Structural changes in the domestic petrochemical industry caused by the supply and demand situation in China," NICE rating, March 20, 2023.

²⁵ A large, family-owned business conglomerate in South Korea.

²⁶ Lee Jeong-hoon, "Samsung and other conglomerates' concentration of economic power has grown ... The Yoon administration's policy is 'pro-chaebol,'" *Hankyoreh*, June 27, 2022.



Chapter 2

A new growth model to kick-start South Korea's next S-curve

We present a framework of three pillars (restructure, shift, and cultivate) and eight actions that could kick-start another S-curve in the South Korean economy to overcome the labor, capital, and industrial competitiveness issues mentioned above. These actions call for a simultaneous transformation across the economy, to boost the country's medium- to long-term economic growth trajectory and enable its third "S-curve."

Restructure

It is time to revisit industries that have traditionally been at the core of South Korea's successful economic growth but are highly likely to face increasingly weakening competitiveness if the current course is maintained. These industries could fundamentally restructure (action 1) and renew their business models (action 2) to improve their current structure.

Shift

Almost all industries need to shift their growth model to focus along three dimensions. These dimensions are a shift to higher value-added portfolios (action 3), a shift to create new businesses based on original technologies already owned (action 4), and a shift to AI (action 5).

Cultivate

Achieving meaningful growth requires more innovative businesses. This would involve building a pipeline of companies—including SMEs, start-ups, and foreign firms, and attracting experts with the necessary key skills. To build a new core of the South Korean economy, long-term investments are crucial. Achieving these goals would require cultivating sources of industrial innovation, including activating megaclusters and revisiting regulations (action 6), building a virtuous capital market (action 7), and nurturing key talent (action 8).

Restructure

1. Restructure core industries

During the 1970s, South Korea's economy blossomed thanks to a large-scale economic transition to heavy and chemical manufacturing industries, which became the core of the domestic economy. Since 2020, the manufacturing industry has represented 27 percent of South Korea's GDP. The heavy and chemical industries (chemical, steel, machinery, electrical equipment, and oil refining) account for approximately 38 percent of the manufacturing industry shipments, playing a key role in exports.²⁷ However, many heavy and chemical industries are threatened by increasing competition and shrinking profitability because of decreasing global demand.

1.1. Optimizing capacity

Core industries that are at risk of losing their competitive edge due to various external factors could consider restructuring to enhance overall sustainability. Industries expected to have excess supply could consider optimizing their capacity through asset rationalization and consolidation between entities (for example, through portfolio exchanges). Furthermore, relocating existing labor to other industries through reskilling could be considered. A restructured industrial environment would continue its important contribution to national economic growth by reestablishing an overall strategic direction.

For example, in 2017, China started a bold restructuring of its key industries such as steel, coal, shipbuilding, cement, and LCD polarizer manufacturing to make them more self-sustaining in the face of overcapacity challenges.²⁸

There are several industries that may need restructuring in South Korea, including oil refining, petrochemicals, steel, and construction. Stagnant growth is expected in the steel and construction industries for reasons that include intensified competition among domestic players and declining overseas demand. For example, in the steel industry, price competition is intensifying as China continues to increase its own supply of steel. South Korean steel companies' competitive edge—especially that of small and medium-sized players—is under threat, despite previous attempts at consolidation. In the construction industry, an ongoing recession in the property market—triggered by unsold properties and a nonperforming loan crisis—is threatening the overall soundness of the South Korean construction economy. Fierce competition is leading many medium-sized players to resort to actions that put them at risk of bankruptcy.

1.2. Address challenges for the oil refining and petrochemical industries

The oil refining and petrochemical industry is one of the stalwarts of the South Korean economy. It accounts for about 5 percent of GDP and in 2022 employed about 170,000 people. However, the future of the industry is at risk due to overcapacity.²⁹

Oil refining industry: The massive global energy transition in response to long-term, carbon-neutrality commitments is expected to trigger a major decline in demand. Therefore, the industry could consider restructuring to address anticipated oversupply. For example, transportation accounts for about 45 percent of global refining demand. However, because of the transition to EVs, as well as declining car ownership trends, a reduction in demand of between 30 and 100 percent is projected across all five of McKinsey's energy transition scenarios, as laid out in its *Global Energy Perspective 2022* report.³⁰

²⁷ "Analysis on manufacturing/corporate activities (business)," Statistics Korea, December 28, 2021.

²⁸ Cheolyong Lee, "China's secondary industry restructuring is more about the conditions for implementation than the scale of excess or insolvency," *LG Business Research*, August 17, 2016.

²⁹ "GDP and GNI by economic activity (original, nominal, quarterly, and annual)," Korean Statistical Information Service (KOSIS), February 4, 2023.

³⁰ *Global energy perspective 2022*, McKinsey, April 2022.

The Further Acceleration scenario, which assumes that all commitments are fulfilled, forecasts that all refined product demand in the Asia–Pacific region could peak between 2025 and 2030, starting with gasoline and diesel in 2023, followed by a major overall decline in demand of around 50 percent by 2050.³¹ Given this unfolding trend, it is time for South Korea to consider restructuring the industry by rationalizing supply capacity. This could be achieved by creating large-scale consolidation of assets such as refineries.

An example of refiguring the industry successfully can be found in Japan. In 2000, Japan's refining capacity was approximately 5 million barrels per day—just over twice that of South Korea's—making it the largest producer of petroleum products in Asia, except for China. However, fuel consumption declined due to various reasons, including an aging population, improved automobile fuel efficiency, and the shift to EVs. This caused a deterioration in the soundness of the refining industry and led to large-scale, industry-wide restructuring. Through mergers and acquisitions (M&As) and business reorganization, Japan's refineries were restructured from 17 to five and outdated refineries were closed or converted into production facilities for specialty chemical products.³² Today, Japan's daily refining capacity is 0.94 times that of South Korea.³³

Petrochemical industry: The South Korean petrochemical industry has experienced dramatic growth, delivering a total shareholder return CAGR of 29 percent from 2001 to 2010, 70 percent greater than that of global players in the commodity chemical segment.³⁴

The country's petrochemical industry was able to scale up quickly because it based growth on volume expansion, mainly in commodity chemicals such as paraxylene and polyethylene. It was able to target the fast-growing Chinese market, the largest customer of South Korean players. However, China has been increasing its self-sufficiency with the support of the government.

Furthermore, structural limitations of the South Korean petrochemical industry are impacting its competitiveness. The capacity utilization rate of the top ten products is expected to fall to around 65 percent by 2028.³⁵ In fact, the domestic petrochemical industry's total shareholder returns CAGR between 2011 and 2020 fell to 1.3 percent, which is lower than the 4.2 percent recorded by the global commodity petrochemical industry (Exhibit 2). It marked the beginning of a slowdown in growth.³⁶

For example, paraxylene is the most representative export product in South Korea's petrochemical industry. China's self-sufficiency rate of paraxylene was approximately 39 percent in 2018, however, it increased to 70 percent in 2022.³⁷ By 2028, demand for the product is expected to be only about 10 percent of South Korean players' current export volume.³⁸ To make matters more difficult, China continues to increase its self-sufficiency, and expects oversupply even within its domestic market.

The South Korean industry therefore needs to consider divesting its non-core assets and business portfolios that have become less competitive, and consolidate or close certain production facilities. Based on the physical and financial resources available after restructuring, the South Korean industry would have to implement a new strategic direction, such as investing in new growth engines.

³¹ Further acceleration of transition will be driven by country-specific commitments, though financial and technological restraints remain; *Global energy perspective*, McKinsey, April 2022.

³² Soogi Lee, "17 down to 5 refineries, Japanese-style restructuring strategy for 'loss-making' refineries," *The JoongAng*, June 18, 2020.

³³ *Statistical review of world energy*, Energy Institute, 2023.

³⁴ Wonsik Choi, Marco Moder, and Eliane Wolf, "Creating a strong future for South Korea's chemicals companies," McKinsey, June 25, 2021.

³⁵ McKinsey internal analysis; OPIS; McKinsey Chemicals Insights, July 2023.

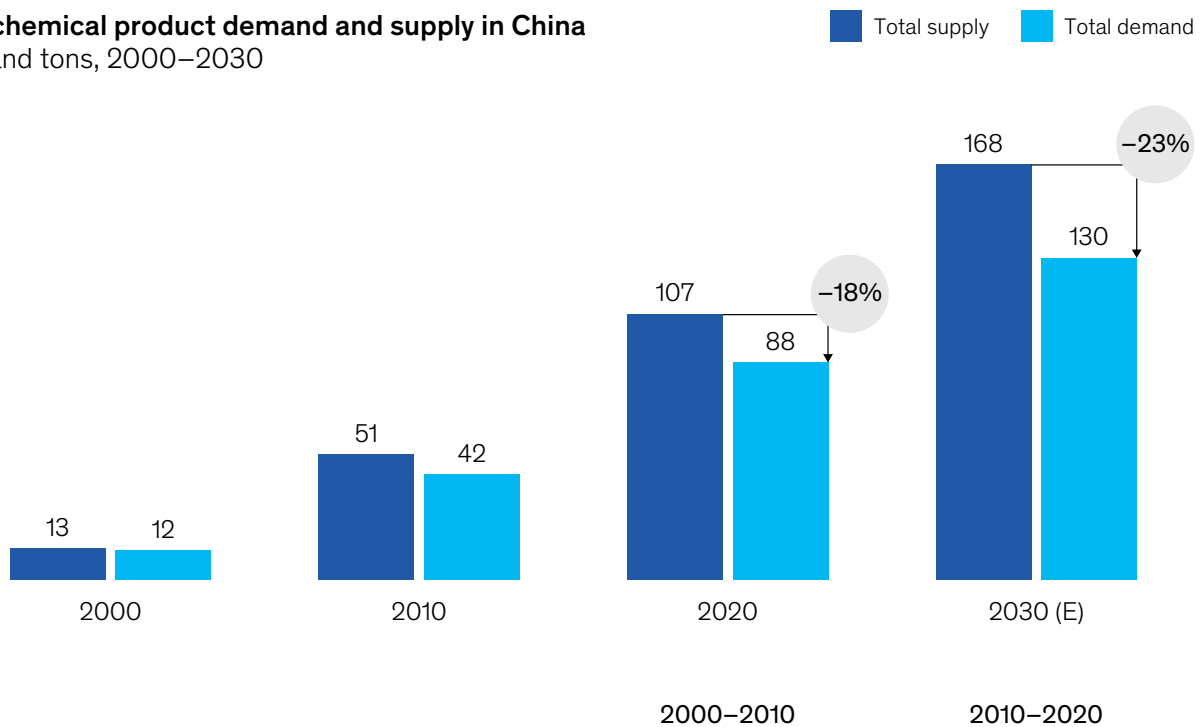
³⁶ Wonsik Choi, Marco Moder, and Eliane Wolf, "Creating a strong future for South Korea's chemicals companies," McKinsey, June 25, 2021.

³⁷ BAIINFO; Korea Petrochemical Industry Association; KOTRA, 2022.

³⁸ McKinsey internal analysis; OPIS; McKinsey Chemicals Insights, July 2023.

South Korea’s petrochemical industry faces challenges from China’s growing self-sufficiency.

Petrochemical product demand and supply in China
thousand tons, 2000–2030



Total shareholder return, CAGR ¹ percent ²	Global commodity chemicals industry	17.2%	4.2%
	Korean chemicals industry	29.2%	1.3%

¹ CAGR period is calculated based on 2001 to 2011 and 2011 to 2020.
² Index = 100, December 31, 2000.
 Source: Chemical market analytics, McKinsey; Corporate performance analytics, McKinsey

Leading petrochemical companies in Europe, Japan, and the United States are accelerating the restructuring of their portfolios into higher-value specialty products by rationalizing existing assets and facilities, and leveraging their technology capabilities, sales network, and sufficient capital power. For example, global energy giant Shell plans to reduce its annual oil exploration expenditure from \$2.2 billion to \$1.5 billion and suspend new exploration after 2025. At the same time, it reduced the number of its refinery sites from 13 to six.³⁹

In South Korea’s commodity sector, the gross value added to sales by the petrochemical industry keeps declining. It dropped from 22.4 percent to 18.7 percent between 2015 and 2019, and remained stagnant in the specialty chemical segment (slightly increasing from 32.8 percent to 33.3 percent over the same period).⁴⁰

³⁹ Kirsten Mosbrucker, “Louisiana braces for refinery closure as Shell retains Gulf emphasis amid global production cutback,” *The Advocate*, February 11, 2021; “Shell accelerates drive for net-zero emissions with customer-first strategy,” Shell.com, February 11, 2021.

⁴⁰ *Gross value-added to sales per industry*, Korea Institute for Industrial Economics & Trade, June 2021.

Another area for South Korea to consider restructuring is its carbon-emitting industries—for example, the petrochemical industry accounts for 20 percent of total industry emissions. If these industries fail to decarbonize, their competitiveness will be weakened as demand from major downstream customers for zero- and low-carbon products intensifies. Mitigating the situation requires not only industry efforts to decarbonize, but also financial support such as tax incentives through the government's Climate Response Fund.⁴¹

Restructure

2. Restructure business models

The main manufacturing industries in the South Korean economy, such as automotive and mobility, shipbuilding, and home appliances have grown steadily over the past three decades under a vertically integrated business model consisting of large conglomerates and Tier-1 and Tier-2 suppliers. This model has contributed to the manufacturing industry's high efficiency and fast product cycles, enabling it to compete on quality and price, and to make incremental process improvements.

Meanwhile, in the consumer goods industry (which includes food, fashion, and beauty), a localized business model has secured competitiveness in the domestic market against global leaders. In some consumer goods areas, such as beauty and food, South Korea has achieved meaningful results in securing a competitive position in overseas markets such as China thanks to the "K-trend."

This vertical business model was an effective strategy in an economy where industry boundaries were clear and intra-industry specialization led to competitiveness. However, even in industries where South Korea has secured a world-leading position, boundaries between industries are becoming blurred, and it will be difficult to respond to changes in technology and customer requirements without restructuring business models, especially in mobility and shipbuilding. In addition, the consumer goods industry, which has traditionally grown mainly in the domestic market, also requires rapid business model reform due to structural factors such as population decline, making it difficult to expect further growth using the current business model.

As opportunities for creative collaboration within and across industries are increasing, companies should actively consider adopting business models based on horizontal collaboration. In addition, they should not only increase such collaboration domestically, but also continue to discover new sources of demand through active global collaboration.

2.1. Restructure to lead the mobility industry

The future mobility era, characterized by megatrends such as sharing, electrification, and autonomous driving, is on the horizon. South Korea's mobility industry is already highly competitive globally, but to maintain such a leadership position, horizontal collaboration between existing and new companies in the ecosystem needs to be actively promoted. It requires multifaceted efforts from domestic mobility start-ups, large corporations, and major companies in various industries.

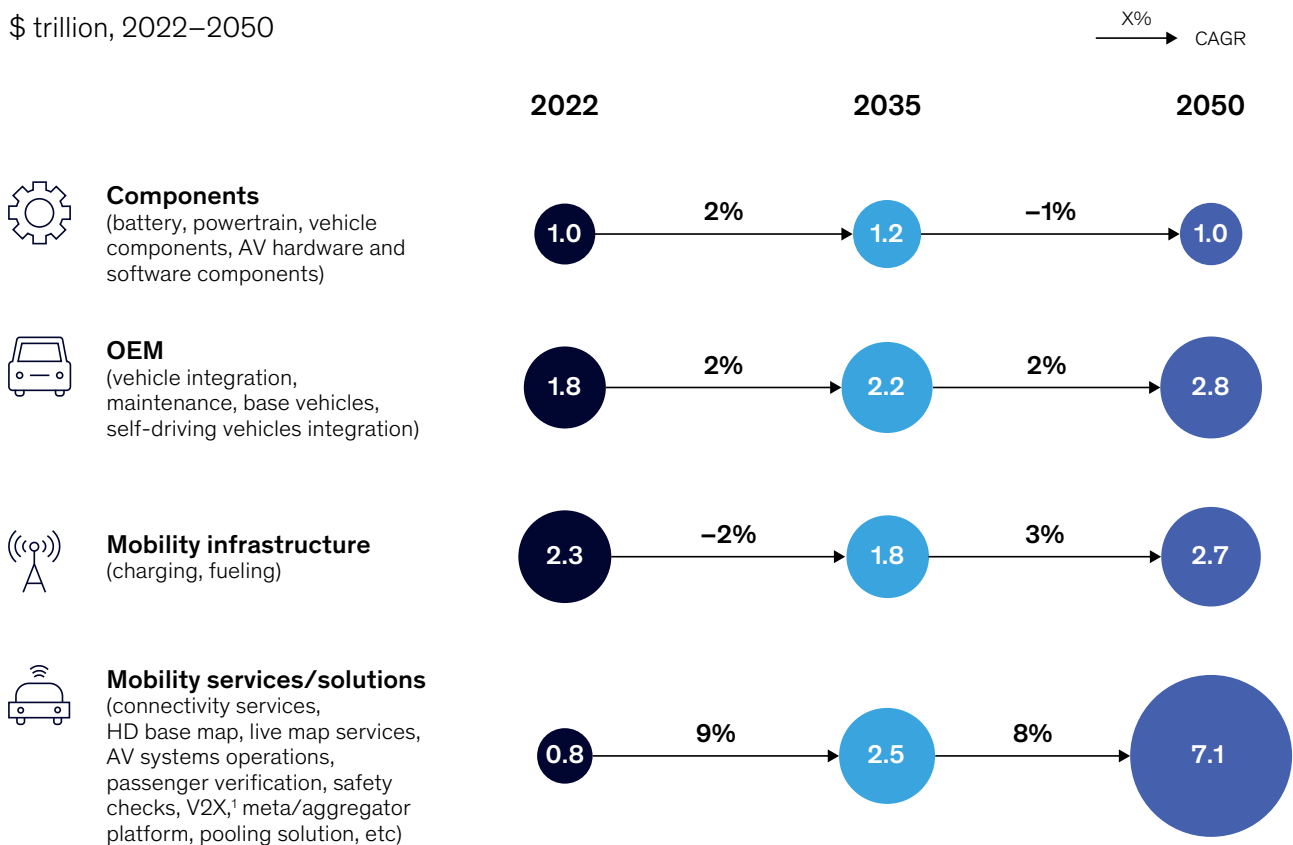
The global mobility industry is currently centered on OEMs and mobility infrastructure. However, the industry is expected to continue changing until 2050. Mobility services, whose value pool is about 45 percent in size compared to that of OEMs, are expected to exceed the OEM value pool by 2035 and form a market size about two-and-a-half times that of OEMs by 2050 (Exhibit 3).⁴²

⁴¹ "Comparative analysis of domestic and international climate action fund utilization and implications," Korea International Trade Association (KITA), October 17, 2023.

⁴² Shared and private mobility value pool data provided by McKinsey Center for Future Mobility (MCFM). Based on McKinsey's five energy transition trend scenarios, in which countries partially fulfill their net-zero pledges but face financial and technical constraints. The detailed value chain for each of the four actors (components, OEMs, mobility infrastructure, and mobility services and solutions) was regrouped by the project team, and definitions may vary by company. We define "value pools" as revenues across the entire value chain. For more information on the five scenarios, see *Global Energy Perspective 2022*, McKinsey, April 2022.

The global mobility industry value pool is expected to keep changing until 2050.

\$ trillion, 2022–2050



¹ Vehicle-to-everything.

Note: Among five scenarios described in McKinsey's Global Energy Perspective 2022, this exhibit assumes a scenario of transition driven by country-specific commitments, though financial and technological restraints remain.

Source: McKinsey Center for Future Mobility (MCFM)

The upheaval in the mobility industry has been caused by the emergence of new businesses that did not exist before. The mobility ecosystem is expected to expand and diversify to include EVs, two-wheelers, advanced air mobility (AAM), robotics, and last-mile delivery. One of the major trends is the electrification of vehicles. If most of new vehicle sales in major markets such as China, Europe, and the United States, are converted to EVs by 2035, as a study by the McKinsey Center for Future Mobility suggests, the hegemony of the EV market will be completely different from that of the existing internal combustion engine (ICE) market.⁴³

In response to this trend, traditional ICE OEMs, native EV players (such as Tesla), and emerging EV powerhouses (Chinese OEMs, for example) are expanding their EV portfolios to dominate in the new market order. Traditional global leading ICE OEMs have indicated their intention to switch 100 percent of their production to EVs by 2030. In addition, Tesla has unveiled a new business model of autonomous driving subscription services.

⁴³ "Why the automotive future is electric," McKinsey, September 7, 2021.

In the face of the ongoing upheaval, South Korea's mobility industry needs to have a mid- to long-term perspective on opportunities it could seize to become a leader in providing the core competencies new markets need. In the long term, large investments are essential if South Korea wants to become a leader in the mobility market by expanding into sectors such as hydrogen vehicles, AAM, and robotics (see "Shift to new businesses based on original technologies" for more information). In the near term, industry and the government need to undertake three main strategies in terms of activating horizontal collaboration within the ecosystem:

2.1.1. Driving partnerships to secure core competencies for the future of mobility

First, it is essential to internalize core subsectors (such as materials, components, and equipment) by expanding value chains in the battery industry—an emerging core industry in the EV era. The size of the secondary battery pack market is expected to grow at an annual rate of about 15 percent from the current \$119 billion (about 160 trillion Korean won) to \$603 billion (about 815 trillion Korean won) by 2035.⁴⁴ To capture the value pool in the market, South Korea's battery industry would need to expand into high-value-added portfolios such as battery subscription services, EV charging infrastructure, and energy storage systems. In the process, active horizontal collaboration among ecosystem players would be beneficial for securing supply chains, obtaining capital, and reducing investment risks.

To remain competitive in the ecofriendly vehicle market, such as electric and hydrogen vehicles, South Korea would also need to diversify its products and services—such as software subscriptions—in addition to selling finished vehicles. To achieve this goal, it would have to create partnerships between major players in the ecosystem. As mentioned earlier, the value pool of the mobility services and solutions market is expected to exceed the value pool of OEMs by 2035 and to become ten to 25 times more profitable than the OEM business.⁴⁵

Given that customer needs and forms of mobility will continue to diversify and expand, start-ups and small companies that can respond flexibly should be encouraged to become leaders in their respective fields. At the same time, it is essential to promote partnerships between OEMs and mobility solution providers, and between mobility solution companies. Chinese automakers are already gaining competitive advantages through ongoing collaborations with several IT companies. In addition to nurturing existing companies, it is important to broaden the pool of potential candidates for partnerships by cultivating new automotive OEMs and new solution providers. Established automotive OEMs would need to play a key coordinating role in this process. OEMs could act as incubators to nurture potential partners based on their high level of capitalization.

2.1.2. Bold portfolio transformation of small Tier 2 and some Tier 1 companies

As existing industries—such as the ICE industry—continue to shrink in size, tier-one and tier-two suppliers in the traditional component industry that fail to adapt to the changing times may be forced out of business, leading to an industry collapse. Approximately 30 percent of South Korea's existing domestic ICE parts companies could disappear by 2030 due to the shift to EVs.⁴⁶ This is mainly because EVs require 30 to 40 percent fewer individual parts compared to ICE vehicles.⁴⁷ Despite the expected decline in demand for ICE vehicles, around 62 percent of domestic suppliers have not begun to transform their portfolios, and only about 15 percent are generating revenue from EV relevant parts sales.⁴⁸

⁴⁴ Kihoon Kim, "Electric vehicle battery market in 2035: KRW 815 trillion ... Price is as important as technology," *Yonhap News Agency*, April 12, 2023.

⁴⁵ "Reimagining mobility: A CEO's guide," *McKinsey Quarterly*, February 25, 2019.

⁴⁶ *Impact of future vehicle industry transition on employment*, Korea Automotive Research Institute, Automotive Industry Human Resource Development Committee, 2022.

⁴⁷ Ji-hoon Lee, "Parts companies that can't keep up with the transition to electric vehicles... 500 places could disappear by 2030," *Korea Economy*, August 26, 2022.

⁴⁸ Jeong Sang-hyuk, "Six out of ten domestic automobile parts companies say it is difficult to transition to future vehicles," *Securities Daily*, March 22, 2023.

By leveraging the shift to electrification, as well as their own expertise in manufacturing components, parts companies could proactively move away from a supply chain that is dependent on demand from existing conglomerates. They could instead adopt new business models that include collaboration with various global OEMs.

2.1.3. Close collaboration with global companies

Close collaboration with global companies, such as companies in India, Japan, and Southeast Asia, could play an important role during the process of implementing the actions suggested earlier. This would be in addition to strengthening competitiveness based on solid cooperative relationships between domestic OEMs, parts companies, and solution providers.

For example, the global OEM alliance for the fuel cell EV industry of South Korean Tier 1 companies could collaborate with companies in India for the two-wheeler market. In addition, domestic mobility services companies, such as ride-hailing and car-sharing companies, have competitive capabilities but are limited to South Korea. They could collaborate with global OEMs to package their services collaboratively and strengthen their mutual competitiveness in the process.

To prepare for the future mobility industry, product and service providers in each value chain would need to implement strategies to expand their global presence. This could be done by providing end-to-end mobility services, rather than developing independent businesses. For example, instead of only focusing on vehicle manufacturing or only on the charger industry, companies could actively collaborate horizontally.

2.2. Overhaul the shipbuilding industry's business model

The shipbuilding industry in South Korea has a global leading position but is facing a steady decline in competitiveness. It needs to transform its business model to one based on horizontal cooperation with other industries. In addition, the gap between South Korea's and China's high-value-added ship technology is narrowing.

If the South Korean shipping industry continues to decline, the situation could intensify the fierce competition that is already occurring due to the policy of low prices in China. In 2012, the gap in high-value-added ship technology between China and South Korea was 6.8 years. In 2016, the gap had halved, and in 2020 only a one-year technology gap remained in high-value-added shipbuilding—for example, using ecofriendly and smart ship technology as part of the same process.⁴⁹

2.2.1. Use horizontal cooperation to address ever-increasing price competition

There are several areas for shipbuilders to consider, one being the autonomous ship market. They could also expand horizontally into other businesses, including offshore wind power or big data, capitalizing on their existing strong supply chain, process-heavy production, and design capabilities. For example, to diversify its business, HD Hyundai Heavy Industries has ventured into autonomous ships, small nuclear reactors, offshore wind power, and businesses utilizing ship, port, and weather big data.⁵⁰

When a company considers entering new high-value-added markets such as the autonomous ship market and offshore wind power, it may be difficult to become a key player in the ecosystem if it only has production capabilities.

⁴⁹ *Technology level assessment*, Korea Agency for Science and Technology Planning and Evaluation, 2012, 2016, and 2020.

⁵⁰ "Hyundai heavy group, gap in cybersecurity technology for 'autonomous ships'," Hyundai, January 25, 2022;

"Hyundai heavy industries and KR · KRISO jointly develop offshore wind power floating body," Hyundai, July 27, 2021.

For example, within the autonomous ship industry there is a convergence of autonomous driving, the Internet of Things (IoT), big data, and advanced sensors. It requires intensive technology such as software, AI, and automation, making it difficult for traditional shipbuilders to organically acquire all the end-to-end technology needed. Consequently, companies need to collaborate with global leaders rather than acquire all the technologies organically.

To become the mainstay of the ecosystem, local companies could, for instance, establish global partnerships with specialized solution providers, and start-ups developing autonomous ship technology in Europe and the United States. In fact, the global autonomous ship and equipment market is expected to grow at a CAGR of about 13 percent from 2021, reaching \$235 billion by 2028, and is expected to become one of the key high-value-added sectors within the shipbuilding industry of the future.⁵¹

2.2.2. Rapid transformation of parts companies

Suppliers need to adjust by acquiring new skills and products for technology like autonomous ships. If suppliers fail to make the shift, shipbuilders will likely end up facing more severe labor and supply shortages when they expand their portfolios. Furthermore, shipbuilders need to support this transformation to ensure a sufficient supply of equipment that will be required in the shipbuilding industry in the future. Suppliers would also need to prepare for the future by adapting their portfolios to ensure their sustainable management.

The success equation of South Korea's pillar industries, including shipbuilding and mobility, needs to be supplemented. As various industries diversify and become more technology- and customer-driven, they need to continue to revamp their business models to stay competitive. Active collaboration between domestic and foreign start-ups, large companies, and cross-cutting industries is necessary. It will be important for industries that are expected to undergo such significant changes in the future to secure competitiveness through active horizontal collaboration.

2.3. Restructuring the consumer goods industry from domestic to global business models

Despite the existence of cultural megatrends such as K-pop and K-beauty, there are only a limited number of South Korean fashion, beauty, food, and other consumer goods companies with significant global presence. Of the top 150 global beauty brands only seven are South Korean, of the top 150 global fashion brands only one is South Korean, and of the top 150 global food and beverage brands only two are South Korean, respectively.⁵² In addition, of the top 3,000 companies in the world by market capitalization, only four are South Korean consumer goods companies, ranking 16th.⁵³

As the domestic market is expected to shrink due to a declining population, South Korean consumer goods companies should expand their presence globally and take advantage of the cultural interest in K-pop, K-food, and K-content.

⁵¹ Park Soon-yeop, "A market worth 300 trillion won will open in 5 years... Speed of development of 'autonomous ships'," *E-daily*, August 1, 2023.

⁵² "Euromonitor's world brand ranking data based on retail sales value in 2022," Euromonitor, April 2023; Fashion (apparel, footwear); beauty (color cosmetics, skin care); and food (baked goods; breakfast cereals; confectionery; edible oils; ice cream; meals and soups; processed fruit and vegetables; processed meat, seafood, and alternatives to meat; rice, pasta, and noodles; sauces, dips, and condiments; savory snacks; sweet biscuits; snack bars and fruit snacks; sweet spreads).

⁵³ S&P Global, October 2023; Corporate Performance Analytics by McKinsey, October, 2023. This contains the global top 3,000 companies by market capitalization as of December 31, 2022. The consumer sector includes: "apparel, fashion & luxury," "retail," "consumer packaged goods," "consumer services," "consumer durables," and "agriculture & food production" as sub-industries. The four South Korean companies are Amorepacific Corporation, LG Electronics, LG H&H, KT&G Corporation, and Samsung Electronics, which also has a consumer electronics division, is classified as "tech, media, and telco."

South Korea's consumer goods industry could take inspiration from traditionally export driven industries such as semiconductor and automobiles. Currently, only a few South Korean consumer goods companies have significant overseas sales. While the semiconductor and automobile industries' overseas sales percentage rises above 95 percent and 59 percent, respectively, overseas sales account for only 34 percent in the domestic beauty industry overseas, 1 percent in the fashion industry, and 32 percent in the food industry.⁵⁴

It is encouraging that some leading consumer goods companies have recently accelerated their overseas expansion, and consumer goods companies could continue to strive to expand into global markets. For example, CJ CheilJedang has rapidly grown its global food business through the acquisition of Schwan's Company, a US food company, and has become the first South Korean food company to exceed 5 trillion Korean won (around \$3.9 billion) in overseas food sales.⁵⁵ Another example, Nongshim, is implementing a premium strategy in Canada and the United States. As of 2022, its share of overseas sales was about 30 percent, and the average annual growth rate from 2020 to 2022 was 17 percent, compared to 6 percent in South Korea.⁵⁶

To effectively go global, companies could consider building global collaborative relationships with local companies. Obstacles to global expansion for consumer goods companies have included difficulties in developing and marketing localized products, and underutilization of global talent, including local teams. In the future, domestic consumer goods companies could consider active equity investment in global companies, M&As, and partnerships, and expand their business centered on overseas markets through active inorganic growth.

Shift

3. Shift to a high-value-added focus

South Korea could take two approaches to kick-start new growth momentum beyond the limitations of its manufacturing-oriented economy. It could expand the proportion of knowledge-based, high-value-added service industries—for example, the information and communication industries. At the same time, it could implement an extensive shift to high-value-added products and services in traditional industries that have supported the South Korean economy to date.

3.1. Shift to a higher proportion of high-value-added industries

Since the 1960s, South Korea's remarkable economic success has been based on two spurts of S-curve growth. It was propelled by a transition from producing simple iron ore to the shift to higher-value export products, such as steel plates, automobiles, industrial products, and semiconductors. However, the country's main export products generally remained the same from the 2000s to the 2020s, with only one new product added—display panels.⁵⁷ At the same time, some of the current top export products face significant challenges. These include industries shrinking due to lack of demand in the refining and petrochemical industry, and greater competition triggered by Chinese companies increasing their competitiveness in major industries such as displays and ships (Exhibit 4).

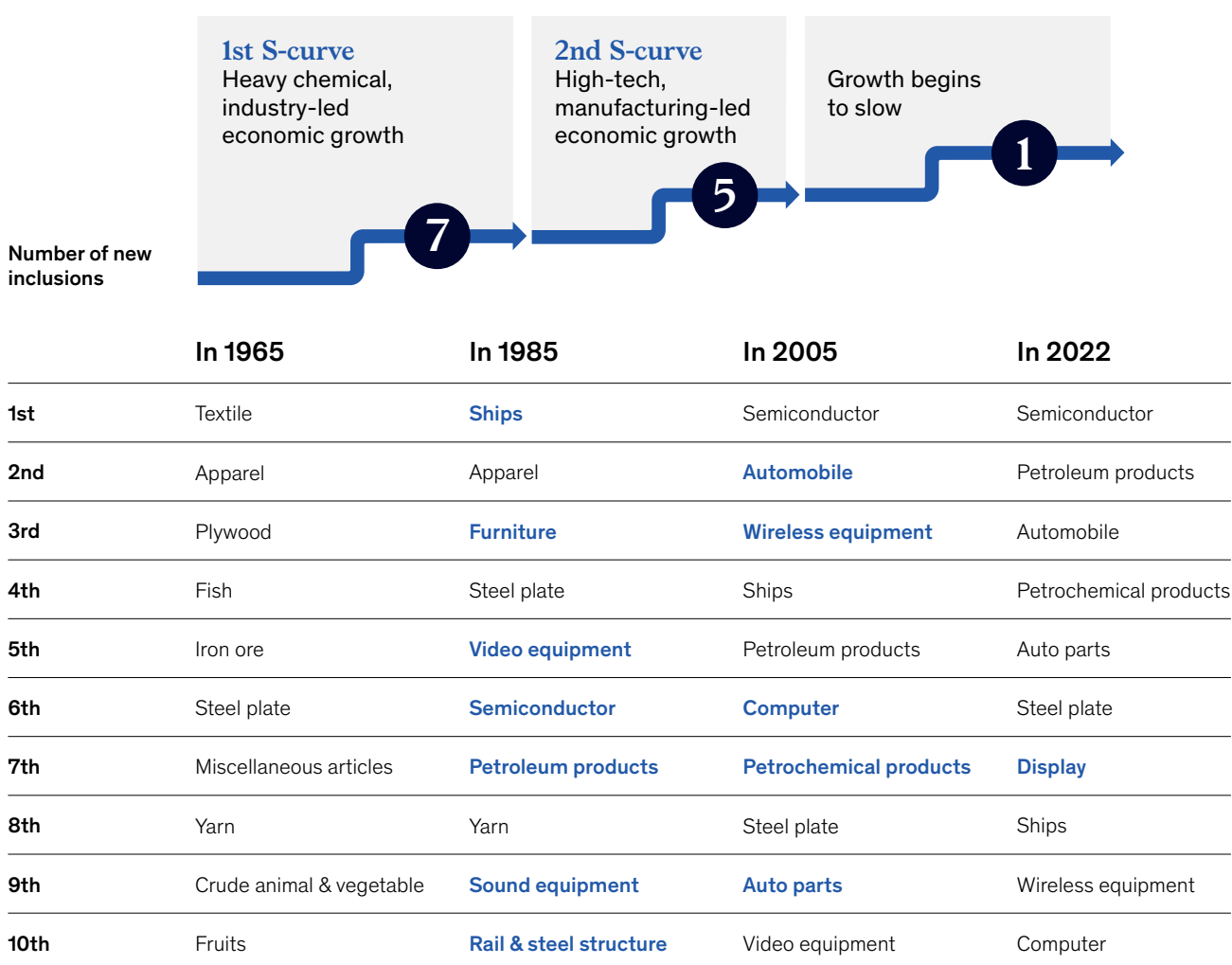
⁵⁴ Semiconductor: Samsung Electronics-Semiconductor BU and SK Hynix as of February 2022; Automotive: Hyundai Motor, Kia, KG Mobility (Ssangyong Motor); Fashion: Kolon Fashion, Samsung Fashion, Shinsegae International; Beauty: Able C&C, Aekyung, Amorepacific, Clio, LG H&H; Food: CJ CheilJedang, Daesang, Dongwon F&B, Nongshim, Ottogi; Companies' investor relations, April, 2023.

⁵⁵ "Performance presentation data, 2022," CJ CheilJedang, October, 2023.

⁵⁶ "Annual business performance in 2022," Nongshim, March 16, 2023.

⁵⁷ *Import and export of items*, Korea International Trade Association; "Economic statistics yearbook," Bank of Korea, 1966.

South Korea's top export products have not changed over the past 20 years.



Source: Economic Statistics Yearbook, Bank of Korea; Import and export statistics, Korea International Trade Association (KITA)

To address the various challenges, South Korea would have to expand the proportion of high-value-added industries throughout its entire production base and turn these companies into new growth engines.

For example, South Korea's current service industry does not make a large enough contribution to national growth compared to the manufacturing industry. As of 2020, the service industry has accounted for approximately 58 percent of GDP, lower than that of Germany (63 percent) and Japan (70 percent). The level of labor productivity in the service industry per employee is less than half that of the manufacturing industry (49.6 percent), and lower than that of major manufacturing powerhouses such as Germany (70.5 percent) and Japan (70.4 percent). This low productivity rate in the service industry places South Korea 34th among OECD countries and signals an urgent need for improvement.⁵⁸

⁵⁸ "Korea's service industry labor productivity ranks 28th out of 36 countries surveyed by OECD," The Federation of Korean Industries (FKI), May 1, 2022.

South Korea's service sector jobs are concentrated in low-value-added industries such as wholesale, retail, lodging, and food services. As a result, the country's service industry consists of a larger proportion of small businesses than in other countries. For example, in 2022, the proportion of self-employed people in South Korea was 20 percent (ranking it eighth among 38 OECD countries). This level of self-employment is 3.6 times higher than in the United States, and 2.4 times higher than in Japan. Countries that rank higher than South Korea include Colombia (53.1 percent), Brazil (33.3 percent), and Mexico (31.8 percent).⁵⁹

For some context, it is interesting to note that, as of 2021, the value added per employee by the service industry in South Korea was \$27,725 in the wholesale, retail, lodging, and food industry, and \$35,610 in the transportation and warehousing industry, compared to \$90,677 in the information and communication industry, and \$88,377 in the professional, scientific, and technical services industry.

South Korea needs to establish more industries that are classified as high value added. As of 2020, the proportion of information and communication, and professional science or technology services—classified as relatively high-value-added, knowledge-based industries—was quite low. They accounted for 4.5 percent and 6.2 percent of GDP, respectively, ranking South Korea 22nd and 28th, respectively, among OECD countries.⁶⁰ Companies in the service industry accounted for only 10 percent of the R&D spend in South Korea in 2019, ranking the country 35th among OECD countries. Furthermore, as of 2020, in South Korea R&D costs per researcher were \$177,000, lower than advanced countries such as France (\$191,000), Germany (\$273,000), Japan (\$242,000), and the United States (\$391,000).⁶¹

3.2. Ways to increase the proportion of high-value-added industries

In particular, those high-value-added service industries with a strong position in the domestic market—such as big tech companies, IT platforms, software companies, and content producers—could benefit from targeting expansion in the global market.

Software industry: Although entering the global arena is essential to succeed in the software market, only a limited number of South Korean companies have done so. According to the 2023 Software Industry Survey, South Korea's domestic software market size is only about 1.5 percent of the global market.⁶² The 2022 Software Industry Survey showed that, among about 30,000 companies surveyed, only 2.9 percent had entered the global market and approximately only 78.0 percent of those were generating sales.⁶³

According to a survey of Fortune 500 companies by the Korea International Trade Association, the highest capability level that South Korean IT start-ups are considered to possess is “innovative technology competitiveness.”⁶⁴ This shows that these companies are competitive; however, in terms of “readiness to enter overseas markets” they scored lowest—evidence of the significant need for structural shifts. For example, in the United States, large IT companies with global influence actively support the global expansion of high-potential IT start-ups. They do this through partnerships and by creating near-term potential partnership opportunities to strengthen mutual competitiveness.

⁵⁹ Park Sang-don, “Last year, the proportion of self-employed people among the employed was ‘pull-up’ at 20% ...Lowest ever,” *Maeil News*, January 16, 2023.

⁶⁰ “Korea's service industry labor productivity ranks 28th out of 36 countries surveyed by OECD,” The Federation of Korean Industries (FKI), May 1, 2022.

⁶¹ *Ibid.*

⁶² *2022 software industry survey*, Software Policy and Research Institute, June 29, 2023.

⁶³ *Ibid.*

⁶⁴ *Korean startups have good technology, but lack preparation for global expansion*, Korea International Trade Association, February 20, 2023.

Content and platform industry: Digital transformation is allowing the content market to grow rapidly, as well as leading to intensified direct competition with global companies as the boundaries between countries become unclear. For instance, global content giant Netflix continually secures global intellectual property (IP), including that of South Korea. The company is consolidating its market influence and has announced investments totaling \$2.5 billion in South Korea-produced K-content over the next four years.⁶⁵

Instead of remaining an “outsourcing country” for global over-the-top companies, South Korean domestic companies could play a leading role in the industry by utilizing K-content—by acquiring and securing IP centered on K-content, they could secure their competitiveness in the market. The production environment could be improved by introducing a standardized content production system, including production and technical guidelines, and budget management.

Furthermore, the government could develop general policies such as tax credits for SMEs and start-ups to support their content production, enabling South Korea to play a central role in the global content industry and not merely to be a content-production subcontractor for global over-the-top companies.

Retail industry: The retail industry is facing a transition from traditional retail business to retail-based digital platform business. For example, the strengthening of privacy laws in various countries has led to a decline in social media advertising based on third-party data, and the rise of retail media networks that advertise through retailers’ own channels.⁶⁶ In addition, the paradigm of online commerce has shifted from searching for products on search engines to searching for products at retailers, increasing the importance of this business.

This is a high-value-added business that has been the focus of major retailers such as Amazon in the United States. In 2023, Amazon’s revenue from advertising was higher than the amount reported as revenue from its Amazon Prime service in the same year.⁶⁷ While the overseas expansion of the traditional retail industry may be relatively limited, retail-based digital platforms will become high-value new-growth engines that could go global in the future. Domestic retailers would also need to have a retail media network ecosystem strategy in place to proactively seize the opportunity for revenue diversification.

3.3. Shift to high-value-added products

The domestic manufacturing industry has succeeded in securing a global presence based on high-process technology and mass production capabilities but has lagged leading countries in terms of the transition to high-value-added product portfolios. The result has been intensified competition with emerging-market countries.

In 2020, South Korea had 77 export market items in a top spot, ranking the country tenth in the world. Yet, it is relatively lower than the number of items in the number one position compared to China (1,798), Germany (668), the United States (479), and Japan (154).⁶⁸ In addition, the number of top export market items has increased by only seven since 2002, while China added 1,193 new top-spot items over the same period.

At this point, South Korea’s pillar industries should start actively considering a bold shift in their business portfolio into the next growth engines.

⁶⁵ *Netflix’s investment on South Korea*, Netflix, April 25, 2023.

⁶⁶ Retail Media Network is a digital advertising infrastructure that enables retailers and distributors to increase conversion rates by using customer data (first-party data) to serve advertisements at the point of sale when customers are buying products.

⁶⁷ *Quarterly results—Q3 earnings release*, Amazon, October 2023.

⁶⁸ “Competitiveness status of our exports based on the No. 1 item in the global export market (as of 2020),” Korea International Trade Association (KITA), March 14, 2022.

Shipbuilding industry: In the shipbuilding industry, competition with new entrants and fast followers such as China continues to intensify. Competitiveness in products such as bulk and tanker ships is already weakening; products such as very large crude carriers, liquified natural gas (LNG) carriers, and liquified petroleum gas carriers are expected to experience more pressure in the long term. Therefore, domestic companies would have to expand their high-value-added product portfolio.

In addition, South Korean companies only have a small presence in the high-value-added design or solution segment, such as LNG technologies and floating production storage and offloading operation (FPSO) solutions, and as a result, their operating profit ratio is below 1 percent. Given that leading companies with original technology for LNG cargo tank design have profit margins of nearly 50 percent, the South Korean shipbuilding industry could also consider expanding its business portfolios to solution business models, thus fully leveraging its existing capabilities.

Construction equipment industry: Domestic construction equipment companies are struggling to narrow the market share gap with leading companies, while emerging-market countries such as China and India continue to expand their capabilities. South Korean companies could strengthen their competitive edge by expanding into high-value-added electrified products and by developing solution businesses such as unmanned and remote operation technologies.

Other industries: South Korea's pillar industries—such as steel, wireless devices, home appliances, and displays—have been leading the global market through quantitative growth. However, they are now at an important turning point where they need to accelerate the shift to high-value-added products to enable profitable growth.

3.4. M&As and joint ventures

For existing industries to accelerate the shift to high-value-added industries, they could consider rapidly building capacity through M&As. They could utilize their existing capital power and form joint ventures with companies with superior capabilities. Leading countries and companies are already accelerating significant scale-ups and their time-to-market by rapidly forming M&As and joint ventures in existing industries.⁶⁹ This implies that domestic leaders could do well by taking similar actions.

Petrochemical industry: In the petrochemical industry, products such as electronic materials and engineering plastics are considered high-value-added products. Yet, they take a long time to develop and specialized companies with extensive expertise dominate the market. The result is that leading petrochemical companies turn to M&As to enter the market. In addition, joint-venture activities between large companies take place frequently. Examples include a joint venture between SABIC and SK Geocentric to enter the high-performance chemicals market; and a portfolio shift to high-value-added chemicals through the Shaheen project, a joint venture between S-Oil and Saudi Aramco.⁷⁰

However, analysis of M&A activity in the global petrochemical industry shows that, in terms of the number of transactions, South Korea ranked fifth in 2015 and dropped to sixth place in 2019. Over the same period, the country dropped from fifth to eighth place in terms of transaction amount (\$5.7 billion to \$3.8 billion), which was only 16 percent that of Japan and 18 percent that of Germany.⁷¹

⁶⁹ Time-to-market is the time it takes to bring a product, service, etcetera, to market, starting from its development or design.

⁷⁰ "SK Geo Centric and SABIC jointly invest KRW 200 billion to produce high-performance chemical products in Ulsan," *Skinnews*, August 23, 2022; "Aramco affiliate S-OIL to build one of the world's largest petrochemical crackers in South Korea," *Aramco*, November 17, 2022.

⁷¹ *Petrochemical industry viewed through M&A*, KPMG Economic Research Institute, August 5, 2020.

Construction machinery: The construction machinery industry is also accelerating the transition to high-value-added businesses by aggressively acquiring specialty equipment and digital solution companies. As an example, the industry could accelerate joint ventures to strengthen the competitiveness of the industry as a whole, such as the collaboration between HD Hyundai Group's construction equipment business and SK Telecom to develop fifth generation (5G) smart construction solutions to enhance mutual competitiveness.⁷²

Semiconductor industry: Various leading companies in the semiconductor industry have recently concluded joint ventures to establish a joint production line to enable them to take a leading position in the advanced packaging market—a state-of-the-art and growing high-value-added niche in the semiconductor value chain.⁷³

Shift

4. Shift to new business opportunities based on original technology

South Korea has previously succeeded in rapidly growing its economy. It did so by developing its capacity to manufacture on a large scale and by boosting the optimal utilization of technology. The country's prominent position as a global manufacturing powerhouse became clear when it attained fourth position on the Competitive Industrial Performance Index in 2021—up from 11th place in 2000.⁷⁴ In the process, South Korea overtook its competitors such as Japan, which slipped from third place to eighth, and the United States, which fell from first place to fifth over the same period.

However, China and other new entrants are fast increasing their competitiveness. The Fourth Industrial Revolution, driven by rapid technological advancement in manufacturing, requires a quick and robust response from South Korea to counter advances being made by other countries also vying for dominant manufacturing positions globally. For example, South Korea was a leader in the display industry from the early 2000s to the 2010s; however, China has since taken the top position in terms of global sales.⁷⁵ Furthermore, China and Taiwan are starting to challenge South Korea's current leadership in the manufacture of OLED (organic light-emitting diode) display products.⁷⁶

South Korea is also finding it challenging to narrow the gap with leading proprietary technology countries such as Japan and the United States, putting the country in a tight spot.

4.1. Competitiveness in proprietary technologies is slipping

The projected structural decline in South Korea's labor force is expected to create a large gap in the production-led growth path the country has been pursuing. To address this issue, the creation of multiple new industries based on proprietary technology will be needed. A continued focus largely based on a “fast-follower strategy” and using applied technologies would make this goal difficult to achieve—taking a technological leadership position and shaping the market would better serve the country.

⁷² Taeho Hwang, “SKT, Hyundai Construction Equipment, and US Trimble sign agreement for ‘smart construction’ using drones,” December 11, 2018.

⁷³ “TSMC, Bosch, Infineon, and NXP establish joint venture to bring advanced semiconductor manufacturing to Europe,” TSMC, August 8, 2023.

⁷⁴ *Competitive industrial performance index*, United Nations Industrial Development Organization, 2021.

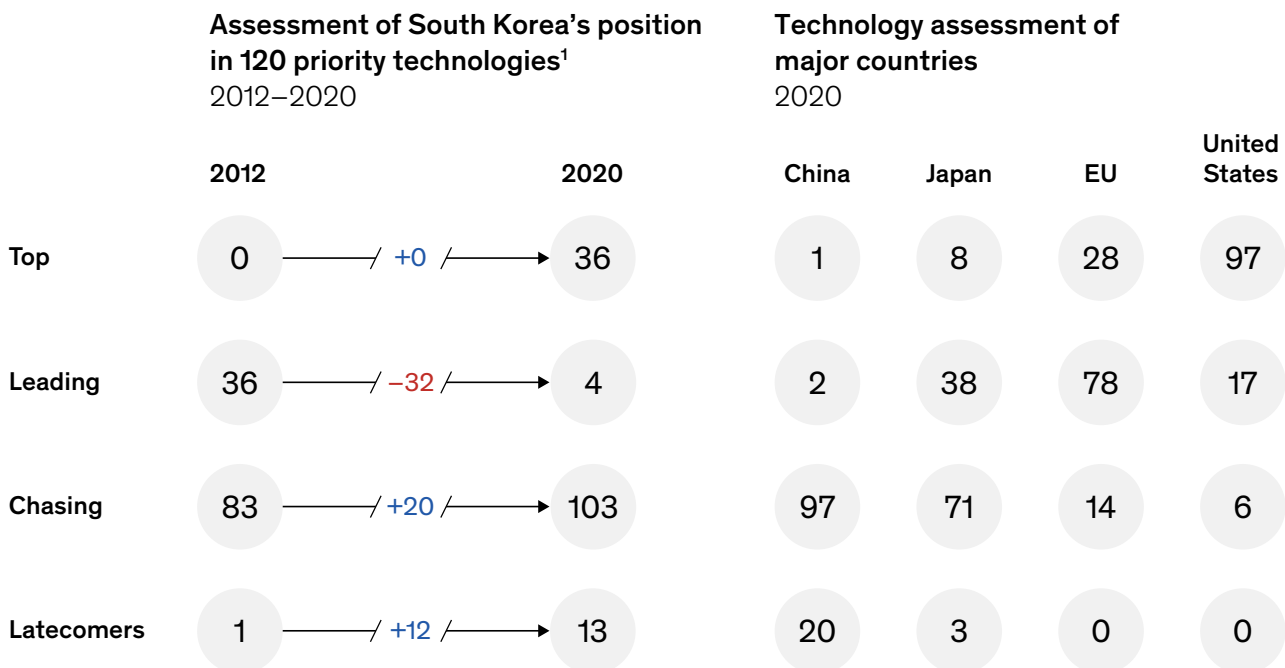
⁷⁵ Chu Daye, “China outpaces South Korea as world's top producer of display panels,” *Global Times*, April 26, 2022.

⁷⁶ Jasmine Choi, “China threatens South Korea's OLED dominance,” *Business Korea*, August 29, 2023.

Under the government's Basic Plan for Science and Technology, the Ministry of Science and ICT has identified 120 key technologies centered on original technologies that South Korea should nurture intensively in the mid to long term. In determining these 120 technologies, the Korea Institute of S&T Evaluation and Planning analyzed the technology gap compared to China, the European Union, Japan, and the United States. Examples of selected technologies include quantum information and communication technology; highly integrated semiconductor manufacturing process and equipment and material technology; carbon capture, storage, and utilization (CCUS) technology; offshore plant commercialization technology; and space launch vehicle development and operation technology (Exhibit 5).

Exhibit 5

Technology areas in which South Korea has a leading position have decreased.



¹120 priority technologies in the Fourth Basic Plan for Science and Technology (2018 to 2022).
Source: Korea Institute of Science & Technology Evaluation and Planning (KISTEP)

The plan found that the number of technologies in which South Korea is leading dropped from 36 in 2012 to four in 2020. Meanwhile, the United States maintained a steady number of technologies rated best in their respective fields, and the European Union expanded its number of top-rated technologies.

At the national level, South Korea had an overall 1.9-year head start over China in 2012. In 2020, there was no longer a technological gap between South Korea and China. For example, in 2012, South Korea was 2.4 years ahead of China in relation to the skills gap in 17 core ICT and software technologies (including sectors relating to semiconductors, displays, big data, and computing). Yet, by 2020, China had overtaken South Korea, and was in fact, 0.3 years ahead. Similarly, South Korea's machinery manufacturing sector was 2.3 years ahead of China's in 2012; however, this gap had narrowed to 0.3 years by 2020.

To keep its competitive edge in original technology, South Korea could consider focusing on expanding expenditure on R&D. It could shift from short- to long-term investment by securing proprietary technologies that would boost the industry as a whole.

For example, by the end of December 2021, out of the top 2,500 companies in terms of R&D investment, South Korea ranked ninth, with 53 on the list and sixth in terms of overall investment amount.⁷⁷ However, R&D investment as a percentage of total revenue for the South Korean companies was 3.5 percent, ranking the country only 16th among the top 30 countries with highest investment. In comparison, Israel ranked first (8.4 percent), followed by Switzerland (8.2 percent), and the United States (7.9 percent).

Furthermore, R&D data is heavily skewed, as one company, Samsung Electronics, accounts for 49 percent of the entire spend. In contrast, the concentration rate of the biggest R&D investment made by one company is only 6 percent in the United States, 8 percent in Japan, 10 percent in China, and 17 percent in Germany, demonstrating South Korea's over-reliance on one company.

If Samsung Electronics is excluded, South Korea's R&D investment volume rank decreases to tenth place from sixth. Also, its R&D volume as a percentage of total revenue then decreases to 2.3 percent, ranking it 19th out of the top 30 countries. In contrast, even in this comparison, Israel maintains its top spot and its R&D volume as a percentage of total revenue even increases, 8.4 percent to 9.3 percent. This indicates the need for the broader South Korean companies—and not just the leading ones—to start increasing their R&D investment.

4.2. Active government support for R&D investment

By implementing policies to provide additional support for new proprietary technologies, the government could stimulate the development of the talent needed to enhance corporate R&D capabilities. This could include providing finance and budget support, creating tax incentives, and implementing deregulation. As an example, China historically allowed companies to deduct as much as 75 percent of their R&D investment from taxes. In 2021, the percentage of R&D that can be deducted from corporate tax for manufacturing companies was increased from 75 percent to 100 percent.⁷⁸ As a result, the number of Chinese companies in the global top 500 in terms of highest R&D spending increased 5.4 times—from 18 companies in 2012 to 97 in 2022, while the number of such South Korean companies stagnated, increasing only from ten to 11 in the same period.⁷⁹

4.3. Leading global companies pick up the pace to secure proprietary technologies

Leading global companies are not only focusing on securing proprietary technologies within their core business, but also continually making early investments in various promising sectors.

Energy industry: For instance, Shell—regarded as one of the global leaders in the energy industry—is actively responding to the current energy transition by accelerating the shift in its business portfolio toward green businesses. The company is acquiring green energy-related proprietary technologies such as renewable natural gas and hydrogen. The company has announced that \$10 billion to \$15 billion of its investments from 2023 to 2025 will go toward green solutions.⁸⁰

⁷⁷ N. Grassano et al., *The 2022 EU industrial R&D investment scoreboard*, European Commission, December 13, 2022.

⁷⁸ *Status of R&D tax incentives in major countries*, Korea Institute for Advancement of Technology, March 31, 2023.

⁷⁹ "China is growing rapidly without R&D tax support, Korea is stuck in difficult procedures," *Keri News*, August 13, 2020.

⁸⁰ "Shell to deliver more value with less emissions," Shell, 14, 2023.

In addition, it is bolstering its competitive edge with inorganic strategies, including the acquisition of Volta for its EV-charging infrastructure technology, WestWind Energy for its wind power technology, and an equity investment in BlueAlp for its plastic-recycling technology.⁸¹

Biopharmaceutical (bio) industry: Another example lies in the bio industry where global leaders and bio venture companies are accelerating proprietary technology development for third-generation drugs—a new growth area in the pharmaceutical industry such as cell and gene therapy (CGT).⁸² Companies are using joint ventures and M&As to accelerate their development, as well as expanding their internal R&D capabilities. As of 2020, the median value of bio company deals in M&A, licensing, and equity investment activities was \$5 million, over ten times higher than a decade previously. In January 2023, global bio leader Sanofi announced plans to invest more than \$750 million in corporate venturing to invest in early-stage start-ups in bio ventures and digital health through its evergreen fund.⁸³

4.4. Opportunities to strategically acquire proprietary technologies

South Korean companies could accelerate their ownership of proprietary technologies by implementing a two-track strategy: one, develop their internal capacity; and two, pursue inorganic growth such as joint ventures and M&As. A meaningful portion of companies' R&D budgets could be set aside for strategic investments in proprietary technologies, and companies could take a long-term approach to enhancing capabilities in more than just the basic and fundamental technological areas. At the same time, companies would need to consider bold M&A moves to acquire core technologies quickly and seize the opportunity to position themselves in an advantageous position.

There are four areas among transversal technologies that are important for the South Korean economy: high-performance computing and semiconductor technologies; future mobility technologies; decarbonization and renewable technologies; and bioengineering technologies.

Semiconductor industry: The demand for next-generation semiconductors is expected to come from novel computing, a new generation of computing technology. An example is quantum computing, which has a projected market size of \$1.3 trillion by 2035.⁸⁴ This type of computing technology will require highly integrated, state-of-the-art, high-performing semiconductors.

Leading regions in this sector, such as the European Union and the United States, are already accelerating their technologies; South Korea's current scale of R&D investment and technological capabilities makes it difficult for it to be competitive. South Korea's existing semiconductor industry could leverage the proprietary technologies of semiconductors—such as the design and production technologies to implement novel computing. By encouraging joint public–private investment and cultivating specialized human resources—locally and from abroad—South Korea could position itself as a leader across the semiconductor value chain.

Mobility industry: The global advanced air mobility (AAM) market, in particular, is expected to grow rapidly. By securing proprietary technologies, such as air-vehicle control mechanisms, and strategically leveraging its automotive industry's large-scale manufacturing capabilities, South Korea could secure an early leadership position in this market.

⁸¹ "Shell invests in plastic waste-to-chemicals technology company BlueAlp," Shell, September 9, 2021; "Shell USA, Inc. finalizes acquisition of Volta Inc., scaling up its US public electric vehicle charging network," Shell, March 31, 2023; "Shell completes 49% acquisition of wind farm developer," WestWind, Shell.com, April 1, 2022.

⁸² Cell and gene therapy is one of the most advanced therapeutic approaches on the market to treat rare diseases, oncology, central nervous system disorders, etcetera, where diseased cells or deficient genes are restored/corrected.

⁸³ "Sanofi Ventures announces multi-year capital commitment from Sanofi, increasing evergreen fund to \$750m," Sanofi, January 11, 2023.

⁸⁴ Mena Issler, Henning Soller, and Matija Zesko, *Early value: An introduction to quantum optimizers*, McKinsey Digital, June 13, 2023.

The global AAM market is predicted to grow to between \$250 billion and \$400 billion by 2040.⁸⁵ Forward contracts worth \$113 billion had already been secured by 2023 and industry players were actively investing to position themselves as leaders. However, the market is still at an early stage, where only a few SMEs and start-ups have successfully managed partial commercialization. This creates an opportunity for incumbents from related industries to continue to enter the market and vie for dominant positions.

For example, out of the top 25 aircraft and component manufacturers, 18 aircraft and 16 component manufacturers have already entered this market. Leading automakers are also accelerating their entry through partnerships.⁸⁶ Furthermore, companies are expanding their capabilities by forming alliances with those from other industries such as renewable energy developers, battery component makers, aircraft operators, and operational technology or solution developers.

Since South Korea already has a global leadership position in mobility platform production—thanks to its long-standing automotive industry—securing proprietary technologies such as high-speed autonomous flight solutions and air-mobility control mechanisms could create a strong, competitive edge in this emerging market.

Energy industry: Global energy leaders are already responding to the industry transition by investing early in promising sectors and securing proprietary technologies. South Korea could benefit from kicking off investments in promising areas such as CCUS, small modular reactors (SMRs), and offshore wind.

CCUS technology is considered to be important for achieving net-zero targets. South Korea could expand its technological capacity in this area and start the commercialization process through international cooperation and public–private joint investment. Also, the country could consider implementing a turnkey, end-to-end business model that integrates various processes from product design to asset operation.

While there are some uncertainties, the National Nuclear Laboratory in the United Kingdom expects that SMRs could be a \$480 billion market by 2035.⁸⁷ South Korean companies already possess SMR capabilities in various industries; examples include plant engineering, procurement, and construction, nuclear power plant operation, and pink (nuclear produced) hydrogen production. However, there is room for improvement in terms of proprietary technologies such as the modular design of core equipment. South Korean companies could enter the international market by forming partnerships with global licensing companies to secure proprietary and core technologies.

The global offshore wind market, which was around 23 gigawatts (GW) in 2018, is expected to grow to 1,000 GW by 2050 and reach annual investments of nearly \$100 billion. The highest growth is expected in the Asia–Pacific region, which will likely account for 619 GW by 2050.⁸⁸ South Korea could harness the leading manufacturing capabilities of its shipbuilding and offshore platform industries. In areas where the country is lacking technological capabilities—such as wind turbines and blades—forming partnerships with leaders could be considered. Based on this, South Korea will need to come up with solutions to drive the emergence and growth of the offshore wind market.

⁸⁵ McKinsey analysis, McKinsey AAM Market Model, 2022.

⁸⁶ Axel Esqué, Tore Johnston, and Robin Reidel, "Future air mobility: Major developments in 2022 and significant milestones ahead," McKinsey, January 19, 2023.

⁸⁷ NNL publishes report on small molecular reactor technology, National Nuclear Laboratory, December 3, 2014.

⁸⁸ *Future of wind: Deployment, investment, technology, grid integration and socio-economic aspects*, International Renewable Energy Agency, October 2019.

Bio industry: South Korea's bio industry has the opportunity to become more competitive in the market for new third-generation cell and gene therapy (CGT) by making strategic investments in proprietary technologies. Doing so could lead to the development of new, innovative drug substances. Approximately 85 percent of third-generation drugs launched to date have been developed or are owned by small laboratories or bio ventures rather than the global top 20 pharmaceutical giants.⁸⁹ This implies that bio ventures will be the driving force in the third-generation drug market.

In addition to increasing investment in bio ventures, South Korea could establish an environment where these companies can operate successfully. For example, the country could consider measures such as relaxing the listing policies for bio ventures that have distinctive technology but lack the necessary funding. Furthermore, measures such as fast-tracking visas could be put in place to attract foreign talent. South Korean companies could benefit from a more structured drug development process and an enabling regulatory environment for initial development, similar to the systematic processes used by countries that have led drug production.

South Korea could consider making partnerships with bio ventures based on the experience accumulated from domestic contract (development and) manufacturing organizations (C(D)MOs), such as large-scale production capacity and operational efficiency.⁹⁰ The development of third-generation drugs is highly dependent on outsourcing to C(D)MOs. This is because of the difficulty and complexity of third-generation drug production processes and logistics. Bio ventures also reduce risk, given that most developers are relatively small companies without production capabilities. Therefore, collaboration between C(D)MOs and developers is becoming increasingly important in the third-generation drug market.

South Korea has leading C(D)MOs, but their focus has mostly been on second-generation drugs, while the market for third-generation drugs (which focuses more on curing rare diseases) is rapidly rising. To gain a positive track record in the third-generation drug industry, industry players could, therefore, consider establishing initial plants in countries where many third-generation bio ventures are already located.

Food industry: The demand for alternative foods is expected to grow steadily, driven by trends in sustainability and wellness. For example, the alternative animal protein (mostly meat and dairy products) market is expected to expand from 2 percent in 2020 to 11 percent by 2035.⁹¹ It will be important to quickly secure original technologies, launch differentiated products based on these technologies, and preempt the market to be able to expand globally. In fact, leading domestic food companies are already working to upgrade the raw materials and technology of alternative foods, and are targeting overseas markets.

Fashion and textile industry (recyclable fashion): Global leading fashion companies are introducing fashion products that utilize recycled plastics and other ecofriendly materials that biodegrade into water, carbon dioxide, and organic matter through biological action. They are launching clothing products using materials such as plastic waste collected from beaches and coasts, and recycled polyester extracted from waste plastic bottles.

⁸⁹ Toby AuWerter, Jeff Smith, and Lydia The, *Biopharma portfolio strategy in the era of cell and gene therapy*, McKinsey Life Sciences, April 8, 2020.

⁹⁰ C(D)MOs provide contract manufacturing of clinical and commercial drug products for pharmaceutical and biotechnology companies.

⁹¹ "Will alternative foods utilizing plant proteins take off?" Issue Briefing, Korea Biotechnology Association, April 2022.

In response, large domestic material manufacturing companies are also strengthening their investments in biodegradable materials. They are developing ecofriendly materials, collaborating with fashion brands, and investing in ecofriendly fashion start-ups. The development of ecofriendly, high-value-added materials such as “recycled low-melting fiber” is steadily progressing through collaboration between chemical fiber material development companies and manufacturing companies. South Korea’s leading textile material manufacturing companies will need to secure proprietary technologies for ecofriendly materials and become price competitive through active cooperation with fashion companies.

Shift

5. Shift to AI-centricity

South Korea’s population has been declining since its peak in 2020, leading to a decrease in the working-age population—currently, of the 52 million people in South Korea, 36 million are of working age. Demographic projections indicate that by 2035 the population will be 50 million, the working-age population will be down to 31 million, and by 2050 the population will be 45 million with a working-age population of 24 million.⁹² At the same time, productivity growth in major industries has been stagnant since 2010, at around 1 percent.⁹³

Historically, the country has increased productivity by using more physical labor; however, this is reaching its limit. South Korea’s future growth requires a major increase in productivity; to achieve this, all industries could benefit from adopting AI technologies, including generative AI (gen AI). By growing its presence in the gen-AI industry, South Korea could potentially position itself as a global player.⁹⁴ To achieve this, however, an AI ecosystem is needed.

AI technologies can be useful for companies and governments trying to automate and accelerate work in various fields, such as sales and marketing, software development, and R&D. Yet, the adoption rate of AI in South Korea is still low, with only 22 percent of enterprises adopting AI and 46 percent considering it, compared to leading countries such as China (58 percent adoption, 30 percent consideration), India (57 percent adoption, 27 percent consideration), and Singapore (39 percent adoption, 46 percent consideration).⁹⁵ Accordingly, there still is significant room for productivity increase across South Korean industries by adopting AI technologies—a move that could be pivotal for the country to secure its future competitiveness.

5.1. The impact on existing industry of adopting gen AI

The global economic impact of adopting gen AI is expected to be between \$2.6 trillion and \$4.4 trillion dollars annually, of which the impact in South Korea is expected to be between \$52.0 billion and \$89.0 billion.⁹⁶ The biggest economic impact will likely be in advanced manufacturing, advanced electronics and semiconductors, IT, banking, business functions such as sales and marketing, software engineering, and supply chain management (Exhibit 6).

⁹² “Population estimates and projections,” DataBank, World Bank, October 2023.

⁹³ Calculated based on GDP per person employed; “Level of GDP per capita and productivity,” OECD, December 2022.

⁹⁴ Generative AI (gen AI) can be seen as an advanced form of traditional AI (AI is defined here as a concept that encompasses both gen AI and analytical AI). Analytical AI utilizes technologies such as machine learning and deep learning for efficient analysis tasks such as data classification and prediction, whereas gen AI is used to generate new content such as audio, image, and text that is more than human-like.

⁹⁵ “IBM global AI adoption index 2022,” IBM, May 2022.

⁹⁶ We derived Korean economic impact based on global economic impact calculation methodology. Economic impact in this report refers to cost savings and revenue increases resulting from productivity and efficiency gains, calculated by applying more than 65 use cases that McKinsey found across industries; *The economic potential of generative AI: The next productivity frontier*, McKinsey, June 2023.

The adoption of generative AI could have a significant economic impact across all industry sectors and business functions.



¹ Includes aerospace, defense, and auto manufacturing.

² Includes auto retail.

³ Excludes software engineering.

Note: Figures may not sum to 100%, because of rounding, and they exclude implementation costs (eg, training, licenses).

Source: McKinsey Digital; internal experts | Databases: CIS/IHS Markit; Oxford Economics

Business function example: Software engineering.

Even companies and organizations that lack AI developers are expected to be able to leverage gen AI's code-creation capabilities and significantly increase their software engineering capabilities.⁹⁷ In other words, in the near future, low-code or no-code services are expected to emerge. Even people with limited coding experience could write code by simply describing in ordinary language the output they want to achieve. In addition, data management and support for writing optimized code with the help of gen AI could enable software engineering-related departments across South Korean industries to generate economic benefits of up to \$22 billion.

Industry example: Semiconductor industry.

Gen AI could be used in South Korea's major industries—it has the potential to unlock an economic benefit of between \$3.7 billion and \$6.4 billion in the advanced electronics and semiconductors industry; for example, it can improve defect detection and chip design optimization. It can detect defects in semiconductor chips by using unsupervised machine learning techniques. Gen AI's reinforcement learning could also be used to optimize the placement of components in a semiconductor chip design. By teaching gen AI what an optimized semiconductor chip design should have, the time taken to develop a semiconductor chip could be reduced to a matter of hours instead of the weeks usually needed by a human expert. For example, applications using gen AI are emerging to help customers reduce the time and cost of full-stack design, testing, and verification processes when designing chips, or to optimize chip designs by evaluating all combinations of layouts and checking for compliance with quality criteria.

To unlock all of gen AI's benefits, companies would need to review gen-AI use cases, validate their effectiveness through pilot tests, and prepare a detailed adoption roadmap if they decided to implement gen AI full scale.

5.2. Become an active player in the gen AI value chain

Gen AI itself is expected to develop into an industry offering significant opportunities. To gain a global position in this industry, South Korea could shift beyond the mere adoption of gen AI in existing industries and choose to play an active role in the gen AI value chain, which comprises: (1) computer hardware; (2) cloud platforms; (3) foundation models (FMs) and (3.1) vertical-specific FMs; (4) adjacent tools; (5) applications; and (6) services.⁹⁸ South Korea could harness opportunities in the function-specific foundation model and hardware sectors (Exhibit 7).

5.2.1. Developing vertical-specific foundation models in industries with high-value data

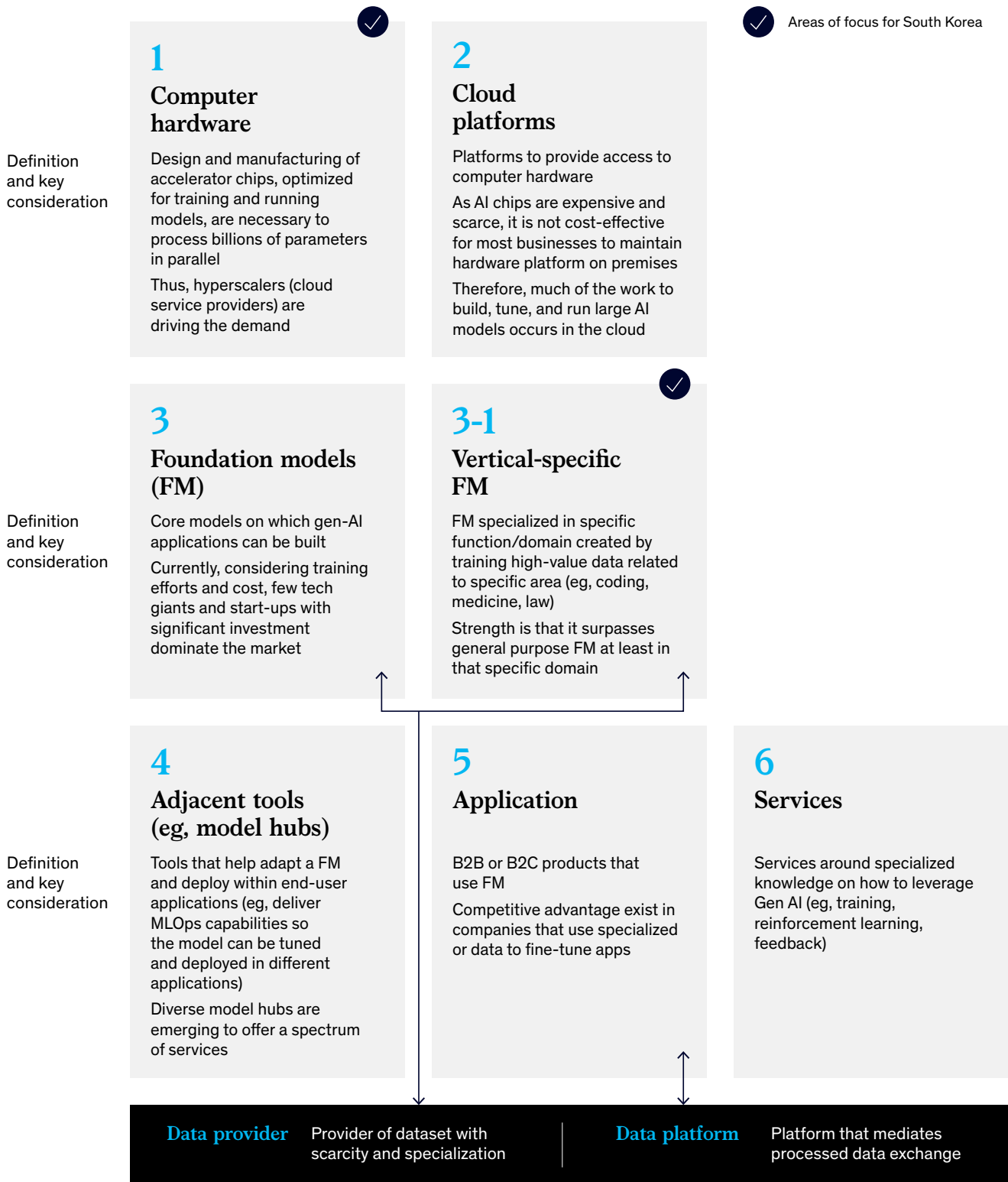
Vertical-specific FMs are gen AI models that can be trained based on data specific to a particular function or industry, implemented at a lower cost and higher performance level in a specific area compared to general-purpose FMs. For example, by combining broader publicly available sources as well as utilizing its own financial data accumulated over 20 years, Bloomberg has developed a powerful model to be used for finance-related applications.⁹⁹ This model can be used within the company, but it is also expected to be sold and exported to other players in the same industry. By acting quickly, South Korea could identify such opportunities to capture market share by using industries with high-value data such as content, petrochemicals, and healthcare.

⁹⁷ They can accelerate the coding process leveraging gen AI's ability to produce draft code, autofill written code, perform dynamic testing, and minimize code overlaps through refactoring and code translation (for example, by leveraging GitHub Copilot).

⁹⁸ For further information about the detailed value chain of gen AI, see "Exploring opportunities in the generative AI value chain," QuantumBlack AI by McKinsey, April 26, 2023.

⁹⁹ Kif Leswing, "Bloomberg plans to integrate GPT-style AI into its terminal," *CNBC*, April 13, 2023; Jamiel Sheikh, "Bloomberg uses its vast data to create new finance AI," *Forbes*, April 5, 2023.

To become a global player in the generative-AI industry, South Korea could consider playing a more active role in the value chain.



Source: QuantumBlack; McKinsey analysis

5.2.2. Lead the fast-growing AI semiconductor chip industry

The demand for AI semiconductors—essential for continuous training of ultra-large data models and data processing for content generation when running gen AI applications—is expected to expand steadily with the increase of gen AI demand. South Korea's existing memory semiconductor players could position themselves as memory solution providers that address the changing requirements of hyperscalers (companies that provide computing, storage, and apps in the cloud).

South Korea could also strive to promote non-memory design and manufacturing capabilities to stay ahead in the AI semiconductor market. Nvidia, for example, currently dominates the graphics processing unit (GPU) market, with more than 80 percent market share and a market capitalization of more than \$1 trillion.¹⁰⁰ Global funding and attention have been focused on fabless start-ups designing neural-network processing units to replace GPUs. For instance, several South Korean AI semiconductor fabless start-ups are emerging, and they are raising large amounts of funding in the early stages of operation. South Korea could, therefore, capture opportunities in this fast-growing AI chip-design market.

5.3. An overlooked opportunity in AI

The recent rise of gen AI has triggered a lot of interest. Yet, the bigger, nearer-term value pool lies in analytical AI (the traditional concept of AI as distinguished from gen AI), which uses machine learning, deep learning, and other technologies to increase productivity. For example, analytical AI can identify market opportunities based on consumer behavior data in the consumer goods industry; it can predict and prevent network degradation and outages for network operators; and it can identify beneficial relationships between branch environments or advisor activities and customer conversion outcomes in the financial industry. With a projected global economic impact of between \$4.0 trillion and \$6.7 trillion, AI is regarded as an important tool for increased industrial productivity.¹⁰¹ The 2021 Global AI Vibrancy Tool ranked South Korea's composite AI-related index sixth in the world. While this is quite high, the AI adoption rate in South Korea is only 22 percent, revealing a great opportunity to make productivity gains.¹⁰²

Although South Korea is actively developing analytical AI technologies, this has not yet translated into a rapid adoption, nor are there enough solution providers. Despite companies' massive expansion of the development of AI-related technology, more domestic and internationally based solution providers are needed to actively operate in South Korea. As of August 2023, there were 124 global AI unicorns, but none of them were in South Korea. In addition, only about 10 percent of these global companies offer services in South Korea—likely due to data regulations, a dearth of AI-related human resources, a lack of investment in the AI ecosystem, and corporate culture.¹⁰³

¹⁰⁰ Nvidia's market capitalization was \$1 trillion, as of October 30, 2023 (based on Google Finance figures).

¹⁰¹ *Notes from the AI frontier: Application and value of deep learning*, McKinsey Global Institute, April 2018. (Note: we have adjusted figures cited in the report to reflect economic impact estimates based on updated use cases since the publication of the report in 2018).

¹⁰² *Artificial intelligence index report 2023*, Stanford Institute for Human-Centered Artificial Intelligence, 2023. The Global AI Vibrancy Tool is an interactive visualization that allows cross-country comparison for up to 29 countries across 23 indicators.

¹⁰³ Analysis based on *Artificial intelligence unicorn start-ups*, Crunchbase, August 2023.

5.3.1. Data regulation challenges

Regarding the use of AI technology, certain business sectors can only be stimulated by establishing or relaxing regulations. In South Korea, however, the development of some of these sectors has been slower than in other countries due to higher legal hurdles. For example, globally there are more than 7,400 companies that combine technology and legal services to provide offerings such as AI-enabled legal searches, automatic document creation, and legal advice. Only about 30 of these companies have a presence in South Korea.¹⁰⁴ These types of services have developed rapidly in Europe and the United States, potentially because of the availability of ample data, such as judgments disclosed after trials and evidence on e-discovery systems. However, as there is a lot of legal data that is not publicly available in South Korea, it may be worth considering a review of regulations related to legal technology in general.

In addition, although the number of inventions, creations, and artworks using AI is increasing globally, the ownership of IP rights for them is vague and the copyright on using AI is still uncertain.¹⁰⁵ There are regulations against illegal data collection, but the line is unclear when it comes to the collection and use of publicly available data.¹⁰⁶

The European Union has pioneered AI-related legislation, imposing regulations based on the level of risk associated with the use and development of AI.¹⁰⁷ South Korea, however, still has to pay attention to this issue, so existing industries and start-ups can get clarity on the legal boundaries and develop services or functions within them. Engaging AI experts and practitioners could minimize transgressions and disputes caused by AI, increase demand for services, and stimulate supply.

5.3.2. AI labor shortage

South Korea has a shortage of skilled AI developers and researchers—the domestic AI labor market presently needs about 8,000 more people. In fact, about 80 percent of companies indicate that they have difficulty recruiting AI workers, citing this as the biggest problem in running an AI business.¹⁰⁸ To solve this challenge, South Korea would need to strengthen AI education in existing educational institutions or establish AI talent training academies.

For example, Canada achieved the fifth-highest global AI skills penetration rate in 2022, while South Korea was ranked seventh.¹⁰⁹ The Canadian government's Pan-Canadian Artificial Intelligence Strategy implemented in 2017 played a critical role. The country established a national research institute and provided support to build a research talent pool and AI ecosystem. Since then, the Canadian government has worked to attract AI talent to Ontario by using open immigration policies, and as a result the number of AI-related jobs in Ontario in 2022 increased by 210 percent annually.¹¹⁰ As part of the second phase, Canada announced in 2022 that it would continue investment and support over the next decade. One of the three main parts of the second phase is attracting and retaining research talent through renewing programs in advanced research and education and providing dedicated computing capacity to AI researchers across Canada.¹¹¹

¹⁰⁴ *Legal tech sector overview*, Tracxn, October 2023.

¹⁰⁵ *New business (bio, drone, fintech, AI) regulatory improvement status report*, Korea Chamber of Commerce and Industry, April 2023.

¹⁰⁶ "Status of artificial intelligence-related legal system," *Journal of the Korea Information and Communication Technology Association*, No. 207, May/June 2023.

¹⁰⁷ *Analysis of major national AI policies*, Korea Agency for Intelligence and Information Society, August 2022.

¹⁰⁸ "2022 AI industry survey," Software Policy Institute, April 2023; The survey on labor shortages was based on 1,915 companies operating in the AI industry. Shortage rate = (shortage workforce / (current workforce + shortage workforce)) x 100.

¹⁰⁹ *Artificial intelligence index report 2023*, Stanford Institute for Human-Centered Artificial Intelligence, 2023.

Relative AI skill penetration rate is the sum of each AI skill penetration rate for an occupation in a specific country or region divided by the global average for the same occupation.

¹¹⁰ *Ontario AI snapshot*, Vector Institute in partnership with Deloitte Canada, 2022.

This report covers the period from April 2021 to March 2022.

¹¹¹ *Current status of the Canadian AI industry and government investment and policy initiatives*, KOTRA, 2023.

By emulating Canada's model and generating such synergy between national policies, research institutions, and industry, South Korea could also create tangible outcomes in the short term.

5.3.3. AI market size and its investment ecosystem

In 2022, South Korea ranked 13th globally in terms of the number of newly invested AI companies and ninth in terms of the cumulative amount of private investment in AI companies (\$5.6 billion) between 2013 and 2022. The country's cumulative investments in AI are equivalent to 50 percent of those of Israel and 70 percent of those of India.¹¹² Yet, investments increased rapidly and the country jumped to sixth place globally in 2022 alone.¹¹³ Based on the current trend, if the private investment ecosystem is further revitalized, South Korea could expand its AI-related market. For instance, diversified efforts to boost M&As will help start-ups to scale.

5.3.4. Domestic corporate culture

In addition, it can be difficult to practically apply AI technologies or services—often because of the way companies operate, requiring fully verified turnkey solutions. To improve performance, AI needs to be continually trained by using real data, even after it has been deployed. Therefore, judging the results of AI deployment too soon after implementation could lead to the belief that it does not meet expectations.

South Korean companies seem less likely to engage in pilot projects or product operations compared to those in leading countries. South Korea's corporate culture, including governance and short-term oriented performance reward systems, could be the reason why it is difficult to take responsibility for decisions that usually only pay off in the long term.

It is also important for South Korea to secure the necessary AI-related capabilities to prepare for future growth industries such as robotics and the metaverse. This could be done by using the foundation model discussed earlier; securing semiconductor capabilities; actively conducting pilot projects; revitalizing the AI-investment ecosystem; and improving related regulations. When the new wave of gen AI arrived with the launch of OpenAI's ChatGPT in November 2022, countries with strong existing AI capabilities were the ones able to ride it the fastest.

In robotics, for example, a shift is expected from robots that move on a set trajectory to the commercialization of robots that combine robotics technology with reinforcement learning techniques to enable more autonomous movement. In addition, the emergence of gen AI will enable low-code or no-code implementation, and the creation of various elements within the metaverse. This will allow more people to become creators, increasing the number of participants and revitalizing the ecosystem. If South Korea were to develop these capabilities, it would be able to adopt new AI technologies that emerge after gen AI.

¹¹² *Artificial intelligence index report 2023*, Stanford Institute for Human-Centered Artificial Intelligence, 2023.

¹¹³ *Ibid.*

Cultivate

6. Cultivate a foundation for innovation

To successfully accomplish the aforementioned actions and achieve meaningful economic growth, South Korea will need an increasing number of innovative companies. The government and industry could cultivate (1) megaclusters based on industry-specific ecosystems, and build (2) the institutional foundations for innovative companies.

6.1. Establish megaclusters based on industry-specific ecosystems

One of the most effective ways to establish a horizontal and open ecosystem where various types of partnerships can flourish is to create megaclusters. When an industrial cluster is formed, start-ups' innovative ideas can develop organically with the support of large companies forming part of the cluster. Specialized labor and various production aspects become located within a short distance of one another, reducing tangible and intangible costs for individual companies.

Emerging industries require cooperation from various sources because of complex innovation processes that follow multiple stages. Geographic proximity to related academic bases is also important for start-ups and companies wanting to benefit from information spillover. Such a process increases overall productivity and the success of technological development through information sharing between relevant parties, particularly in a knowledge-based industry. Therefore, it is known to be more efficient to locate universities and public and private R&D institutions within a megacluster as well.¹¹⁴

For example, South Korea's IT, semiconductor, and bio industries could benefit from being located in megaclusters. In the IT industry, the pace of innovation could be enhanced by creating a knowledge-exchange network and developing world-class IT talent. In the semiconductor industry, if companies and talent are located in close proximity, they would be able to create synergies such as technological innovation and cost reduction through mutual cooperation, as well as competition. In the bio industry, megaclusters could also play a meaningful role. Countries such as Singapore, Switzerland, the United Kingdom, and the United States—considered highly competitive in this field—have all developed their successful bio industries around megaclusters.

6.1.1. The five elements of a bio megacluster

Bio megaclusters are important as they bring together companies at different stages of the value chain to create synergies.

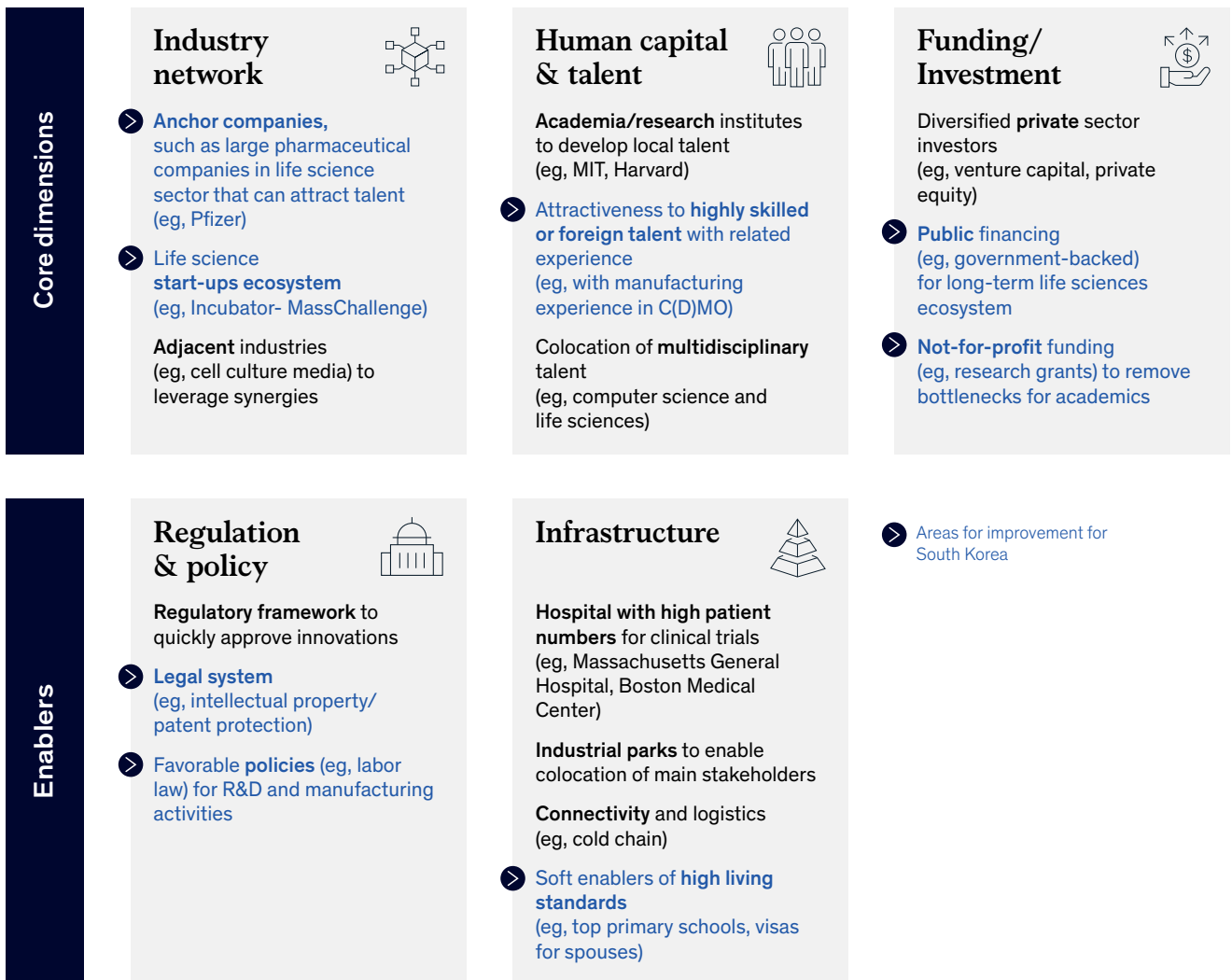
A bio megacluster would consist of five core elements and enabling components. These include C(D)MOs for manufacturing; small bio ventures for new drug discoveries; companies focused on clinical development; contract sales organizations providing outsourced sales and marketing services; and research labs for academic support.

¹¹⁴ "Status of Korea's innovative bioclusters and ways to improve," Korea Association for New Drug Development and Research, October 2020.

Lawyers providing specialized services, contract research organizations, which manage outsourced clinical trials or complex medical testing responsibilities, and accelerators are also usually available within the megacluster. Last but not least, government support enables all these entities to come together within a megacluster, creating a favorable environment in which to do business, share the necessary workforce, technology, and the financing and business infrastructure. Such an environment could stimulate companies to be more productive and better equipped to deal with the rapidly changing business environment (Exhibit 8).

Exhibit 8

A biopharmaceutical megacluster requires synergy between five main components to achieve success.



Source: McKinsey

The Boston biocluster is a prime example of an effective industry-specific megacluster. Beginning in the 1970s, the nonprofit Massachusetts Biotechnology Council (MassBio) was established in 1985 to support the megacluster. Over the next 30 to 40 years, the Boston biocluster evolved into a natural convergence of large pharmaceutical companies such as Pfizer, world-class universities and research institutes such as MIT and Harvard, start-up accelerators and incubators, and leading investors.¹¹⁵ It is now home to more than 1,000 life sciences-related companies, generating more than 100,000 jobs annually.¹¹⁶

In particular, the CGT market, which involves third-generation drugs, is expected to grow rapidly. Accordingly, South Korea could consider creating a bio megacluster centered on third-generation drugs to position itself uniquely in comparison to existing global leading megaclusters. The global pharmaceutical industry is estimated to be worth about \$1.0 trillion, growing to \$1.4 trillion by 2030, driven by the transition to the third-generation bio industry.¹¹⁷ This industry opens up new ways to treat diseases compared to first- and second-generation drugs. It is still a small industry but is expected to grow by 34 percent annually between 2020 and 2030, reaching a total value of \$110 billion by 2030.

South Korea could establish its pharmaceutical industry on a global level by expanding into the CGT C(D)MO and drug-development industries. Such investments could take advantage of the trend of diversifying sources of value that will be created by the transition to third-generation biopharmaceuticals. As mentioned before, the growth in the third-generation bio market will mostly come from start-ups with niche technologies.¹¹⁸ However, it is not easy for small companies to go through all the processes from research to manufacturing by themselves. C(D)MOs responsible for manufacturing third-generation drugs consider such colocation important as it provides the physical infrastructure conducive to collaboration with customers, and bio megaclusters would be able to provide this.

By fostering start-ups developing innovative substances and bringing together the large-scale mass production capabilities and operational efficiency improvement capabilities of advanced C(D)MOs, South Korea can create blockbuster drugs.

6.1.2. Centralize clusters scattered across the country

South Korea currently has more than 15 bioclusters—including in Incheon, Osong, and Seoul—but they are scattered across the country, making it difficult to possess the five elements required for a well-operating megacluster. Each region specializes in a specific industry or a specific stage of the value chain. For example, Seoul has a biomedical R&D cluster, Songdo has a cluster based on C(D)MO's manufacturing facilities, Wonju has a medical device cluster, and Iksan has a cluster related to the food microbiology industry. Networking potential is limited due to their small scale. This differs from global advanced bio megaclusters where all stakeholders—in R&D, commercialization, and investment—are in one place, as well as the support systems for each stage of pharmaceuticals development, such as licensing, preclinical, and commercialization (Exhibit 9).¹¹⁹

Funding and support from venture capital, private equity, and large corporations could be increased by centralizing the dispersed clusters, increasing the opportunity for companies to scale and network with each other.

¹¹⁵ *Development of domestic and international biomedical clusters and types of overseas expansion*, Korea Health Industry Development Institute (KHIDI), January 2023.

¹¹⁶ *2022 Industry snapshot*, MassBio (Massachusetts Biotechnology Council).

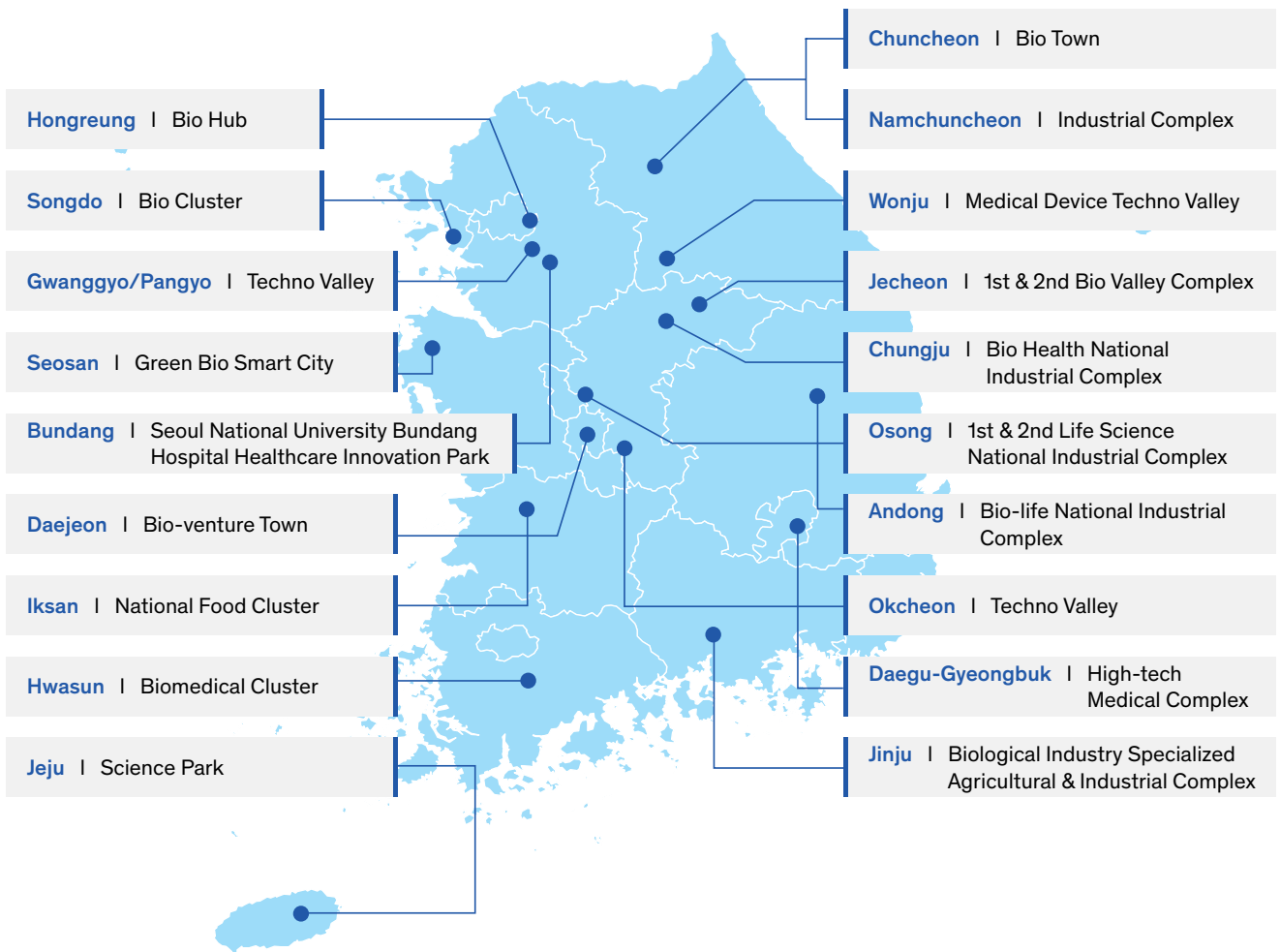
¹¹⁷ McKinsey analysis.

¹¹⁸ Toby AuWerter, Jeff Smith, and Lydia The, *Biopharma portfolio strategy in the era of cell and gene therapy*, McKinsey Life Sciences, April 8, 2020.

¹¹⁹ Ministry of Health and Welfare announcements, August 2023; Korea Health Industry Development Institute (KHIDI) announcements, August 2023; local government announcements, August, 2023.

South Korea has many bioclusters across the country, each focusing on an individual sub-industry or stage of the value chain.

Not comprehensive



Source: Korea Health Industry Development Institute; local government announcements; Ministry of Health and Welfare, Republic of Korea

Industry networks: There are some plans within existing C(D)MOs and bio ventures to relocate to be closer to each other. For example, Songdo—one of the largest clusters—is home to several leading C(D)MOs; other C(D)MOs and bio ventures are planning to move closer to one another. While these relocation plans will create momentum, additional planning will be needed to attract companies that do not have plans to move. These companies would include large global pharmaceutical companies, companies specializing in clinical aspects or sales and marketing, and companies in related industries.

For example, the relocation of the Asia–Pacific R&D center or a specific branch function of large pharmaceutical companies to South Korea could create an anchor to encourage other companies to gather around them. This would enable the country to harness the use of its large hospitals to conduct the clinical tests needed by the megacluster, and in the process, bring together companies and researchers to build an industrial ecosystem.

Talent attraction: The bio industry has the second-highest shortage of industrial technicians among the country's 12 major industries—an additional 7,500 specialized workers will probably be needed by 2025.¹²⁰ In particular, there is a significant shortage of highly skilled workers in research-related roles.¹²¹ The competition for skilled talent is expected to intensify, necessitating the attraction of key local talent, as well as highly skilled specialists from abroad. For example, in the case of Singapore's Biopolis, to attract top-level staff and expand the cluster's networks after its launch in late 2003, the Singaporean government supported a research program to enable workers to gain experience at leading bio megaclusters overseas for a number of years before returning to work in the local cluster.¹²²

Capital support: Instead of relying solely on public funding to establish megaclusters, the government could attract foreign investors by making investing in companies and megaclusters more attractive. Foreign investment in the pharmaceutical and healthcare industry was approximately \$500 million in 2020 (2.0 percent of total foreign investment) and about \$200 million (0.5 percent) in 2022.¹²³

Regulation and policy: A full range of supportive policies, including tax incentives, listing schemes, and early drug development regulations, needs to be reviewed to revitalize South Korea's bio megaclusters. The Ministry of Health and Welfare has already announced a strategy to support exports and provide funding for early-stage companies to boost bio health into becoming the next major industry after semiconductors.¹²⁴ By focusing on support for companies to establish themselves within bio megaclusters, South Korea could move closer to achieving this goal. Ireland, for example, used huge tax incentives to attract global pharmaceutical companies to Cork and Dublin, with one of the lowest corporate tax rates at 12.5 percent since the early 2000s; additionally, since 2004, a tax system of providing additional 25.0 percent tax credit was implemented for R&D activities.¹²⁵

Infrastructure: Building the right infrastructure will attract various role players wanting to collaborate and carry out research. It is particularly important to promote open innovation by ensuring that companies and start-ups are able to conduct effective clinical trials, share equipment, and use joint tenancy or laboratory facilities by locating them close to large hospitals and medical centers. An example of this is Japan's Kobe Medical Industrial City, an industrial medical complex founded in 1999 with the establishment of a research center and an advanced medical center. Since then, Kobe has continued to improve its infrastructure, including a shared laboratory where early-stage start-ups can experiment immediately, and a large-scale R&D center that focuses on cell therapy.¹²⁶ In addition to this, the quality of infrastructure for their lifestyles, schools for their children, and support for their spouses are important, as the ability to attract skilled workers to megaclusters also relies on the lifestyle infrastructure.

¹²⁰ *Results of the 2022 industrial technology manpower supply and demand survey*, Ministry of Trade, Industry and Energy, Korea Industrial Technology Agency, December 2022; *Bio industry innovation measures (IV): Bio industry human resource development promotion plan*, Policy Coordination Bureau, Ministry of Strategy and Finance, 2020; "Singapore's bioindustry promotion policy and implications," Seoul Institute of Technology, Seoul Economic Brief, 2004.

¹²¹ *Quantitative and qualitative mismatches in the biopharmaceutical workforce*, Chemical and Biotechnology Industry Human Resource Development Council, April 2022.

¹²² "Singapore's biomedical cluster: Lessons from two decades of innovation and manufacturing policy," Cambridge Industrial Innovation Policy, University of Cambridge, February 19, 2021.

¹²³ "Foreign direct investment statistics," Trade & Investment Big Data, Korea Trade-Investment Promotion Agency (KOTRA), September 2023.

¹²⁴ *Strategy for creating new markets for biohealth*, Ministry of Health and Welfare, February 2023.

¹²⁵ *Comparison of biopharmaceutical infrastructure and systems in major countries*, Federation of Korean Industries, June 2016.

¹²⁶ "Current status of domestic and international biomedical clusters and development of overseas expansion types," Health industry brief, Korea Healthcare Industry Promotion Agency, January 2023.

6.2. Establish an institutional foundation for innovative companies

Regulations that can potentially stifle the creation of innovative companies need to be revisited. The time it takes for development and innovation in new industries, such as bio health, drones, fintech, and AI, is becoming shorter, while convergence between technologies is accelerating. Yet, regulatory reform has often lagged at a slower pace than the emergence of new businesses.

In South Korea, a 2019 analysis of 86 regulations in four fields (bio health, drones, fintech, and AI) found that only eight regulations improved in the previous four years (an improvement rate of 9.3 percent), 21 were under review, 57 were unchanged, and 11 were being tested through sandboxing.¹²⁷ Regulatory improvements supporting innovation could, therefore, be made to match the pace of technological development in the country.

Another example is regulation relating to autonomous vehicles. Since other countries already allow test-driving in various environments and use of autonomous sensors and AI technology, South Korean companies prefer to test-drive overseas where there are fewer regulatory restrictions. For instance, San Francisco's August 2023 decision to allow two self-driving robotaxi service companies to operate around the clock was seen as a stepping stone for the innovation and development of autonomous driving technology (although there were internal concerns).¹²⁸

In the fintech sector, there no clear regulation for crowdfunding companies that only provide investment platforms. Despite this, they are classified as investment brokerage businesses, and are subject to burdensome regulations such as banking-commerce separation and investment restrictions.¹²⁹ In the medical field, remote dispensing and home delivery of medicines to remote mountainous areas are regulated by the Pharmaceutical Affairs Act. South Korea should consider improving regulations for innovation in these industries to keep pace with technological advances.

Furthermore, innovative products such as drones and 3-D printers are designated as "products for competition among small and medium-sized enterprises."¹³⁰ This, however, limits opportunities in the market only to SMEs, which could prevent the development of greater synergies with other business groups. This can make it harder for companies to get a head start by limiting their opportunities to compete and reducing their chances of establishing a presence.

No matter how much investment or support is given to new start-ups and the next potential global champion, it may not be enough without also looking at the related regulations in a timely fashion and responding fast. To solve this challenge, it would be necessary to establish a type of public-private council, led by technical experts from private companies, to codevelop the necessary regulations.

Apart from providing support for the physical infrastructure to cultivate megaclusters, the government could identify innovative companies' needs and provide a progressive regulatory foundation.

¹²⁷ *New business (bio, drone, fintech, AI) regulatory improvement status report*, Korea Chamber of Commerce and Industry, April 2023.

¹²⁸ Nadia Bidarian, "Regulators give green light to driverless taxis in San Francisco," *CNN*, August 11, 2023.

¹²⁹ Joo-seok Na, "Crowdfunding twisted because of the 'name'... Can we avoid the regulatory trap?," *Asian Economy*, January 18, 2019.

¹³⁰ "Products for competition among small and medium enterprises," Public e-Procurement Information, Small and Medium Business Distribution Center (SMPP), October 2023.

Cultivate

7. Cultivate a virtuous cycle in the capital market

Morgan Stanley Capital International (MSCI) classifies global leaders such as Japan and Singapore as developed markets, whereas South Korea is an emerging market. MSCI's reasons for this include that South Korea is relatively closed to foreigners, and that it has a less accessible foreign exchange market, a foreign investor registration system, low availability of investment instruments, and a lack of investor information flow.

In light of these conditions, South Korea could focus on revitalizing its domestic capital market and diversifying its capital sources to provide better opportunities for large corporations, SMEs, and start-ups alike.

7.1. Attract foreign direct investment

South Korea has the potential to secure foreign capital at a similar level to that of countries with advanced economies by implementing policies that would encourage foreign investment. South Korea's foreign direct investment (FDI) volume ranked 23rd. The size of South Korea's FDI is much smaller than high-GDP countries such as China, Japan, and the United States, and international financial hubs such as Singapore. In fact, it is similar to countries such as Chile and Malaysia (Exhibit 10).¹³¹

Exhibit 10

South Korea's foreign direct investments ranking is lower than that of developed countries.

\$100 million, 2022

1st	United States	3,516
2nd	China mainland	1,802
3rd	Singapore	1,408
4th	Hong Kong SAR	1,210
5th	France	962
	⋮	
21st	Indonesia	217
22nd	Chile	209
23rd	South Korea	180
24th	Colombia	170
25th	Malaysia	151

Source: World Bank

¹³¹ Foreign direct investment, net inflows (BoP, current US\$), DataBank, World Bank, July 2023.

While Israel's labor force is only 15 percent of South Korea's, its FDI volume was 94 percent that of South Korea's in 2012. By further actively attracting foreign investment, mainly by leveraging high-value-added IT and service industry start-ups, Israel's FDI volume had reached 154 percent of South Korea's by 2022.

In times of difficult internal and external conditions—such as the current global economic slowdown, global reshaping of supply chains, and declining domestic economic vitality—attracting foreign investment can help revitalize the labor market. FDI inflows into South Korea over the past decade have created 295,000 jobs and an additional 75,000 work opportunities for young people—highlighting the importance of attracting foreign capital for economic growth.

There are several ways the government can attract more foreign investments. The government could review the tax environment, including corporate taxes, and the private sector could continue to make itself more attractive to investors. For example, developed economies offer attractive incentives such as tax exemptions, and also have supportive policies in line with company needs, such as cash support measures and rent reduction incentives.

In Singapore, FDI has been a key driver of economic development since the early stages of the country's development. The Economic Development Board under the Ministry of Trade and Industry is dedicated to attracting foreign investment. It provides one-stop services for foreign investors, including rapid response to their inquiries, evaluation of investment incentive applications, and assistance with factory sites and labor. These fast-track services enable businesses to start up within three months of investing. For instance, businesses that introduce advanced technology, and for which there are no similar businesses in Singapore, are granted “pioneer” status and receive a 20 percent corporate tax reduction for five to ten years.

Regarding venture investments, South Korea has a complex system compared to other leading countries because of the variety of different types of funds and laws governing this sector.¹³² As a result, overseas venture capital firms prefer to invest in South Korean start-ups through their headquarters directly rather than establishing a fund in South Korea. Simplifying venture investment policies, expanding the autonomy of fund structure design to create a more investor-friendly environment, and actively implementing supportive policies such as joint-venture support and tax incentives, could raise South Korea's venture-investment ecosystem to global standards.

7.2. Strengthen investor confidence through a range of value-enhancing measures

According to Bloomberg, “[South] Korean companies tend to be valued low because of poor corporate governance and an unfriendly attitude toward minority shareholders.”¹³³ Given that South Korean stocks are often valued at one-third of their global book value, global investors have tended to avoid the South Korean capital market. Enhancing stakeholder value by increasing dividends and share buybacks could enable South Korean companies to break the trend of passive shareholder returns and strengthen investor confidence. This, in turn, would enhance corporate value and contribute to the development of the domestic capital market.

¹³² Sumi Na, “Qualitative growth plan for venture capital market in private-led transition period,” Small and Medium Venture Business Research Institute, March 7, 2023.

¹³³ Henry Ren, John Cheng, and Youkyung Lee, “Why bringing a \$1.8 trillion stock market to the big leagues could backfire,” *Bloomberg*, May 31, 2023.

7.2.1. Encourage active shareholder returns

When comparing ten-year average shareholder return rates in major countries, South Korea stands at 29 percent, below China at 32 percent and well below the United States at 92 percent. In the United States, total share repurchases by S&P 500 companies in 2022 reached nearly \$943 billion (1,220 trillion Korean won), whereas South Korea's share repurchases over the same period were only \$3 billion (approximately 4 trillion Korean won). Moreover, S&P 500 companies have maintained their dividend payout ratios despite the increase in share repurchases. They enhanced shareholder value substantially by shortening the frequency of dividends, for example, to quarterly and monthly. Shareholders were then able to reinvest their dividends for a compounding effect, resulting in growth of nearly 169 percent over ten years, significantly higher than South Korea's 25 percent.¹³⁴

7.2.2. Establish advanced corporate governance

South Korean companies could enhance shareholder value by ensuring transparency at board level and by implementing corporate governance systems that meet leading global standards. According to the 2021 Dow Jones Sustainability Index, the average environmental, social, and governance score of South Korean companies was 70.9, slightly lower than the global average of 76.5. However, their average governance score was 36.0, which is 26.4 points lower than the global average. In the category of code of ethics, the score was 75.3, which was 8.2 points lower than the global average.¹³⁵ In Sweden, for example, companies under the Wallenberg family, one of the largest and most prominent families in business in that country, are governed by a board of directors comprising mostly former or current directors and CEOs of other companies.¹³⁶ This creates checks and balances between the CEO and the board to ensure transparency, in turn promoting investor confidence in the companies' operations.

7.2.3. Cultivate entrepreneurship and a growth mindset

Finally, South Korean companies could cultivate a growth mindset that continually creates new value by exploring new challenges and innovative activities. This means not only securing the stability of existing businesses, but also making bold capital investments in new businesses or promising start-ups. For example, in 2023, a survey of CEOs of ventures and start-ups in their 30s and 40s found that 93.6 percent said high inheritance tax rates "reduce entrepreneurs' willingness and ability to take risks."¹³⁷ A survey conducted in February 2020 among 1,400 mid-sized companies in South Korea found that 81 percent of executives reported they did not have a family succession plan. Many cited the burden of inheritance and gift taxes as the main reason—these are as high as 60 percent, well above the OECD average of 25 percent.¹³⁸ Nineteen of the 38 OECD countries have no inheritance tax, and even those countries with high inheritance taxes offer a variety of deductions.¹³⁹

¹³⁴ Cha Chang-hee, "Korean stock market shareholder return rate 29 percent ... It doesn't even reach middle level," *Maeil Business Newspaper*, July 9, 2023.

¹³⁵ "Announcing the 2021 Dow Jones Sustainability Index (DJSI) Results," Korea Productivity Center, November 13, 2021.

¹³⁶ Richard Milne, "Meet the Wallenbergs," *Financial Times*, June 5, 2015.

¹³⁷ "3040 CEO perceptions of South Korean inheritance tax system," Korea Enterprises Federation, 2023.

¹³⁸ "Survey on small and mid-sized companies," Federation of Middle Market Enterprises of Korea, June, 2022; "Korea's inheritance tax burden is among the highest in the OECD, urgent need to rationalize the tax system," *Korea Economic Research Institute*, June 17, 2022

¹³⁹ "Korea's inheritance tax burden is among the highest in the OECD, urgent need to rationalize the tax system," *Korea Economic Research Institute*, June 17, 2022; OECD Stats, 2022.

7.3. Diversify sources in the venture capital market

The venture capital market for start-ups and other small businesses has achieved steady growth. Looking at the performance of venture capital investments, the total amount of investment grew from \$2.0 billion (2.4 trillion Korean won) in 2017 to \$6.4 billion (7.7 trillion Korean won) in 2021; the number of investments increased from 2,400 to 5,600 and the number of funded companies increased from 1,300 to 2,400 for 2017 and 2021, respectively.¹⁴⁰

The domestic venture capital market is characterized by a higher proportion of investments from public pension funds and public policy funds compared to other countries.¹⁴¹ About two-thirds of venture investment funds are formed with public and policy financial investments. Contributions from the corporate sector are below global averages. Therefore, the economy needs the participation of traditional companies with sufficient capital and a stable presence, not only to make financial investments but also as strategic investors to support the discovery of new economic growth engines. Diversifying sources in the venture capital market could create ventures and start-ups with the potential to become the growth engines of the future.

For example, South Korea could consider boosting corporate venture capital (CVC) as a source of funding to incubate new companies and unlock new growth engines. CVC is involved in 25 percent of all venture capital investments globally.¹⁴² In the United States, 26 percent of all investments come from CVC, but it accounts for nearly 48 percent of the total investment amount in 2020, playing a significant role as a large capital force.¹⁴³ In 2022, CVC accounted for 31 percent of all venture capital investments in South Korea. The internally retained earnings of the top 100 domestic companies exceeded \$760 billion (approximately 1,000 trillion Korean won) in 2022, and the retained earnings of the top ten companies are \$240 billion (448 trillion Korean won).¹⁴⁴ To encourage the release of this type of funding into the capital market, incentives such as deregulating CVC could be used.

South Korean companies are still limited in their ability to invest freely. Under South Korea's current capital regulations, the proportion of funds from outside a parent company is limited to 40 percent. The proportion of CVC funds that can be invested in overseas ventures is restricted to a maximum of 20 percent of the fund's capital. Conflicts with existing laws, such as the Fair Trade Act and the Holding Company Act, may become unavoidable, creating the need for more proactive regulatory improvements as in other countries where most companies can freely receive funds from outside organizations.¹⁴⁵

An example of such success would be Google's investment in today's technology leaders such as Airbnb through its own CVC organization, Google Ventures, which was founded in 2009. South Korea could consider regulatory reforms to facilitate corporate participation in the venture capital market to create synergies between their stable management know-how and venture firms' innovative capabilities.

¹⁴⁰ Sumi Na, "Qualitative growth plan for venture capital market in private-led transition period," Small and Medium Venture Business Research Institute, March 7, 2023.

¹⁴¹ Ibid.

¹⁴² "Corporate-led venture capital (CVC) leading companies and implications," Federation of Korean Industries (KRI), August 20, 2020.

¹⁴³ "Global VC status," Korea Venture Investment Corp, December, 2020.

¹⁴⁴ Hyunsook Cho, "In-house reserves of top 100 companies exceed KRW 1,000 trillion ... Increased by 395 trillion in ten years," *The JoongAng*, October 3, 2022.

¹⁴⁵ "Corporate-led venture capital (CVC) leading companies and implications," Federation of Korean Industries.

Cultivate

8. Cultivate and expand the core talent pool

South Korea's highly skilled technical workforce is estimated to have remained stable at nearly 34 percent of the total workforce, accounting for 1.63 million people in 2017 and 1.68 million in 2021. However, the shortage of industrial technical labor in the economy's 12 major industries accounts for nearly 75 percent of the country's total labor shortage.¹⁴⁶ Therefore, when taking into account the anticipated decline of the population, it is clear that measures need to be taken to expand the labor force and diversify the core talent base if South Korea wants to remain competitive.

8.1. Ensure a sustainable talent pipeline for high-tech industries

High-tech industries such as software and biopharmaceuticals, in particular, are continually experiencing labor shortages. Prioritizing these two industries could help to ensure a sustainable pipeline of necessary labor.

Software industry: The South Korean software industry is estimated to have had a labor shortfall of 6,000 workers at the end of 2021.¹⁴⁷ Around 63 percent of 300 SMEs surveyed indicated that they were struggling to source talent.¹⁴⁸ This is concerning given that software skills are necessary in almost every industry, including automotive, AI, and semiconductors. Moreover, the software industry should consider filling the software-developer gap across the entire industry, in comparison to big technology companies that tend not to have talent shortages.

Bio industry: While employment in this fast-growing industry continues to increase, local companies still struggle to find certain higher-qualified talent, such as researchers, leading to fierce competition.

Companies that create high-value-added products—such as CGT and new drug development—require many skilled workers for R&D. Yet, over half of domestic bio employees are not involved in research.¹⁴⁹ According to the Chemical and Bio Industry Skills Council, the main reasons for the shortage of labor for research-related jobs are the lack of professionals with knowledge of the latest technology, the gap between the education curriculum and industrial practices, and the lack of practical training in education and on training courses.¹⁵⁰

Semiconductor industry: By 2031, the South Korean semiconductor industry could have a labor shortage of 54,000 skilled professionals with college degrees or higher.¹⁵¹ McKinsey research undertaken in 2022 found that the US semiconductor industry is expected to have a labor shortage of approximately 300,000 engineers and nearly 90,000 skilled technicians by 2030.¹⁵² To create the skills needed, the United States is introducing various academic degrees related to semiconductors and using immigration policies to attract people from abroad who have the relevant skills.¹⁵³ Similar policies could also help South Korea to stabilize the supply of such key talent.

¹⁴⁶ "Survey on supply and demand of industrial technical manpower," Ministry of Trade, Industry and Energy, 2022.

¹⁴⁷ Ibid.

¹⁴⁸ Hyunsung Shin, "60 percent of venture firms 'have difficulty finding SW talent'... 4 percent prefer to hire graduates," *News Suwon*, May 19, 2022.

¹⁴⁹ "2020 Korean bio industry survey," Korea Institute of S&T Evaluation and Planning (KISTEP), March 31, 2023.

¹⁵⁰ Sunggyu Huh, "Education and training must improve to address workforce mismatch in pharma and bio industry," *Medipana*, December 30, 2022.

¹⁵¹ Samsung SALT's speech during the symposium "Current status and future of Korean semiconductor industry," 2023.

¹⁵² *How semiconductor makers can turn a talent challenge into a competitive advantage*, McKinsey Semiconductors, September 7, 2022.

¹⁵³ Census Bureau, 2022; IPEDS, 2022; Myvisasjob, 2022; US Bureau of Labor Statistics, 2022.

8.2. Build a structural development system to supply core talent

Collaboration between the South Korean government, industry, and academia could help establish a state-of-the-art local education curriculum, attract talent from abroad, and identify ways to innovate corporate culture in line with global leaders' standards. Attracting core talent in future would require employment retention policies with a long-term focus. These could include financial support for tuition, research funding, and the introduction of advanced educational and vocational systems able to address the practical, long-term needs of the industry.

8.2.1. Expand government's expenditure on labor market

A first step could be for the government to increase fiscal spending on the labor market, with a focus on strategically fostering industries. Labor market-related policies, for instance, accounted for only 0.84 percent of total annual government expenditure in 2019—lower than the OECD average of 1.37 percent. In particular, the proportion of active labor market policies (for example, employment services, vocational training, employment incentives, sheltered employment and rehabilitation, direct job creation, and entrepreneurship incentives) accounts for only 44 percent of total labor market policy expenditure.¹⁵⁴ This is lower than the OECD average of 53 percent.¹⁵⁵

8.2.2. Foster close collaboration between academia and industry

A first step to rapidly produce the expertise and technological skills required by the overall industry in general would be to create an advanced and practical educational system. Here, too, close cooperation between government, industry, and academia would play a key role. Some industries have already established support systems such as full-tuition scholarships and guaranteed employment. However, closer cooperation is required to accelerate the nurturing of high-quality talent. Measures could include expanding the number of specialized schools and departments, introducing an employment-guaranteed curriculum, and increasing investment in academic research.

In addition, South Korea could consider providing financial support to create a stable pipeline of human resources. This important challenge could be addressed by introducing support policies with economic benefits to encourage STEM students (versus entering medical schools). This issue can be seen in the semiconductor industry, for example. Of the students with partnership agreements with South Korean semiconductor companies who enrolled in 2023 at the semiconductor departments of four major universities (Hanyang University, Korea University, Seoul National University, and Yonsei University) 155 percent withdrew (due to wait-listed students withdrawing). This is higher than the overall enrollment withdrawal rate of 33 percent at the top three South Korean universities, Korea University, Seoul National University, and Yonsei University.¹⁵⁶

Financial support from companies and industries is needed to enhance the attractiveness of the industry from a long-term perspective. Several measures can help achieve this. Stability throughout the career life cycle could be created by reemploying mid-career professionals, including women, and by creating angel funds and acceleration schemes for young and mid-career professionals.

¹⁵⁴ Employment incentives to ensure that the labor force is employed at the right time and in the right place; active labor policy instruments that expand employment opportunities by directly creating jobs; and passive labor-market policies such as unemployment benefits, unemployment assistance, and other public assistance.

¹⁵⁵ *An analysis of the impact of active labor market policies on unemployment*, Korea Economic Institute, December 21, 2022.

¹⁵⁶ Minje Kim, "Despite the guarantee of 'jobs at large companies', a large number of semiconductor departments at major universities are leaving," *The Hanky*, February 18, 2023. (Korean STEM students prefer to enroll in medical degrees rather than STEM degrees. If their final exam grades are high enough, they withdraw their applications to STEM programs in preference for medical ones.)

For example, policies that provide comprehensive services for the entire business life cycle could be expanded, such as the Entrepreneurship Success Package of the Youth Entrepreneurship Academy offered by the Ministry of SMEs and Startups. The package includes not only support for commercialization, but also for start-up infrastructure, training and coaching, prototyping, overseas expansion, and follow-up services.

8.3. Attract global talent

South Korea could increase its efforts to attract international workers by implementing focused policies. The number of foreign workers in South Korea has stagnated over the past decade, and the number of skilled professionals has declined (Exhibit 11).¹⁵⁷

Japan also faces a steady decline in the proportion of its working-age population. However, it has achieved significant growth through aggressive overseas recruitment policies that attracted a large number of foreign workers. It has also managed to expand the number of skilled professionals in key industries.¹⁵⁸

According to the Federation of Korean Industries, South Korea's inflow rate of foreign labor with higher education qualifications is 2.8 percent. This rate ranks the country 33rd out of OECD countries—only Chile, Colombia, Mexico, and Turkey have lower inflow rates.¹⁵⁹ In addition, the majority of the 855,000 foreign workers in South Korea in 2021 were low skilled, and only 10 percent among them were classified as skilled laborers.¹⁶⁰ Thus, policies are needed to attract specialized workers. For example, Japan's Industrial Revitalization Strategy, launched in 2016, included the relaxation of requirements for the certification of highly skilled workers and allowed them to stay in the country for an unlimited period of time. These measures led to the share of skilled foreign workers increasing from 18.5 percent in 2012 to 22.8 percent by 2021.¹⁶¹

Only 42 percent of foreign PhD students who earned their degrees in South Korea are currently employed domestically.¹⁶² To address this urgent situation, the South Korean government could consider improving conditions for foreign professionals to stay in the country. Measures could include targeting certain segments and earmarking visas for specific skilled professionals. For industries, in-house support systems could be used to expand the recruitment of foreign professionals. In addition, South Korea's image as an attractive destination for skilled foreign workers could be enhanced by creating shared communities for foreigners and providing educational facilities.

South Korea is at an important crossroads in terms of its ability to compete across industries if it does not secure more talented workers, both domestically and from abroad. To help kick-start the next S-curve, the country needs to explore more proactive strategic workforce-development policies.

¹⁵⁷ "Status of foreign residents in local government," Ministry of the Interior, Korean Statistical Information Service (KOSIS), December 2021; "Foreign employment status" (as of the end of October 2020), Ministry of Health, Labor and Welfare, 2021.

¹⁵⁸ *Trends of attracting foreign experts in major countries and Korea's challenges*, Federation of Korean Industries, December 8, 2022.

¹⁵⁹ *Status and implications of human resource competitiveness in OECD countries and Korea*, Federation of Korean Industries, 2022 June.

¹⁶⁰ "Results of the 2022 Immigrant Status and Employment Survey," KOSIS, December 20, 2022.

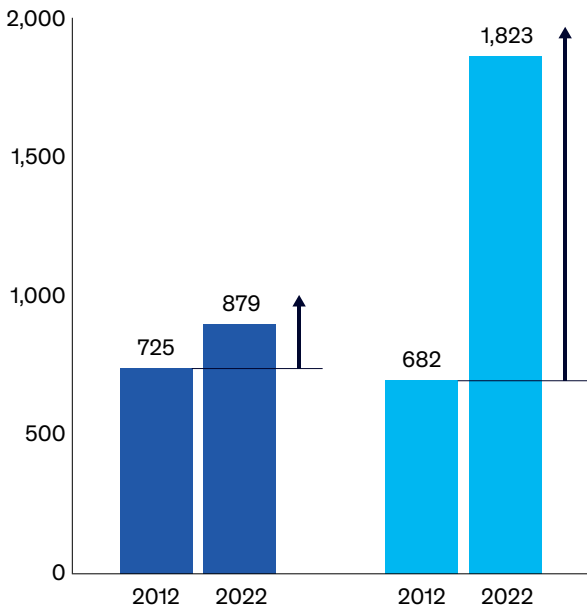
¹⁶¹ "Trends in attracting foreign professionals in major countries and challenges for Korea," The Federation of Korean Industries (FKI), December 8, 2022.

¹⁶² Hyunsup Noh, "Only 42 percent of international students who earned doctoral degrees in Korea find employment in Korea ... The rest of us leave Korea," *Seoul Economic Daily*, November 25, 2022.

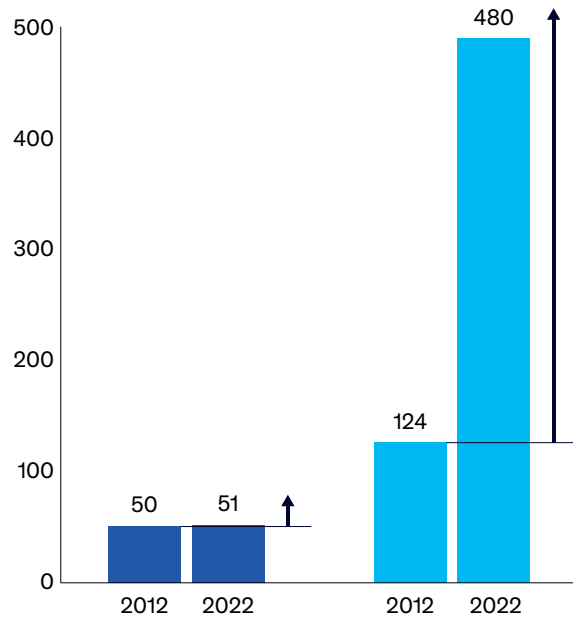
Japan has succeeded in significantly increasing its proportion of skilled foreign workers while South Korea's has remained stagnant.

■ South Korea ■ Japan

Number of foreign employees
thousands, 2012–2022



Number of foreign professionals
thousands, 2012–2022



Source: "Employment Status of Foreign Nationals," Ministry of Health, Labor, and Welfare, Japan; "Immigration status and employment surveys," Statistics Korea; Ministry of Justice, Republic of Korea



Chapter 3

Toward an era of \$70,000 GDP per capita by 2040

Where should South Korea head in the years leading up to 2040? If South Korea does not achieve a revolutionary improvement in productivity while maintaining its current industrial structure, the current trend of low growth will continue. To achieve such a worthy goal, extensive improvements to the core structure of the national economy would need to be implemented simultaneously, as well as stimulating an increase in innovative productivity by using the eight actions discussed in this report. By creating the next S-curve, South Korea should be able to aim for an era of \$70,000 per capita GDP by 2040.

This means that South Korea will need to outgrow its projected GDP¹⁶³ for 2040 by about \$1 trillion, a bold move toward an average growth rate of 4 percent instead of the current projected average growth rate of 2 percent. It also means that the absolute size of South Korea's economy, which has ranked between tenth and 15th largest over the past 30 years, would move into the top seven countries, further increasing its international influence.

Although some countries have experienced fast-paced economic progress in the past, it's not easy for them to regain significant growth. Nevertheless, it could be achieved by introducing a new, innovative formula for national economic growth. Germany and the United States, for example, both managed to achieve around 4 percent economic growth in the mid-to-late 1990s and mid-to-late 2000s, respectively.

From a growth rate of 3 percent from 1986 to 1990, the United States slowed to 2 percent from 1991 to 1995, and then rebounded to a 4 percent growth rate from 1996 to 2000 due to a number of changes, including monetary policy and the impact of IT diffusion.¹⁶⁴ The Federal Reserve contributed to promoting corporate investment and consumer consumption through stable monetary policies and interest rate control. In addition, numerous IT start-ups were established, leading to a virtuous cycle of job creation and investment. Companies in the United States significantly enhanced operational efficiency through proactive digital innovations such as data analysis using IT.

Germany also grew at a rate in the 3 percent range from 1986 to 1990, plateaued in the mid-1 percent range from 1991 to 2005, then grew at a rate close to 4 percent from 2006 to 2011, excluding the global economic crisis.¹⁶⁵ This resurgence was supported by labor reform and manufacturing export competitiveness, each as one of several growth drivers. In 2003, the German government announced its Agenda 2010, which continued even after the change of government in 2005.¹⁶⁶ Its success was due to mid- to long-term changes in the overall labor market, the social security system, taxation, and education. Further, Germany secured its global competitiveness in specialized industries such as industrial machinery and automobiles through greater reductions in manufacturing costs, and by establishing Eastern Europe as a production base for finished products and parts.

¹⁶³ S&P Global projects South Korea's GDP to reach \$2.4 trillion by 2040, and Economist Intelligence Unit (EIU) projects South Korea GDP to reach \$2.2 trillion by 2040.

¹⁶⁴ "World development indicators," DataBank, World Bank, October 2023.

¹⁶⁵ Ibid.

¹⁶⁶ Lothar Funk, "Chancellor proposes Agenda 2010 to revive economy," Eurofound, March 30, 2003.

Goals for South Korea to achieve by 2040

South Korea should aim to achieve the following seven goals by 2040 by fully implementing the eight bold national actions proposed in Chapter 2 of this report (Exhibit 12).

1. Create an additional five companies with revenue of over \$100 billion, 20 with over \$10 billion, and 100 with over \$1 billion

The quantum leap to \$70,000 GDP per capita will require growth across industries and value chains.

In 2022, in terms of revenue, three companies in South Korea had over \$100 billion, 54 companies over \$10 billion, and 418 companies over \$1 billion.¹⁶⁷ This means that, based on the growth of existing companies and the emergence of globally competitive high-growth companies—mainly in industries such as renewable energy, bio, AI, mobility, and semiconductors—South Korea needs to add five more \$100 billion revenue companies, 20 more \$10 billion revenue companies, and 100 more \$1 billion revenue companies by 2040.

2. Double SMEs' productivity

Value added per person employed is one of the basic measures used to compare countries in terms of the performance of their economies, industries, businesses, and processes. For countries where population growth is slowing, productivity improvement is a key factor to enable continued economic growth. However, the productivity of companies in South Korea is lower than that in other countries, especially when comparing SMEs to large enterprises. South Korea has the fourth-largest productivity gap in the OECD, with SME productivity at about 30 percent that of large firms (the OECD average is about 50 percent).¹⁶⁸

Approximately 99 percent of domestic companies are SMEs, which employ about 80 percent of the workforce. Therefore, the ripple effect on the domestic economy of improving SMEs' productivity per capita would be significant.¹⁶⁹ By adjusting the vertical business model between conglomerates and their suppliers to a horizontal win-win business model of cooperation and joint growth between various companies in the value chain, South Korea should aim to double SMEs' productivity.

3. Ensure that 70 percent of GDP comes from the service industry

The domestic service industry represented around 60 percent of GDP in 2021, below the OECD average of around 70 percent, and below that of Germany (63 percent), Japan (70 percent), and the United States (78 percent). While South Korea's domestic service industry accounts for approximately 70 percent of domestic employment, the industry significantly lags in terms of the value created per person.¹⁷⁰

Traditional manufacturing companies should convert their maturing portfolios to high-value-added products in the near future. They should actively expand into new knowledge-intensive businesses that leverage intellectual property. In addition, service industry companies should expand the scope of their high-value-added services to areas such as IT platforms, software, content, and the fields of science, technology, and medical services. Through such a transformation, South Korea should be able to turn itself into a country with more than 70 percent of GDP originating from the service industry.

¹⁶⁷ KISVALUE, September 2023; McKinsey analysis, September 2023.

McKinsey research team's analysis was based on the data from NICE Information Service.

¹⁶⁸ Kim Eun-ha, "Small and medium enterprises productivity enhancement strategy," Korea Federation of SMEs, February 2023.

¹⁶⁹ "Basic statistics for SMEs as of 2020," Korea Ministry of SMEs and Start-ups, July 2022.

¹⁷⁰ Services, value added (percent of GDP), World Bank national accounts data; OECD National Accounts data files, 1960 to 2022, November 3, 2023.

By 2040, South Korea should aim to achieve the seven goals through the implementation of the aforementioned bold actions.

Illustrative

GDP per capita

\$70,000

Big 7



Revenue \$100 billion plus 5 companies (currently 3)

Revenue \$10 billion plus 20 companies (currently 54)

Revenue \$1 billion plus 100 companies (currently 418)



2x SME productivity

Current productivity of SME is less than half of large enterprises



2x financial depth

Current size of securities issuance such as stocks/bonds relative to GDP is half that of the leading countries



Expand service industry to 70% of GDP

Currently, service industries represent ~60% of GDP, which is lower than the OECD average of 70%



3+ global leading clusters

Currently, lack of leading clusters such as the Boston Bio Cluster



2+ new global champion industries

The current champions include semiconductors, battery, etc.



50,000 professionals in AI

Forecasted that only 5,000 AI professionals will be available by 2027

4. Double the financial depth

Financial depth indicates whether investment is playing a sufficient role as fuel for growth. Most developed countries (such as Singapore, the United Kingdom, and the United States) have more than triple the capital maturity of developing countries, illustrating the need for South Korea's capital sources to foster new companies, as well as investment for new growth engines. In 2018–2022, financial depth in the United States was 25.0 percent, the United Kingdom 20.6 percent, and Japan 11.0 percent, compared to 9.5 percent in South Korea.

Efforts are needed to advance the capital market, such as encouraging shareholder value-enhancing policies and improving governance. In addition, South Korea needs to diversify its capital sources by increasing the share of CVC and foreign investment to create an investment base that encompasses all medium, small, and start-up companies. By doing so, South Korea should aim to double the country's financial depth by 2040 compared to the current level.

5. Develop more than two global champion industries

Owning a global champion industry based on proprietary technology means having control and influence across the value chain to determine and redefine the direction of the industry's evolution. Furthermore, companies that produce unique, non-substitutable products or technologies can take initiatives that transcend economic security and geopolitical hegemony. South Korea currently possesses technological controlling powers in semiconductors and EV batteries, which have helped build its nation state and enhance its competitiveness. However, the rapid pace of technological advancement that other countries are making in these fields threatens its leadership position.

Therefore, in addition to making R&D investments to acquire proprietary technology and introducing policies to encourage collaboration between industry and academia, South Korea should cultivate and attract high-quality human resources. This is essential to widen the gap between South Korea and more recent entrants to the semiconductor and mobility sectors, as well as to identify several leading industries in new fields—such as renewable energy and bio—to further solidify the country's national competitiveness.

6. Create more than three top global megaclusters

When an industrial megacluster is formed in a place where companies in an industrial ecosystem are concentrated, it kick-starts cooperation between start-ups and conglomerates. This then leads to specialized labor and various production factors being aggregated to reduce costs for individual companies. Establishing megaclusters can directly contribute to uplifting GDP and securing national competitiveness.

As mentioned earlier in the report, the Boston Bio Cluster is a great example of a megacluster bringing significant economic benefits. Based on close collaboration between more than 1,000 pharmaceutical or bio ventures, it had attracted around \$14 billion in venture capital funds as of 2021. Most of the top 20 global pharmaceutical companies are located there, as well as major research institutes such as Harvard and MIT.

As discussed above, five elements are necessary for a successful megacluster: human resources, an industrial network, capital support, regulation and policy, and infrastructure. South Korea needs to be better equipped with all these elements.

To maximize the impact and synergy of revitalizing its megacluster ecosystem, South Korea should create a centralized megacluster rather than having several small and medium-sized clusters. The focus, in particular, needs to be in megaclusters that are competitive to leading global ones in fields such as bio, IT, and semiconductor industries.

7. Foster 50,000 advanced AI professionals

As significant productivity growth becomes increasingly important, AI-led innovation will play a critical role. This makes fostering AI talent, revitalizing the investment ecosystem, and reviewing related regulations vital. By 2027, the supply of AI workers in South Korea is expected to reach around 53,000, compared to an actual demand of around 66,000. About 48,000 jobs are expected to be from talents with qualifications equal to or below a bachelor's degree, while approximately 5,000 are expected to be from high-quality candidates who have more than master's and PhD degrees.¹⁷¹ Due to the fast speed of development, high technological barriers, and need for deeper understanding, securing advanced skills has become even more urgent.

In addition to nurturing skills domestically, attracting talent from overseas, and expanding cooperation between industry and academia to enhance the process, South Korea should use incentives and the creation of communities to establish itself as a country where highly qualified people want to work. This is essential to attract about 50,000 highly skilled workers and secure a leading position for the country in AI-led industrial innovation.

¹⁷¹ "A shortage of 12,800 new employees in artificial intelligence (AI) and 18,800 in cloud is expected by 2027," Korea Development Institute (KDI), August 31, 2023.



Closing

It's time to take a leap

In 1953, immediately after industrial facilities were destroyed during the Korean War, South Korea's GDP per capita was about \$70.¹⁷² At that time, the country was a developing nation in Asia. It had a weak global presence and insufficient human and material resources for growth. Despite these circumstances, South Korea was able to grow successfully by starting with an export-led growth model that focused on light industries, later expanding to heavy and chemical industries.

The economic ride has been bumpy and included an International Monetary Fund bailout in 1997 and weathering the financial crisis in 2008. Nevertheless, in addition to its success in technology-intensive industries such as semiconductors, electronics, and automobiles, South Korea managed to become a global leader in cultural content industries such as music, games, and webtoons. It has done so through dramatic industrial restructuring, new market discoveries, and technology investments. As a result, a quantum leap has been achieved, with a GDP per person of \$32,000.¹⁷³

In 2013, in reference to the Korea report, McKinsey used the analogy of a frog in a pot of boiling water being slowly heated to describe the South Korean economy. The report then focused on the country's low-productivity problem and the financial crisis middle-class households faced. It pointed out various related social issues such as excessive spending on funding for housing and private education, and the poor productivity of SMEs and service industries. This highlighted the lack of accurate problem recognition and solutions in the face of a major crisis.

A decade later, the water in the pot has become hotter, and the country is still facing various challenges. They include an increased demographic imbalance; a decrease in labor productivity; the Korea discount on the stock market; a lack of dynamism in venture capital; intensified competition in core national industries; a lack of productivity among SMEs; and an increasingly complex geopolitical landscape.

South Korea should not wait for the situation to change. It needs to make bold moves and changes. Based on the aforementioned eight bold actions, the country should create a framework that will allow for significant growth. This determination and drive will enable South Korea to break out of its current economic stagnation and succeed in introducing a new S-curve, making it one of the world's seven-largest economies by 2040.

¹⁷² Korea Statistics, November 10, 2023.

¹⁷³ Ibid.

Acknowledgements

This report was led by **Seungheon Song**, a senior partner and the office manager in McKinsey's Seoul office; **Richard Lee**, a senior partner in the Seoul office; **Jay Lim** and **Woosun Kyoung**, who are partners in the Seoul office; **Won-Mo Koo** who is an associate partner in the Seoul office; and **Jeongmin Seong**, a partner at McKinsey Global Institute in Shanghai.

The team, which included consultants **Jaewon Hwang**, **Jinha Hwang**, and **Sooyong Kim**, was led by **Youngwoo Song**, a consultant in McKinsey's Seoul office.

Many colleagues in the Seoul office provided valuable input and guidance: Seunghyuk Choi, Wonsik Choi, Jae Jung, SK Kang, Younghoon Kang, Gihong Kim, Sonny Kim, Sunho Kim, Taeyoung Kim, Josh Lew, Marco Moder, Hojoon Moon, Joongho Park, Inji Yeom, and Wonsik Yoo.

We wish to thank our McKinsey colleagues outside the Seoul office who helped us drive this important report with their insights: Ondrej Burkacky, Eunjo Chon, Michael Chui, Autumn Hong, Minyoung Kim, Matt McDevitt, Jay Park, and Jeff Smith.

Finally, we wish to thank colleagues in McKinsey's Client Capability Network and the McKinsey Center for Future Mobility (MCFM), and many other colleagues who supported the team internally: Sol Ahn, Keunho Bae, Saeil Jung, Hejin Kim, Jihye Lee, Youna Lee, Heesung Shin, and Yongheum Yeon.

This report aims to contribute to our mission to help businesses and policy leaders understand the forces transforming the South Korean economy. As with all other McKinsey Korea reports, it is independent and has not been commissioned or sponsored in any way by any business, government, or other institution.

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Korea's next S-curve:
A new economic growth model for 2040
December 2023

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