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CENTER FOR KOREAN INNOVATION AND COMPETITIVENESS

How South Korea Can Turn Its AI-Memory Boom Into Systemic Strength in the Face of China's Scale Pressure

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South Korea's AI-memory boom proves that it can still lead at the technological frontier. The proposed Future Response Fund and national megaprojects will test whether South Korea can turn that lead into stronger suppliers, exportable capabilities, and allied scale before Chinese expansion narrows its industrial base.

KEY TAKEAWAYS

- Advanced industries play an unusually large role in South Korea's economy. Ten key sectors, including electronics, machinery, vehicles, and chemicals, accounted for 25.1 percent of its economy in 2022—more than twice their share of the global economy.
- South Korea's AI-memory boom is real, but it does not secure the country's wider industrial system. The risk is that its industrial base could gradually narrow, not that it could suddenly collapse.
- China's scale increasingly overlaps with Korea's strongest sectors. From 2018 to 2022, China added $611.5 billion in output in the same 10 advanced sectors that made up a quarter of Korea's economy, while Korea added only $7.4 billion.
- To turn the AI-memory boom into systemic strength, Korea should make first-to-the-world innovation its primary domestic strategy. That will require stronger R&D incentives for large firms and faster commercialization of frontier technologies.
- Korea also should build allied scale, beginning with Japan; coordinate measures against unfair Chinese practices; and make public support conditional on productivity, commercial qualification, firm growth, and exports.

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INTRODUCTION

South Korea entered the second half of 2026 with clear evidence that it still matters at the technological frontier. High-bandwidth memory had made SK Hynix a critical supplier to the global AI buildout. In June, it overtook Samsung Electronics in market capitalization for the first time and announced a multiyear technology partnership with Nvidia.[1] Samsung and SK Hynix had also become central to the Korea Composite Stock Price Index's (KOSPI) AI-led rise.[2] By the end of June, Korea's semiconductor exports for the first half of 2026 had already exceeded the record reached in all of 2025.[3]

The government has responded with plans that match the scale of the moment. Weeks after the June local elections, the Lee administration announced three national megaprojects covering semiconductors, physical AI, and AI data centers.[4] The semiconductor plan includes 800 trillion won for four new fabs and a supplier and workforce ecosystem in the southwest, 81 trillion won for a high bandwidth memory (HBM) and advanced-packaging hub in Chungcheong, and regional materials and equipment hubs. It also commits more than 30 trillion won over 15 years to next-generation chips and aims to double memory production capacity within five years.[5] The physical-AI program connects robotics to Korea's manufacturing base, while the data-center plan begins with 8.4 gigawatts of capacity and, including a planned expansion of SK's project, targets a total of 18.4 gigawatts by 2035.[6]

The government is also developing a proposal for a Future Response Fund financed with additional revenue associated with the semiconductor boom to finance major industrial projects. Its size, accumulation method, and detailed investment priorities remain unsettled and are expected to be determined through interagency consultation and National Assembly review.[7]

Whatever its final form, the fund's industrial-investment window should be separately identified and governed by capability-based performance tests. It should not convert cyclical revenue into permanent baseline spending or reimburse investments firms already have a commercial reason to make.

The government's plans correctly identify the need for packaging, suppliers, power, and regional production ecosystems. But investment totals are not the right measure of success. The test is whether the fund and megaprojects qualify suppliers, close measurable bottlenecks, and create exportable capabilities in machinery, materials, power systems, industrial software, and services. Large funding vehicles and new fabs can coexist with a narrower industrial base.

This report treats the Lee administration's industrial agenda as a stress test. Korea's AI-memory boom proves that it can still lead at the technological frontier; however, it does not prove that Korea is secure across the wider industrial system. From 2018 to 2022, China added $611.5 billion in Hamilton-industry output while Korea added $7.4 billion, with much of that expansion occurring across industries in which Korea is also specialized. The test is whether the megaprojects convert semiconductor strength into resilient inputs, stronger suppliers, broader production capability, and allied scale before China captures more of the surrounding system.[8] The 2022 Hamilton data is a structural baseline rather than a real-time reading of 2026 conditions; subsequent sections use 2025–2026 trade and policy data to test whether that structure is changing.

The Hamilton Index measures national production and specialization across 10 strategically important advanced industries, using value-added output rather than gross sales.[9] Its location quotient, or LQ, compares those industries' share of a national economy with their share of the global economy. An LQ of 1 represents the global average; an LQ of 2 means the industries are twice as concentrated in the country as they are worldwide. In 2022, the latest year covered by the underlying Organization for Economic Cooperation and Development (OECD) data, Hamilton industries generated $420.4 billion in value-added output in Korea and accounted for 25.1 percent of its economy, as shown in table 1. Korea's composite LQ was 2.17. Computers and electronics alone generated $133.6 billion, accounted for 8.0 percent of Korea's economy, and had an LQ of 5.27. Korea is not an advanced-industry laggard. It is one of the world's most specialized advanced-industry economies.

Table 1: South Korea's position in the 10 advanced industries comprising ITIF's Hamilton Index, 2022

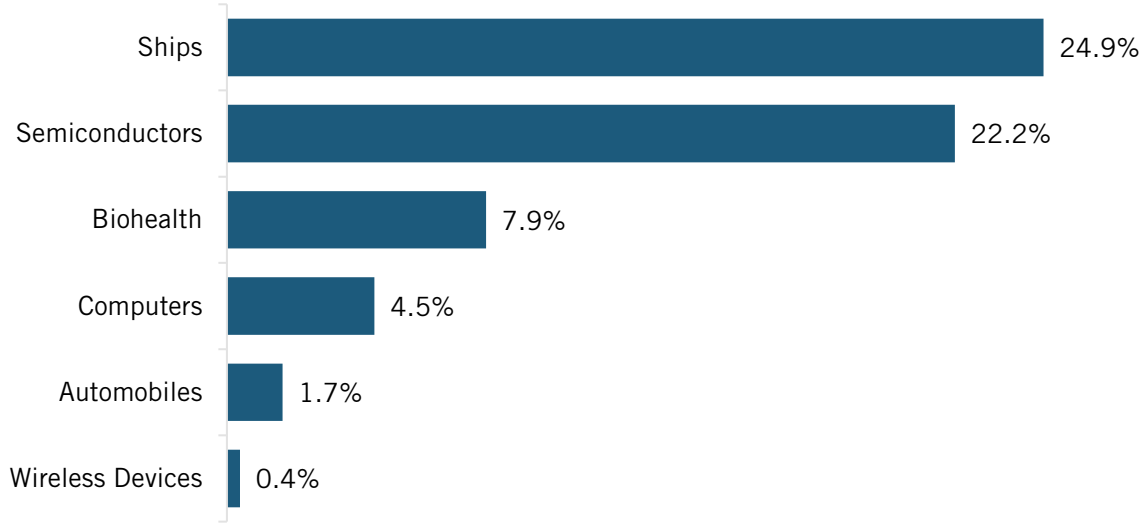
Indicator	All Hamilton Industries	Computers and Electronics
Value-added output	$420.4B	$133.6B
Share of domestic economy	25.1%	8.0%
Global market share	3.5%	8.6%
LQ	2.17	5.27

Korea's strength is broader than just semiconductors. It is also specialized in electrical equipment, motor vehicles, chemicals, machinery, metals, and other transportation equipment.[10] This breadth gives Korea the industrial layers needed to turn a lead in one technology into

strength across a production system. It also creates exposure, as China is expanding across many of the same layers.

The recent export record shows both sides of the problem. Korea's exports reached $709.7 billion in 2025, up 3.8 percent year on year and above $700 billion for the first time.[11] Semiconductors, ships, biohealth, computers, automobiles, and wireless communication devices were the six major product categories in which exports grew. (See figure 1.) Nine of the 15 principal categories did not. Petrochemicals and steel were among the sectors under pressure as global oversupply pushed down product prices. This was not industrial decline. It was growth concentrated in a limited number of high-performing sectors.

Figure 1: Major South Korean export categories that grew in 2025



China has changed the significance of that concentration. From 2018 to 2022, China added $611.5 billion in value-added output in the 10 industries covered in the Hamilton Index. Korea added $7.4 billion. In computers and electronics, Korean output fell by $11.0 billion while China's rose by $22.6 billion. All seven Hamilton industries in which China had an LQ above the global average were also industries in which Korea was above the global average. China is clearly expanding through much of the same industrial space in which Korea has built its strength.

Rhodium Group's 2026 analysis shows why the pressure is becoming more systemic.[12] China's industrial policy now reaches beyond final products into upstream materials, components, industrial equipment, services, and frontier technologies. Between 2021 and 2024, Chinese exports of intermediate inputs rose 26 percent and capital-goods exports rose 32 percent, while consumer-goods exports were broadly flat. Measured by export volume, the number of products in which China held more than 50 percent of global exports rose from 192 to 315. The number above 70 percent rose from 67 to 116. China is increasingly supplying the inputs and machinery that other countries' factories use.

Korea therefore should focus on three priorities:

1. **Staying ahead through first-to-the-world innovation.** Korea should strengthen incentives for frontier corporate research and development (R&D), including a substantially stronger

general R&D tax credit for large firms, and judge public programs by commercialization and global market entry.

2. **Building allied scale and slowing Chinese gains that rest on unfair or mercantilist practices.** Cooperation should begin with Korea and Japan in semiconductor materials and equipment and extend to U.S.-led coordination on trade remedies, technology protection, procurement, and competition in third-country markets.
3. **Making Make sure the Future Response Fund and national megaprojects scale productive firms rather than protect smallness.** Support should be time limited and conditional on productivity, supplier qualification, exports, and firm growth, with redesign or exit when results do not improve.

The findings do not support pessimism about Korea's industrial future. The nation begins with a broad, highly specialized production base and a genuine technological lead. It also faces a competitor affecting the materials, machinery, services, and production capacity around that lead. The task is to use the boom while it lasts: reach the next frontier first, combine scale with trusted partners, and direct public support toward firms and capabilities that can grow.

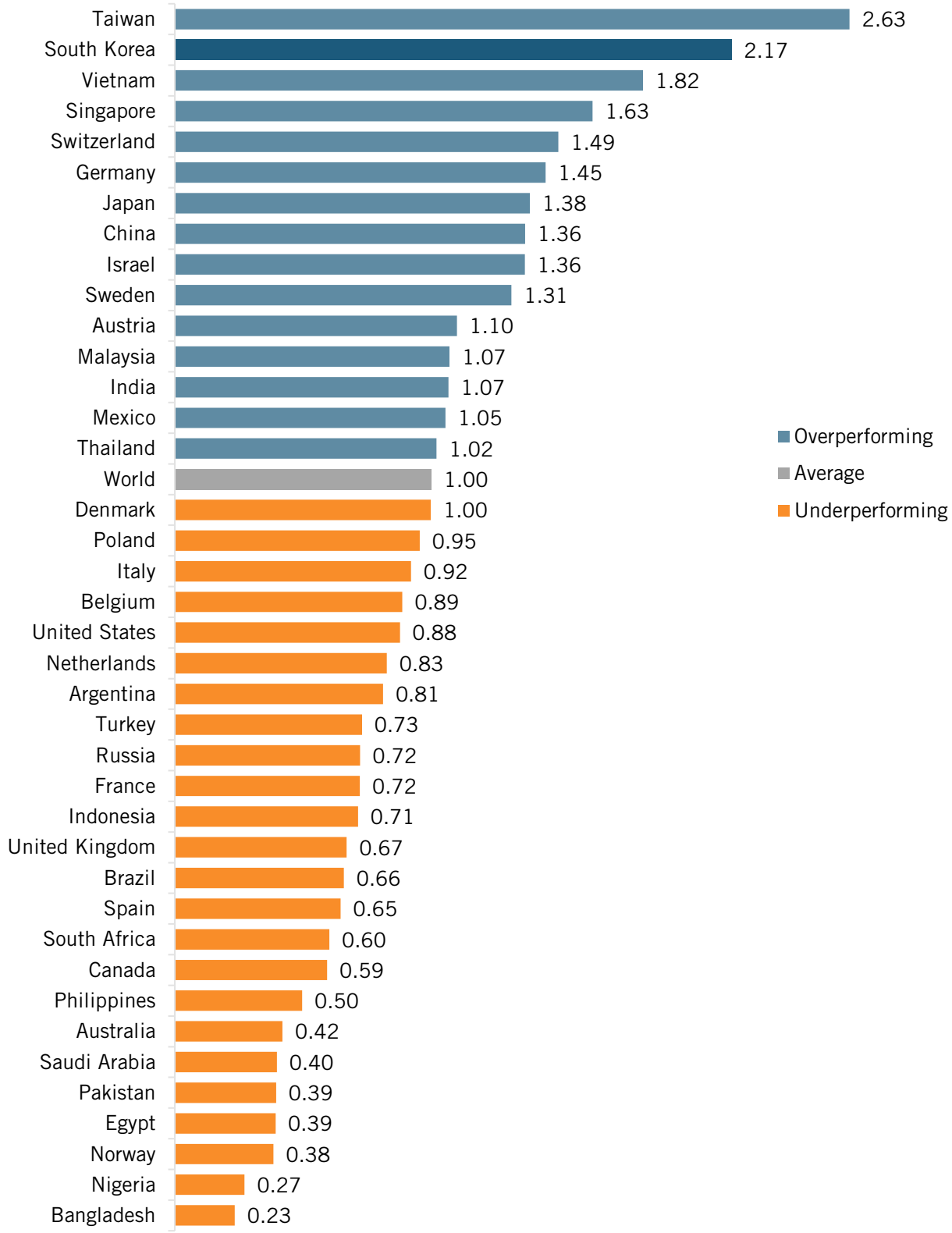
KOREA'S POSITION IN ADVANCED INDUSTRIES: SPECIALIZED, DIVERSIFIED, AND STRATEGICALLY IMPORTANT

South Korea's industrial position is often reduced to semiconductors. But doing so misses the production system around them. In 2022, Korea had an LQ above the global average in 9 of the 10 industries included in the Hamilton Index. Its areas of comparative strength extended across computers and electronics, electrical equipment, motor vehicles, chemicals, machinery, metals, pharmaceuticals, and other transportation equipment. Semiconductors are the anchor of Korea's industrial base, but they are not the whole structure.[13]

South Korea's industrial position is often reduced to semiconductors. But doing so misses the production system around them.

In 2022, the 10 advanced Hamilton industries generated $420.4 billion in value-added output in Korea and accounted for 25.1 percent of its economy. Korea's composite Hamilton LQ was 2.17, meaning that these industries were more than twice as concentrated in Korea as in the global economy.[14] Among the 39 countries in the Information Technology and Innovation Foundation's (ITIF's) comparison, Korea ranked second in composite specialization, behind Taiwan and ahead of Vietnam, Singapore, Switzerland, Germany, Japan, and China. (See figure 2.) So, Korea does not need to build an advanced-industrial base from the ground up. It needs to make its existing one stronger.

Figure 2: South Korea's relative specialization in ITIF's composite Hamilton Index compared with peer economies



Korea's strongest sector was computers and electronics, wherein it generated $133.6 billion in value-added output in 2022, equal to 8.0 percent of the Korean economy and 8.6 percent of global output in the sector. Its LQ was 5.27.[15] The sector accounted for almost one-third of Korea's total Hamilton-industry output. This concentration explains why the current AI-memory boom matters so much. It also explains why semiconductor success can obscure what is happening elsewhere in the industrial base.

The rest of Korea's portfolio is substantial. Chemicals generated $47.6 billion in value-added output and had an LQ of 2.16. Motor vehicles generated $43.9 billion and had an LQ of 2.33. Machinery and equipment generated $42.4 billion and had an LQ of 2.02. Basic metals generated $35.9 billion, fabricated metals $32.6 billion, and electrical equipment $29.8 billion. All three were more concentrated in Korea than in the global economy.[16] These sectors supply the materials, tools, power systems, and components on which advanced manufacturing depends.

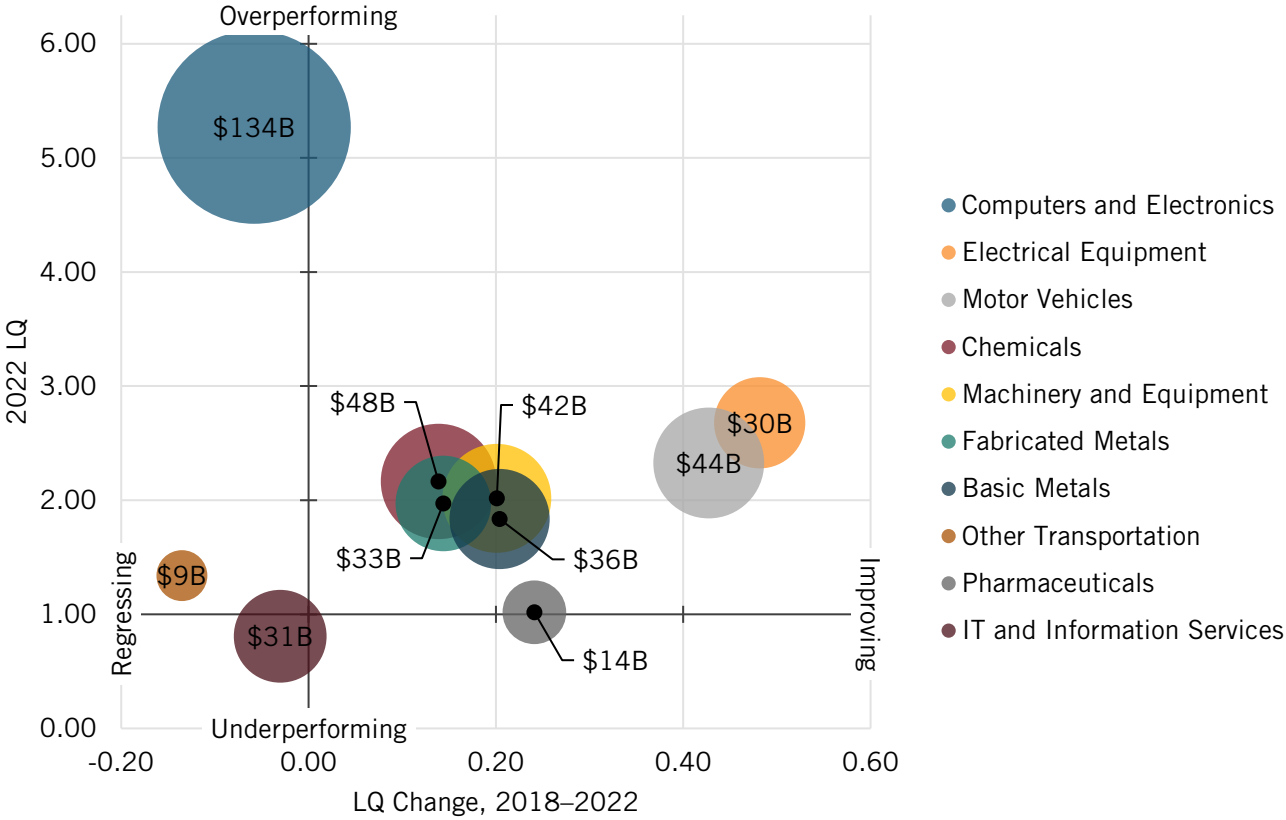
Korea is therefore neither a one-industry economy nor a fully balanced one. ITIF classifies it as "moderately concentrated," with about one-third of its Hamilton output coming from its largest sector.[17] That gives Korea more room to respond to a semiconductor downturn than a narrow reading of its economy would suggest. But breadth alone does not guarantee resilience. The relevant question is whether the sectors around semiconductors are growing, upgrading, and remaining competitive.

Korea is therefore neither a one-industry economy nor a fully balanced one.

This breadth also increases Korea's exposure to China. China's industrial policy is moving beyond final products and into materials, components, machinery, industrial equipment, software, services, and frontier technologies.[18] These are not adjacent to Korea's industrial base. They are much of the base itself. Korea's strength in chemicals, machinery, electrical equipment, metals, and fabricated products places it directly inside the next phase of Chinese industrial expansion.

Korea's portfolio is not static. As figure 3 illustrates, its relative performance improved in 7 of the 10 Hamilton Index industries from 2018 to 2022. Pharmaceutical value-added output rose from $10.2 billion in 2018 to $14.5 billion in 2022, an increase of 42.7 percent. Meanwhile, the sector's LQ rose from 0.78 to 1.02, moving the sector slightly above the global average.[19] Korea is not yet specialized in pharmaceuticals on the scale of Switzerland, Denmark, or Belgium. But the direction it's heading shows that new areas of strength can emerge beyond Korea's established manufacturing sectors.

Figure 3: Change in South Korea's relative performance in Hamilton industries, 2018–2022



Electrical equipment is a more established strength. Korea's output increased from $26.1 billion in 2018 to $29.8 billion in 2022, while its LQ rose from 2.20 to 2.68. Korea had the highest electrical-equipment LQ among the countries in ITIF's comparison.[20] The category includes batteries, cables, relays, switchgear, and other equipment needed for grids, factories, data centers, and industrial electrification. It should be treated as part of Korea's AI and energy infrastructure strategy, not as a secondary manufacturing sector.

The same data shows where the country's position is less secure. Computers and electronics output fell from $144.5 billion in 2018 to $133.6 billion in 2022, even as the sector retained an exceptionally high LQ. Other transportation equipment fell from $12.1 billion to $9.3 billion, while its LQ declined from 1.47 to 1.34. High specialization did not prevent either sector from losing output, as an LQ measures relative concentration; it does not show that a sector is expanding or that its lead will endure.

Korea is also less specialized in the service layer of the industrial economy. Information technology (IT) and information services generated $30.8 billion in value-added output in 2022, but the sector's LQ was only 0.81.[21] Korea's industrial strength remains centered on manufacturing, while software, data processing, industrial services, and system integration are becoming more important to production. China is directing more policy support toward those same service and technology layers. Korea must deepen them without weakening the manufacturing base that gives it strategic value.

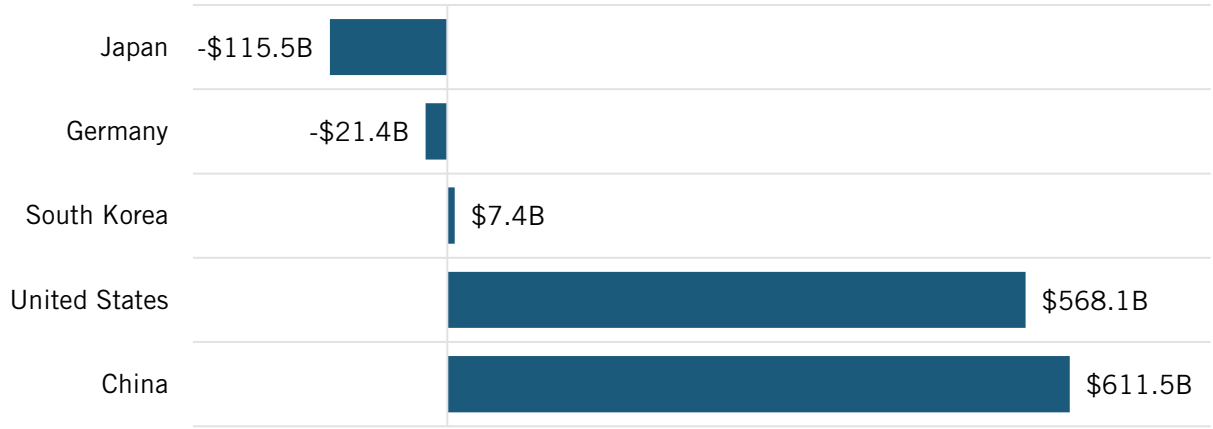
The Hamilton data establish the starting point. Korea has a large, broad, and highly specialized advanced-industrial base. But it is still concentrated around manufacturing, and several important sectors were already losing output before the current AI boom began. Korea's challenge is no longer to prove that it has industrial capability. It is to turn that capability into sustained growth, wider system strength, and allied scale before Chinese expansion reduces the value of Korea's existing advantages.

CHINA'S SCALE PRESSURE AND KOREA'S UNEVEN RECOVERY

Korea's problem is not simply that China is larger. It is that China is adding scale across many of the same industries in which Korea is most specialized. Korea retains strong firms and, in several sectors, better technology. But technical leadership becomes harder to sustain when a competitor is building more factories, suppliers, equipment, engineering capacity, and domestic demand across the surrounding production system.

The scale gap widened quickly in the years covered by the Hamilton data. From 2018 to 2022, China added $611.5 billion in Hamilton-industry value-added output. (See figure 4.) Korea added $7.4 billion. Korea's total Hamilton output rose only 1.8 percent, compared with 26.1 percent for China. Korea remained highly specialized, but it did not add enough output to keep pace with the change in the competitive environment.

Figure 4: Overall change in value-added output in Hamilton Index industries, 2018–2022



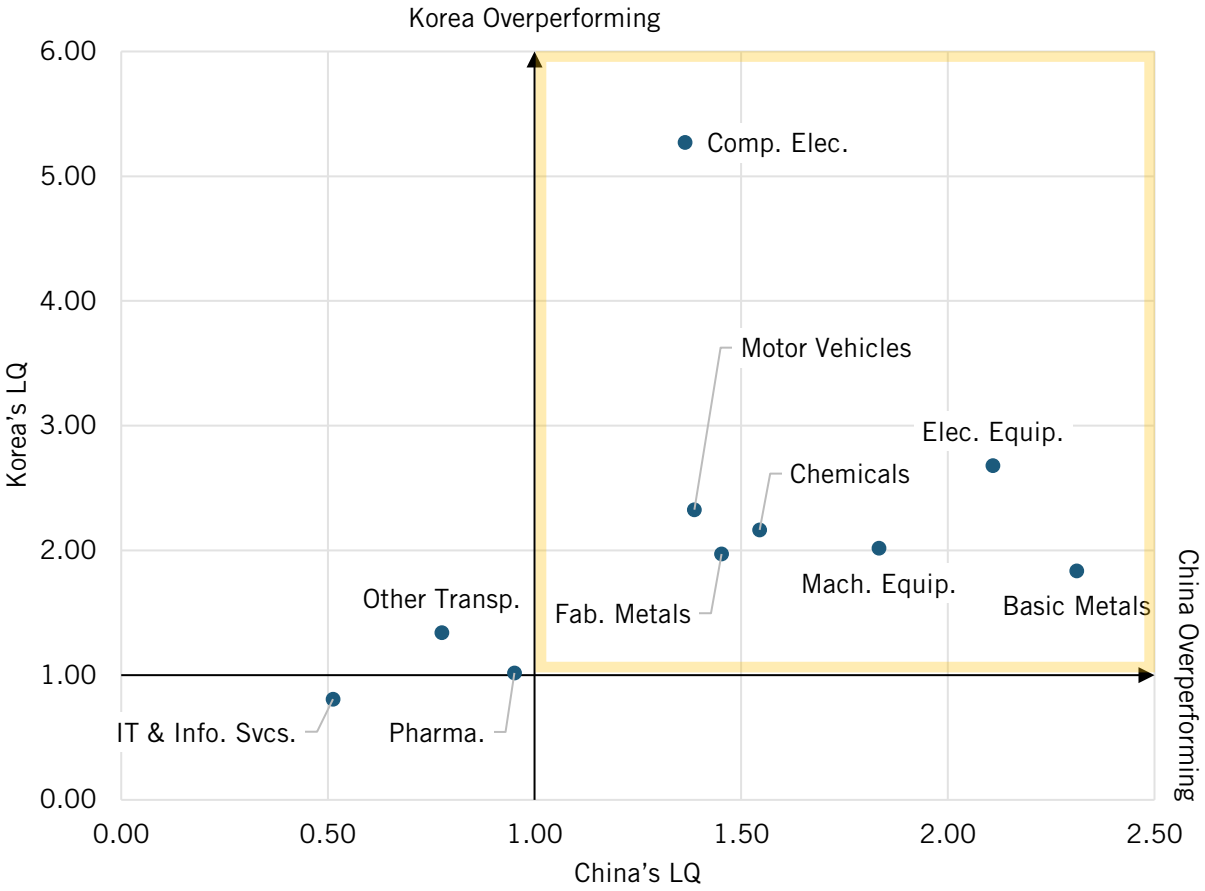
The overlap matters as much as the gap. China had an LQ above 1 in seven Hamilton industries in 2022, and Korea was also above 1 in each of them. (See figure 5.) Across the nine industries in which at least one country had an LQ above 1, the cosine similarity of the two countries' log-transformed LQs was 0.79. A score of 1 would indicate perfectly aligned specialization patterns, not necessarily identical LQ levels. Korea remains far more specialized in computers and electronics, while China is more specialized in basic metals. The similarity of the results indicates substantial overlap in specialization; the output data shows that China has built much greater scale across that shared industrial base.[22]

Rhodium Group's analysis explains why this is becoming a system-level problem. China's industrial policy increasingly targets the inputs beneath final production: materials, components, machinery, industrial software, equipment, and services. Between 2021 and 2024, Chinese exports of intermediate inputs increased 26 percent and capital-goods exports increased 32

percent. China is not only selling more finished products, but also supplying more of what other countries use to make them.

Figure 5 shows Korea's relative performance versus China's in the 10 Hamilton industries. Each dot represents 1 of the 10 industries. The reference lines mark an LQ of 1, the global average. Seven industries lie in the upper-right quadrant, indicating above-average specialization in both countries.

Figure 5: South Korea's LQs vs. China's LQs in advanced industries in 2022



This produces two different policy problems. In the first group, Chinese scale has already changed the economics of broad competition. Korea's task is to preserve critical capabilities, move into higher-value segments, and manage adjustment. In the second, Korea still holds meaningful technical or commercial advantages. The task there is to reinforce those advantages before Chinese scale closes the remaining gap.

Where China Has Already Pulled Ahead

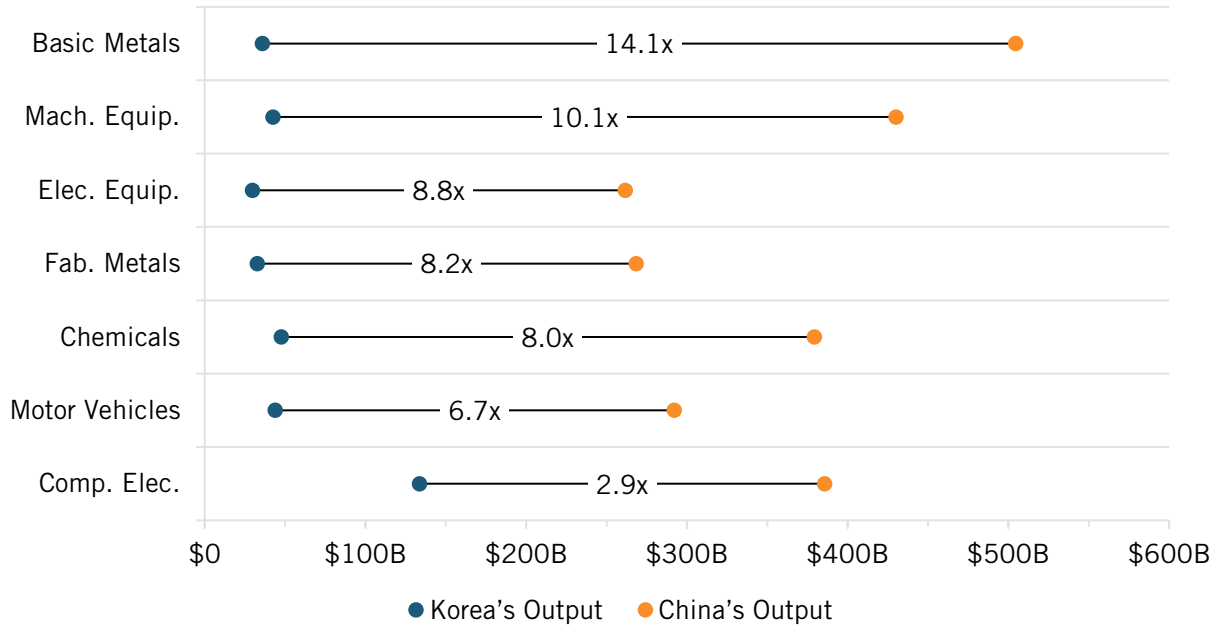
The first category includes industries in which China's broad production scale is already too large for Korea to match nationally, as figure 6 illustrates. This does not mean that every Chinese product is better or that Korean firms have no defensible position. It means that the underlying economics have shifted. Capacity, supplier density, domestic demand, and continued policy support allow Chinese firms to compete even when prices and margins fall.

Basic metals provides the clearest example. China generated $504.5 billion in basic-metals value-added output in 2022, compared with $35.9 billion in Korea. China's LQ was also higher, at 2.31 compared with Korea's 1.84. Korea remains a major steel and metals producer, but it is competing against a production base that is 14 times larger. The pressure does not stop at steel. It moves into vehicles, ships, machinery, energy infrastructure, construction equipment, and defense production.

Chemicals shows a similar scale imbalance, although Korea remains more specialized. Korea's chemicals LQ was 2.16 in 2022, compared with China's 1.54. But China generated $379.2 billion in value-added output, almost eight times Korea's $47.6 billion. This distinction matters. Korea still has competitive chemical firms and specialized products. But in commodity chemicals and standard materials, specialization offers limited protection against a competitor that can keep adding capacity and exporting through weak margins.

The same pattern appears in fabricated metals and machinery. China produced $268.3 billion in fabricated-metals value added in 2022, compared with Korea's $32.6 billion. China's machinery and equipment output reached $430.1 billion, more than 10 times Korea's $42.4 billion. These are not merely large export categories. They form the tool and component layer of industrial production. Scale in these sectors helps China improve the cost and speed of manufacturing across the rest of its economy.

Figure 6: Difference between Chinese and South Korean value-added output in key industries (expressed as multiples)



Displays illustrate the same shift outside the Hamilton categories. Displays cannot be isolated cleanly in the Hamilton dataset, so they should not be presented as a Hamilton sector. But the industry evidence is clear. In 2024, LG Display agreed to sell its Guangzhou LCD plant to CSOT, the display unit of China's TCL, as LG shifted its resources toward higher-margin OLED products. Korea did not exit displays. It retreated from a segment in which Chinese scale had made broad competition harder to sustain.[23]

The right response is not to preserve every unit of capacity. Korea should identify which parts of these sectors remain essential to downstream industries, technological upgrading, regional employment, and national security. High-grade steel, low-carbon production, specialty chemicals, advanced materials, and precision components may justify continued support. Broad commodity capacity should face a higher test. The objective should be industrial capability, not permanent protection of firms or capacity. Where contraction is unavoidable, policy should support worker transition and the reuse of regional industrial assets rather than subsidize uncompetitive production indefinitely.

Where Korea Still Leads, But China Is Closing the Gap

The second category requires more urgency. These are sectors in which Korea retains stronger specialization, frontier technology, globally competitive firms, or premium-market positions. The danger is not that those strengths have already disappeared. It is that China can turn a scale advantage in the surrounding system into technological and commercial convergence.

Computers and electronics are the clearest case. Korea's LQ was 5.27 in 2022, compared with China's 1.36. (See figure 7.) But China generated $385.7 billion in sector output, almost three times Korea's $133.6 billion, as shown in figure 6. From 2018 to 2022, Korean output fell 7.6 percent while Chinese output rose 6.2 percent, as shown in figure 8. Korea remained far more specialized, but China added output from a much larger base.

Figure 7: South Korean and Chinese LQs in Hamilton industries, sorted by the differences between the two

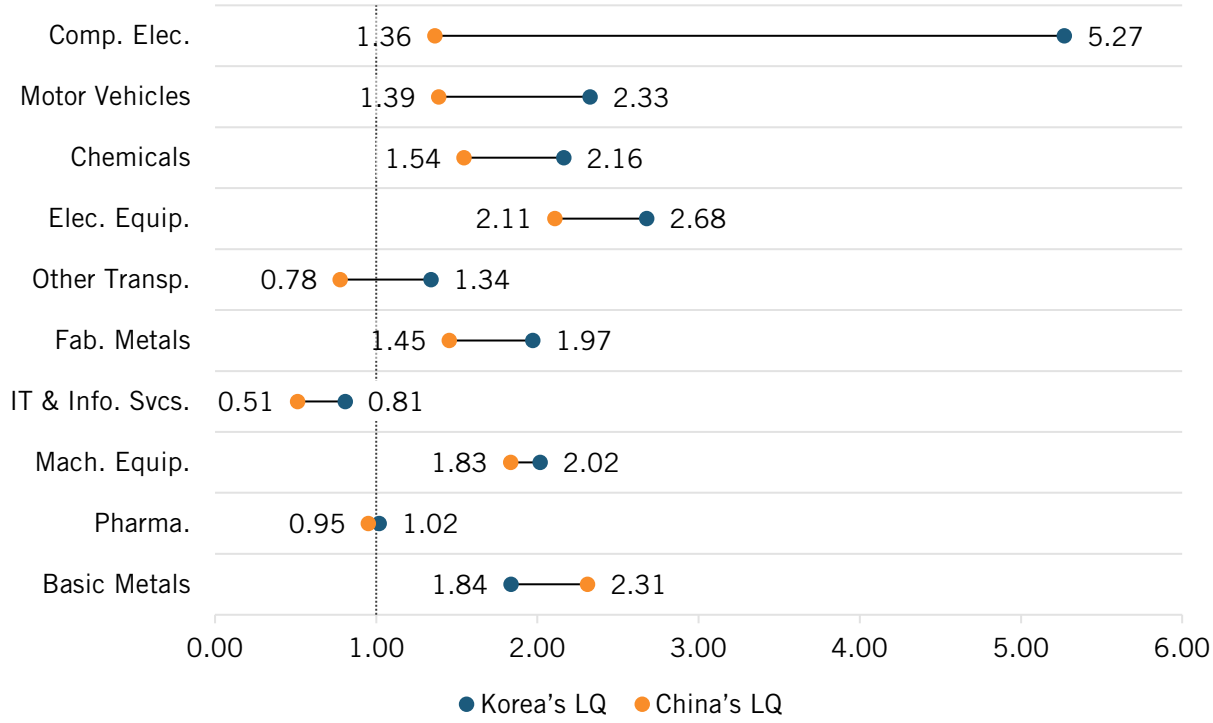
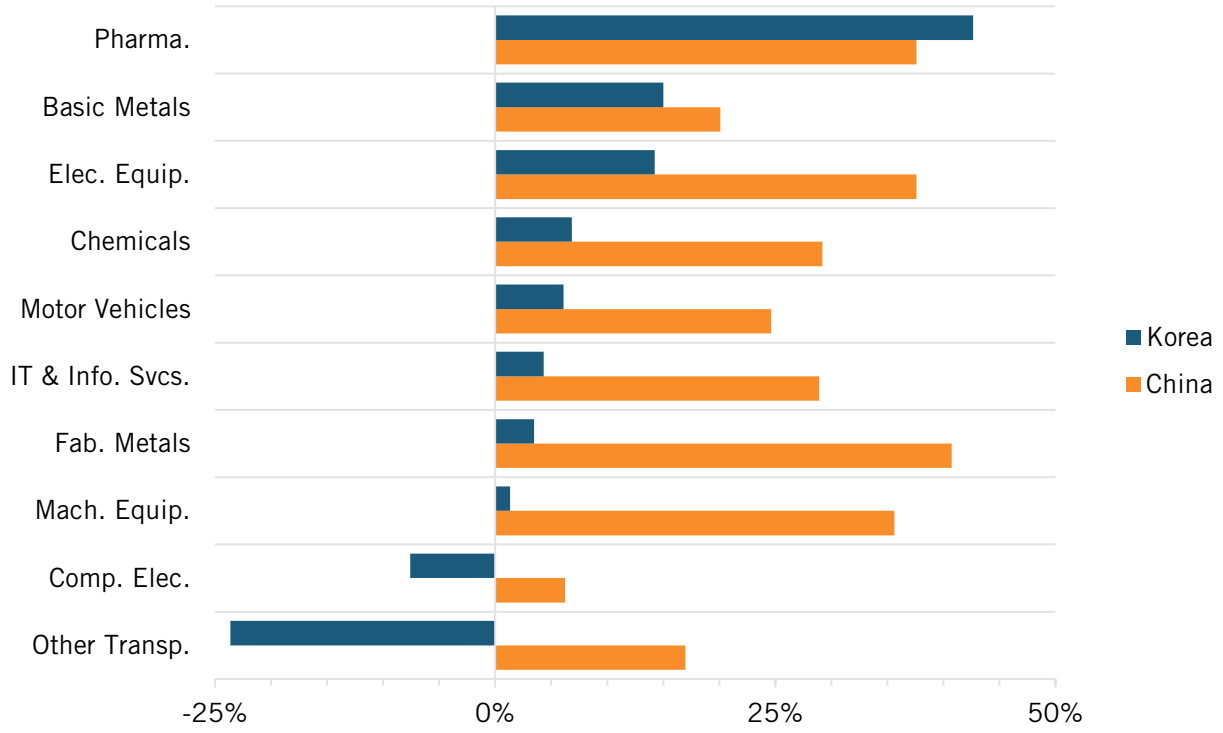


Figure 8: Change in value-added output in Hamilton industries, 2018–2022



Korea has since strengthened its position in the most valuable part of this sector. SK Hynix held an estimated 58 percent of the global high-bandwidth memory (HBM) market, which supplies stacked memory chips used in AI computing, in the first quarter of 2026, with Samsung and Micron at 21 percent each.[24] In June, SK Hynix began shipping HBM4E samples to major customers. Korea is not being overtaken in frontier AI memory today. Its lead is real.[25]

But the lead is now an explicit Chinese industrial target. CXMT has been expanding advanced dynamic random-access memory (DRAM), which temporarily holds data for processing, capacity and has indicated plans to begin HBM3 production, an earlier generation of high-bandwidth memory, in 2026. Its technology remains behind the leading Korean and U.S. producers, and recent reporting has identified yield problems in advanced DRAM. The relevant fact is not that China has reached parity. It is that state-backed capacity, a large domestic AI market, and continued technical upgrading give Chinese firms time and demand with which to narrow the gap.[26]

Electrical equipment presents a similar tension. Korea's 2022 LQ was 2.68, higher than China's 2.11. Yet China generated $261.6 billion in value-added output, compared with Korea's $29.8 billion. Between 2018 and 2022, Korean output increased 14.2 percent while Chinese output increased 37.6 percent. Korea remains highly specialized, but China is adding more batteries, grid equipment, power systems, charging infrastructure, and industrial-electrification capacity around the sector.

Batteries now sit between the report's two categories. Korean firms retain major global customers, manufacturing experience, and advanced technology. But China already leads in scale. CATL held 39.2 percent of global electric vehicle (EV)-battery usage in 2025 and BYD

held 16.4 percent. In early 2026, CATL's share rose further. Korea should not describe this as a market it still leads overall. It should describe it as a strategic industry in which Korean firms remain globally important but now operate behind a Chinese scale leader.[27]

Motor vehicles show the same tension between specialization and scale. Korea's LQ was 2.33 in 2022, compared with China's 1.39. But China's motor-vehicle output was $292.1 billion, compared with Korea's $43.9 billion. From 2018 to 2022, Korean output increased 6.1 percent while Chinese output increased 24.6 percent. Korea still has global brands and strong export positions. China has a larger home market, deeper battery integration, faster product cycles, and a rapidly expanding overseas presence.

Shipbuilding is another mixed case. China accounted for 53 percent of global shipyard output by compensated gross tonnage in 2024, compared with Korea's 28 percent. Korea nevertheless remained the world's second-largest producer and retained a strong position in high-value and alternative-fuel vessels. The sector should therefore support the allied-scale argument, but it does not need to carry the report as a separate policy pillar.[28]

The strategic distinction is now clearer. Korea should not spend equally across sectors. Where Chinese scale has already transformed the market, policy should focus on critical capability, upgrading, and managed adjustment. Where Korea retains frontier technology or strong global firms, policy should move faster. The goal is to turn technical leadership into a durable system of suppliers, equipment, skills, demand, and allied markets.

Post-2022 Korea: The AI-Memory Boom Has Not Ended China's Scale Pressure

Korea's recent performance in early 2025 was stronger than that of the 2022 Hamilton endpoint. Exports reached a record $709.7 billion in 2025. Semiconductor exports rose 22.2 percent to $173.4 billion, ships increased 24.9 percent to $32.0 billion, and biohealth exports rose 7.9 percent to $16.3 billion. But only 6 of the 15 major export categories increased. The recovery was real, but it was led by a limited group of sectors.[29]

The first half of 2026 was broader and much stronger. Total exports increased 48.4 percent to $496.7 billion. Under the Ministry of Trade, Industry and Resources' (MOTIR's) revised 20-item classification, 14 product categories increased and nonsemiconductor exports rose 16 percent. This is not directly comparable to the earlier 15-item framework, which MOTIR replaced and applied retroactively from 2022. Even so, the newer data shows that Korea's recovery is no longer confined to the same six categories that grew in 2025.[30]

But the semiconductor concentration became more pronounced. First-half 2026 semiconductor exports rose 162.6 percent to $192.4 billion, exceeding the previous full-year record in six months. Computers increased 262 percent to $21.2 billion. Automobiles, by contrast, fell 1.1 percent. Petrochemical export value rose 5.2 percent, but MOTIR attributed the increase to higher prices even as export volumes declined. The industrial picture improved, but semiconductors still supplied most of the acceleration, with AI-related memory demand a major driver. By July, the recovery had broadened further: 19 of MOTIR's 20 key export items were growing, while nonsemiconductor exports increased 26 percent year over year. Yet, semiconductors still accounted for roughly 73 percent of the year-over-year increase in total export value over January–July, based on ITIF calculations from MOTIR's published first-half and July 2026 data.[31]

This is precisely why the current boom should be used as a stress test. High semiconductor profits can finance new fabs, packaging facilities, equipment purchases, research, and supplier development. But they can also conceal weakness in sectors that do not benefit directly from AI demand. The government should ask whether the boom is expanding Korean capability in materials, machinery, power equipment, industrial software, robotics, and data-center systems or merely increasing the output of the sectors already at the top.[32]

China's expansion continues beneath the headline export data. Rhodium has found that Chinese export-share gains are substantially larger in volume than in nominal value because falling prices obscure the amount of product entering global markets. China is also becoming more dominant in intermediate inputs and production machinery. Strong Korean export revenue can therefore coexist with worsening price pressure and deeper Chinese control of the industrial layers around Korea's leading products.[33]

Korea is thus being tested during a boom. The risk is not sudden industrial collapse. It is gradual narrowing. Korea could remain the world's leading producer of AI memory and other premium products while China captures more of the materials, equipment, components, and production capacity around those products. The policy question is not whether the boom is real. It is whether Korea can use it to build an industrial system that remains competitive after the cycle turns.

WHAT KOREA SHOULD DO: TURN THE BOOM INTO SYSTEM STRENGTH

Korea cannot match China by subsidizing comparable capacity across every Hamilton industry. Its domestic advantage must come from reaching the next technological frontier first and spreading that lead through productive firms. Its external advantage must come from combining scale with trusted partners and preventing unfair Chinese practices from eroding allied market share. The Future Response Fund and national megaprojects should serve those goals, not become separate policy agendas.

Win the Race to First-to-the-World Innovation

Korea cannot outbuild China across every advanced industry, but it can still out-innovate it. The AI-memory boom shows the value of reaching the frontier first: Korean firms established an indispensable position before Chinese scale could erase the commercial value of the lead. But China is no longer only a fast follower. It is increasingly capable of developing new-to-the-world technologies and then scaling them through a much larger production system. Korea therefore needs to organize industrial policy around reaching the next frontier before China does, not merely defending the current one.[34]

Doing so requires stronger incentives for the firms capable of undertaking the largest and riskiest R&D programs. Korea's general R&D tax credit remains sharply differentiated by firm size. The volume-based rate is 25 percent for SMEs and 8 percent for mid-sized firms, while the rate for other firms is capped at 2 percent. Korea should substantially raise and stabilize the volume-based general R&D credit for large firms while preserving or strengthening the existing incremental option that rewards additional domestic R&D. Large firms should not receive support simply because they are large. They should receive it when they undertake research with large spillovers and costs that smaller firms cannot finance at the necessary scale.[35]

More R&D spending is not enough. Government programs should be judged by whether they shorten the path from research to first commercial deployment. Shared research infrastructure, industry-aligned graduate training, pilot lines, testbeds, and early customer qualification should focus on areas where Korea can establish a first-mover position, including next-generation memory and packaging, AI semiconductors, advanced batteries, robotics, and industrial software. The relevant measures are closing technology gaps, commercial deployment, global customer adoption, and export growth, not patents, participating firms, or money announced.[36]

The current boom creates a temporary window to finance this shift. The industrial portion of the Future Response Fund should support precommercial research, shared infrastructure, talent, and commercialization capabilities that markets are likely to underprovide. It should not reimburse routine capital spending or preserve existing firms. The objective is to turn today's semiconductor profits into the technologies that will lead the next cycle.

Build Allied Scale and Slow Unfair Chinese Gains

Innovation can widen Korea's technological lead, but it cannot supply the scale Korea lacks. Korea produced $420.4 billion in Hamilton industries in 2022, compared with roughly $3 trillion in China. Korea cannot close that gap by subsidizing domestic capacity across every sector. It can, however, narrow the effective gap by connecting its production base to the markets, technologies, inputs, and capital of trusted partners.

Allied scale requires more than broad declarations of cooperation. Korea should pursue a small number of sector compacts that combine demand, production, and investment around specific bottlenecks.[37] Each compact should identify the capabilities the partners need, where additional capacity is commercially justified, and how standards, supplier qualification, export finance, and technology protection will support it. The measure of success should be new production and more resilient market access.

The first sector compact should operationalize the 2026 Korea-Japan Supply Chain Partnership in semiconductor materials, equipment, and related manufacturing capabilities. Japan's colonial rule caused profound and lasting harm, and those grievances cannot simply be dismissed. But allowing unresolved history to block practical industrial cooperation would leave Korea weaker in the face of China's scale. Korea and Japan compete with China in many of the same industries while holding different parts of the capabilities needed to do so. In 2022, Korea produced $133.6 billion in computers and electronics, compared with Japan's $69.7 billion. Japan produced $130.4 billion in machinery and equipment, compared with Korea's $42.4 billion.

While Korea brings electronics scale and Japan brings strength in machinery, materials, and industrial technologies, neither has closed the gap with China alone. In 2022, China produced $385.7 billion in computers and electronics and $430.1 billion in machinery and equipment. (See figure 9 and figure 10.) Together, Korea and Japan narrowed China's lead in machinery from roughly tenfold to under threefold.

Figure 9: Value-added output in computers and electronics, 2022

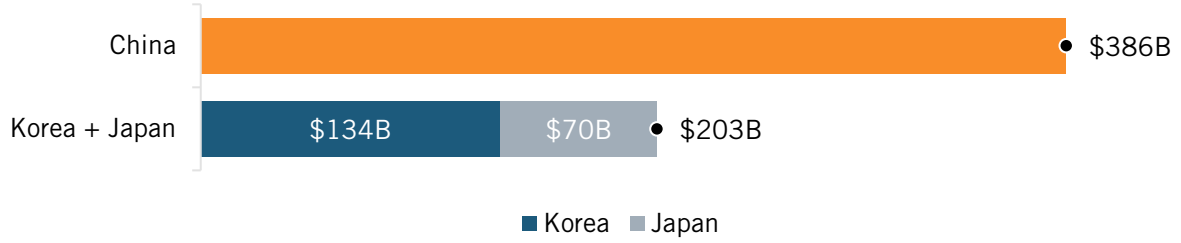
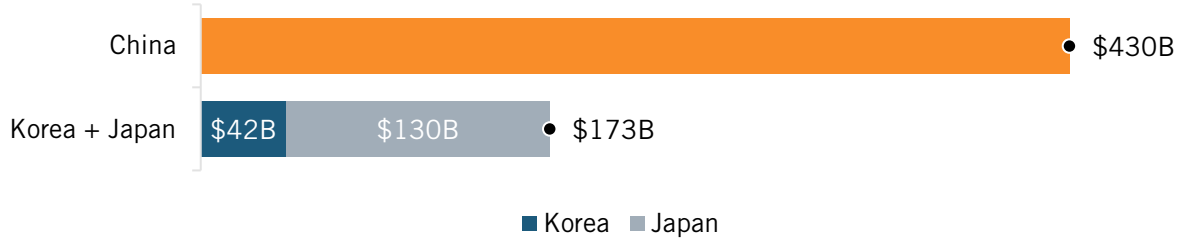


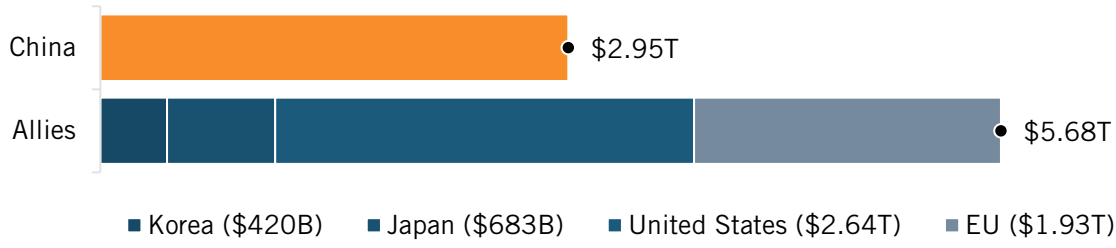
Figure 10: Value-added output in machinery and equipment, 2022



The two governments should begin with a joint production map for a limited set of semiconductor materials, equipment, and related manufacturing capabilities. It should show where both countries depend on the same external source, where firms in one country can strengthen production in the other, and where joint or reciprocal investment would add viable capacity. Policy banks and export-credit agencies could then support projects tied to this map. The Korea–Japan Supply Chain Partnership signed in 2026 and recent Japanese investment in Korea provide a practical base for this work.[38]

Japan should be the first partner, but it cannot be the only one. The United States offers large-scale demand, capital, and frontier technologies. Europe offers major markets, standards-setting power, and capabilities in areas such as critical minerals and batteries. The United States will ultimately need to lead a broader coalition of market-based economies because only a coalition representing a large share of global demand can prevent China from redirecting trade and investment toward the least restrictive market. Figure 11 illustrates how the United States, Europe, Korea, and Japan together outweigh China in the advanced industries that make up the Hamilton Index. Within that broader framework, each sector compact should remain concrete, closing a defined production gap through common standards, reciprocal investment, supplier qualification, export finance, and technology protection.

Figure 11: Total value-added output in ITIF's composite Hamilton Index, 2022



Building allied capacity is only half the strategy. Korea and its partners should also slow Chinese gains when they are built on industrial subsidies, coerced or illicit technology acquisition, discriminatory regulation, or other nonmarket practices. Unilateral action is unlikely to work. If Korea, Japan, the United States, and Europe apply different rules, Chinese firms can route trade, investment, and technology acquisition through the least restrictive jurisdiction.

These governments should begin with three coordinated measures in Hamilton industries: share evidence and align trade remedies and public-procurement restrictions where Chinese firms benefit from demonstrable nonmarket support; apply common safeguards to research partnerships, acquisitions, and other channels of illicit technology acquisition; and combine export credit and development finance when allied firms compete with state-backed Chinese bidders in third-country markets. This should not become blanket decoupling or unilateral controls that weaken allied firms without materially slowing China. The test should be whether a measure reduces Chinese national-power-industry gains while preserving allied firms' capacity to invest and compete.[39]

Allied scale should create deliberate interdependence, not a new single-source dependency. Cooperation should add enough alternative capacity to withstand disruption or coercion while preserving competition, innovation, and cost discipline. Korea cannot match China's scale on its own, and no ally can afford to be picked off one by one. A coordinated strategy should ensure that firms operating under market rules retain enough demand and revenue to keep investing in the next generation of technology.[40]

Make Public Support Scale Productive Firms

The Lee administration's three megaprojects and the proposed Future Response Fund should be judged by whether they raise productivity and help capable firms scale. The plans already include advanced packaging, domestic neural processing units (NPUs), power and cooling solutions, cloud technology, large-scale testbeds, power infrastructure, and industrial applications of physical AI. The unresolved question is whether these elements become competitive suppliers and exportable production systems or remain a long list of subsidized participants.

Every major program should pass a system-conversion test. Public support should answer four questions: Does it raise productivity? Does it qualify Korean or allied suppliers with demanding commercial customers? Does it reduce a measurable bottleneck or single-country dependency? And does it create an exportable product, production system, or service beyond the flagship facility? Capacity expansion that does none of these may still be commercially useful, but it should not automatically be treated as strategic industrial policy.

Eligibility should be size neutral, and support should be time limited. Small firms should receive support when it helps them adopt technology, win customers, and scale into mid-sized or large enterprises. Firms should graduate from small and medium-sized enterprise (SME) preferences as they grow. Firms that repeatedly miss productivity, qualification, or export milestones should lose support. Where exit is unavoidable, policy should support workers and the reuse of regional industrial assets, not preserve unproductive firms.[41]

The same discipline should apply to the domestic production tax credit proposed in August 2026 for six strategic fields, including semiconductors, secondary batteries, critical materials, and AI

and robotics components. Its success should be judged by whether it strengthens strategic capabilities rather than by subsidized output alone.[42]

AI data centers offer the clearest test. Korea will gain little industrial leverage if it builds large facilities but imports most processors, software, networking, power-control, and cooling systems. It will also gain little from rigid local-content rules that force the use of uncompetitive products. The better approach is competitive testbeds that allow Korean NPU, power, cooling, cloud, and systems firms to prove performance at scale, qualify with major customers, and export the resulting solutions.

The government's megaproject plan states that AI data-center investment will be linked to domestic NPU, power, cooling, cloud, and solution industries through large-scale testbeds and demand-company alliances. The recommendation here is to judge those programs by commercial qualification and exports rather than by nominal participation.

The same principle should govern semiconductor support. The Semiconductor Industry Competitiveness Enhancement special account should prioritize shared infrastructure and capabilities that individual firms are unlikely to provide at the necessary scale: pilot lines, advanced packaging, supplier qualification, power and water infrastructure, workforce development, security, and selected materials, equipment, and industrial software bottlenecks. Scarce public funding should not simply reimburse routine capacity expansion that firms already have a commercial reason to undertake.

Physical AI should be judged by diffusion into production. MOTIR's AI Factory Flagship Project offers an early benchmark: among 42 sites that had begun generating measurable results, productivity increased by an average of 30.1 percent and defect rates fell by 15.5 percent. Large Korean manufacturers should serve as demanding lead customers and test sites for robotics, sensors, industrial AI, and manufacturing software. Public support should help the suppliers that meet those standards qualify, scale, and export. It should not guarantee survival to every participating SME.[43]

Where capacity must contract, policy should support worker transition and the reuse of regional industrial assets rather than permanently subsidize uncompetitive firms.

Under the government's proposed structure, the Future Response Fund's growth-engine account should be subject to separate reporting and project-level performance tests. The government also plans to expand the National Growth Fund from 150 trillion won to 200 trillion won and create a strategic-investment account at the Korea Investment Corporation for domestic and overseas strategic investments.[44] The Future Response Fund should therefore be coordinated with these vehicles around clearly defined capability gaps and common performance measures, with responsibilities separated to avoid duplicative financing. Each major program should carry dated targets for productivity, supplier qualification, exports, technology gaps, firm growth, and reduced dependency. Support should expand when those measures improve, be redesigned when they stall, and end when the strategic case disappears.

China can sustain excess capacity for long periods. Korea's advantage must come from better selection, faster scaling, and faster correction.[45]

CONCLUSION

Korea's AI-memory boom gives it a window to strengthen the industrial system around its lead before China gains more ground in materials, machinery, services, and production capacity. Korea should use that window to reach the next technological frontier first, combine scale with trusted partners, and direct public support toward capabilities that can prove commercial value.

The Future Response Fund and national megaprojects should therefore be judged by productivity, supplier qualification, exports, and firm growth. Korea cannot match China factory for factory. Its advantage will depend on innovating faster, scaling with allies, and correcting policy faster when results fall short.

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https://english.motir.go.kr/eng/article/EATCLdfa319ada/2539/view. In April 2026, Tekscend Photomask announced approximately 120 billion won in new investment for a third South Korean plant producing photomasks for sub-14-nanometer semiconductor processes. https://www.motir.go.kr/kor/article/ATCL3f49a5a8c/171753/view.

39. Robert D. Atkinson et al., "Mobilizing for Techno-Economic War, Part 2: Slowing China's Advance" (ITIF, March 30, 2026), https://itif.org/publications/2026/03/30/mobilizing-for-techno-economic-war-part-2-slowing-chinas-advance/. The report proposes coordinated allied measures to limit Chinese knowledge acquisition, imports, financing, mercantilist advantages, and expansion in third-country markets while cautioning against unilateral measures that weaken allied firms without materially slowing China.; Robert D. Atkinson, "How Not to Lose Korea's Advanced Industries" (ITIF, September 3, 2025), https://itif.org/publications/2025/09/03/how-not-to-lose-koreas-advanced-industries/.
40. This is the authors' policy principle. Rhodium Group documents both the strategic risks created by concentrated dependence on Chinese supply chains and the costs of poorly coordinated diversification among advanced economies.
41. Robert D. Atkinson and Sejin Kim, "South Korean Policy in the Trump and China Era: Broad-Based Technological Innovation, Not Just Export-Led Growth" (ITIF, May 18, 2025), https://itif.org/publications/2025/05/18/south-korean-policy-trump-china-era-broad-based-technological-innovation/. The report recommends replacing survival-oriented SME protection with size-neutral, performance-based policies that encourage productivity, scaling, graduation, and orderly exit.
42. Ministry of Finance and Economy, "2026 Tax Revision Bill," August 3, 2026, https://english.mofe.go.kr/pc/selectTbPressCenterDtl.do?boardCd=N0001&seq=6455; Ministry of Trade, Industry and Resources, "국내산업 공급망 확충을 위한 국내생산세액공제 신설," August 7, 2026, https://www.motir.go.kr/kor/article/ATCL3f49a5a8c/172092/view. The proposed credit would provide individual and corporate income-tax credits based on domestic production volumes in six strategic fields: solar power equipment, wind power equipment, secondary batteries, semiconductors, critical materials, and AI and robotics components.
43. Ministry of Trade, Industry and Resources, "M.AX Delivers Tangible Results on the Factory Floor," August 5, 2026, https://english.motir.go.kr/eng/article/EATCLdfa319ada/2703/view. MOTIR reports that among 42 relatively early AI Factory Flagship Project sites that had begun generating measurable results, productivity increased by an average of 30.1 percent and defect rates fell by an average of 15.5 percent. The government's broader physical AI and M.AX programs connect manufacturers, AI providers, shared testbeds, and policy finance. The proposal in this report to help capable suppliers scale and condition continued support on measurable performance is the authors' recommendation, not an existing government policy. See also Ministry of Trade, Industry and Resources, "AI-Led Transformation of Manufacturing: Korea Unveils Its 2030 Blueprint," June 29, 2026, https://www.motir.go.kr/kor/article/ATCL3f49a5a8c/171975/view; and MOTIR, "MOTIR and the Financial Services Commission Join M.AX Leaders to Accelerate Korea's Rise as a Global Physical AI Powerhouse," July 1, 2026.
44. Ministry of Planning and Budget (기획예산처), "미래대응기금 신설, 청년·성장동력·지방·교육에 선제적으로…미래대응기금 추진방안" August 21, 2026, https://www.korea.kr/news/policyNewsView.do?newsId=148970426; Financial Services Commission, "대체불가 대한민국 대도약을 선도하는 「금융 구조개혁」 가속화," July 15, 2026, https://www.fsc.go.kr/no010101/87328; Ministry of Finance and Economy, "Economic Growth Strategy for the Second Half of 2026," July 14, 2026, https://english.mofe.go.kr/pc/selectTbPressCenterDtl.do?boardCd=N0001&seq=6445. The Financial Services Commission announced plans to expand the National Growth Fund from 150 trillion won to

200 trillion won, while the government's second-half growth strategy calls for a strategic-investment account at the Korea Investment Corporation for domestic and overseas strategic investments.

45. Atkinson and Kim, "South Korean Policy in the Trump and China Era: Broad-Based Technological Innovation, Not Just Export-Led Growth." The report recommends replacing survival-oriented SME protection with size-neutral, performance-based policies that encourage productivity, scaling, graduation, and orderly exit.; Robert D. Atkinson and Sejin Kim, "Korea's Real Jobs Problem Isn't AI" (ITIF, March 14, 2026), https://itif.org/publications/2026/03/14/koreas-real-jobs-problem-isnt-ai/. The authors argue that South Korea's firm-size-based support system rewards companies for remaining small, constrains the creation of high-quality large-firm jobs, and should be replaced with policies that reward productivity, wage growth, and firm expansion.