

Export Nation or Ecosystem Power

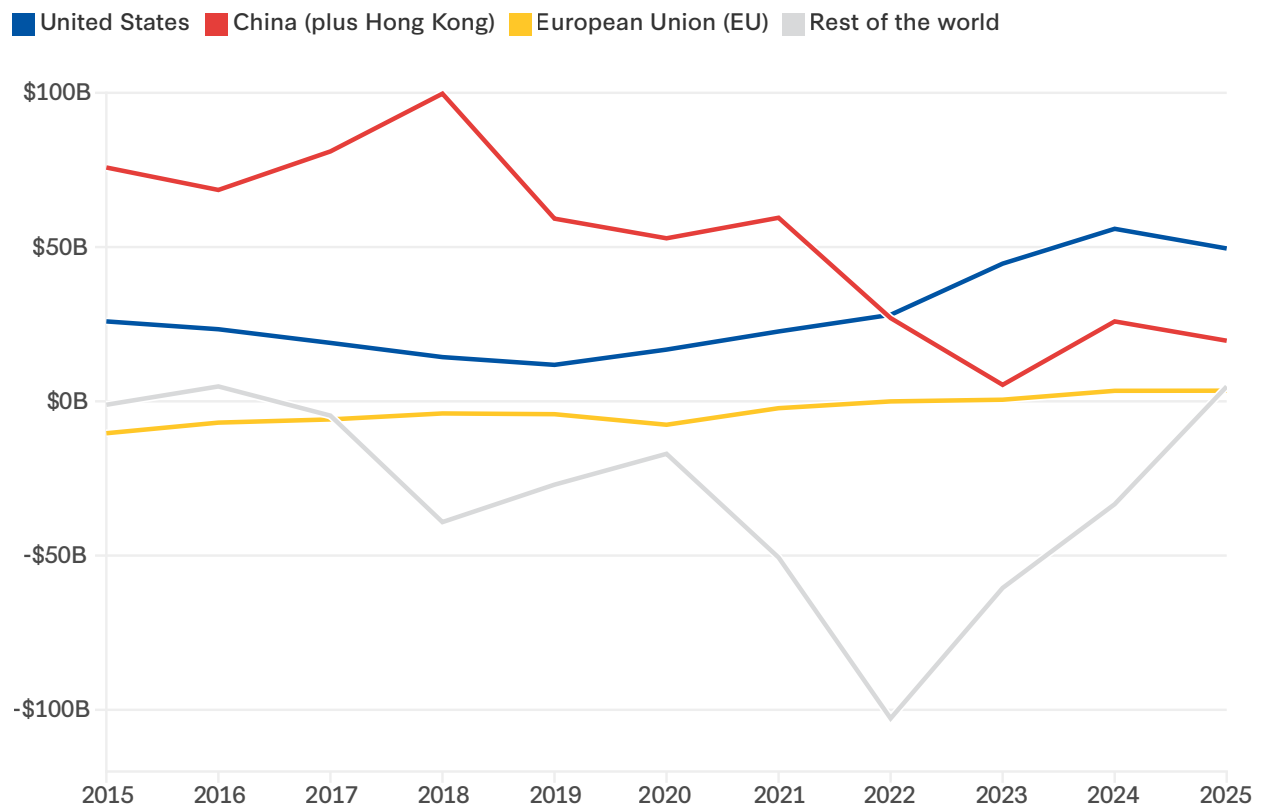
South Korea's Choice in the AI Industrial Age

By Navin Girishankar

By conventional measures, South Korea's export model is succeeding. In 2025, South Korea exported a record **\$709.7 billion** and carried an overall trade surplus of \$78 billion—the largest since 2017. Semiconductor exports surged 22 percent year-on-year to an all-time high of **\$173.4 billion**, driven by AI memory demand that only South Korea can supply at scale. Yet those metrics now conceal more than they reveal. The world that enabled the South Korean export-led miracle is disappearing, and the terms of its prosperity are being rewritten by forces it did not choose and cannot ignore.

For decades, China was South Korea's largest export market and its largest source of trade surplus. That relationship is now changing: South Korea has been running lower trade surpluses with China (including Hong Kong) for the greater part of the decade—from \$99.7 billion in 2018 to \$19.6 billion in 2025 (Figure 1)—as Chinese firms have displaced South Korean exports across electronics, electric vehicles, batteries, and petrochemicals. While counterfactuals are hard to define, from the 2018 baseline, South Korea's foregone export revenue to China cumulatively totals to **\$158.9 billion** over 2019–2025 (**\$258.3 billion** including Hong Kong)—a South Korean version of the China import shock all too familiar to Americans. In parallel, the United States, now South Korea's **largest surplus partner**, has used tariff policy to compel trading partners running structural surpluses to invest in American reindustrialization. Meanwhile, South Korea must contend with a shifting global trade landscape while also facing the steepest demographic headwinds of any major economy. Its fertility rate, **0.75 in 2024**, is the lowest of any OECD country, meaning the workforce that built the country's export model is shrinking faster than the model can adapt.

Figure 1: South Korea's Trade Balance by Partner



Source: EST's calculations based on International Monetary Fund.

These are not momentary challenges that can be solved by diplomacy alone. They are structural conditions foreclosing one growth model and opening another. South Korea's export model—built on capital deepening, manufacturing scale, and open markets—delivered one of the most compressed development trajectories in modern economic history. Sustaining that dynamism in today's accelerating technology race requires a different approach. The question is whether South Korea can evolve from one of the world's most successful exporting nations into something rarer: an ecosystem power—a country whose firms occupy the architectural control points, including the interfaces, standards, certification systems, and platforms around which the world's most consequential technologies and industries are organized.

A country that misses this transition will not collapse. But in an era of geoeconomic competition, it will become increasingly peripheral and vulnerable to external influence. Its companies will generate returns but not relationships, its capital will earn yield but not strategic leverage, and its industrial excellence will be admired but ultimately substitutable.

New Geography of Globalization

고래싸움에 새우 등 터진다. This Korean proverb warns that “the shrimp's back breaks in the fight between two whales.” It is tempting to read South Korea's geostrategic position entirely through the lens of U.S.-China competition, but focusing on the whales misses the deeper currents reshaping the global economy. The world in which the Miracle on the Han River materialized no longer exists. China's

mercantilism, civil-military fusion strategy, and willingness to weaponize economic interdependence accelerated this transformation. But the forces they unleashed are now global and self-reinforcing. South Korean policymakers are acutely aware that economic security is as much a prerequisite of economic growth as it is its byproduct.

Four forces have rewritten the rules of globalization for export-oriented economies such as South Korea, transforming a world once organized around efficiency into one organized around resilience and alignment:

1. **Supply chains have become arenas of geostrategic competition.** The pandemic exposed their fragility; Russia's invasion of Ukraine weaponized energy; the United States and China dramatically expanded the use of export controls to deny access to strategic technologies and their inputs; and Iran demonstrated how maritime chokepoints such as the Strait of Hormuz can disrupt the global economy overnight.
2. **Advanced technology has become the principal arena of economic competition.** Leadership in AI, semiconductors, quantum computing, biotechnology, and clean energy technologies increasingly determines not only commercial success but national power.
3. **Global trade and investment are being realigned, not reversed.** Cross-border commerce continues to expand, but market access is conditioned not by price and productivity alone, but also security, standards, resilient supply chains, and political alignment. Global foreign direct investment (FDI) rose **15 percent** in 2025, to \$1.66 trillion, even as **180-plus targeted deals** embedded security of supply into their terms.
4. **Governments have returned as architects of industrial competition.** While **China vastly outspends** other advanced economies on industrial policies, these types of policies are now a **global phenomenon**. Governments are intervening in product and factor markets and deploying subsidies, sovereign wealth funds, and other tools to establish industrial and technological advantages.

The result is not deglobalization but a new phase of globalization in which competitive advantage depends not simply on producing more efficiently, but on becoming indispensable to trusted technology ecosystems. For South Koreans, whose prosperity was built on open markets and the proposition that the best product wins, these are not temporary headwinds. They are a structural challenge to the export model itself.

Why Ecosystem Powers Will Win

The countries that will shape the emerging order are not the largest or the richest. They are the ones that build the ecosystems around which others organize, combining scientific leadership, industrial capabilities, capital, standards, and alliances to position their firms in global value chains. In the AI industrial age, position matters as much as production. The firms—and countries—that shape the critical interfaces through which others innovate, produce, and compete capture the greatest economic and geopolitical advantage.

Modern production increasingly operates through modular ecosystems rather than vertically integrated firms—a phenomenon that Thun, Taglioni, Sturgeon, and Dallas (2022) describe as “massive modularity.” Think of the smartphone industry as a LEGO set. Thousands of specialized firms produce

LEGO bricks—the processors, operating systems, displays, memory, software, and applications. But not all LEGO pieces are equally valuable. Some firms provide the connector blocks—the interfaces, standards, certification systems, software platforms, and design architectures—that determine how every other brick fits together. Those firms become ecosystem orchestrators because everyone else must organize around their architecture.

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Samsung illustrates both the opportunity and the limits of manufacturing excellence. The company's output spans smartphones, memory chips, displays, processors, semiconductor fabrication, and advanced manufacturing, making it one of the world's most vertically integrated technology companies. Yet even Samsung depends on ecosystems it does not control, including ARM's instruction set architecture, Google's Android operating system and app ecosystem, semiconductor design software, and global technical standards. Manufacturing excellence creates resilience. Architectural control creates durable power.

Occupying these architectural control points requires more than technological excellence. Ecosystem power rests on five mutually reinforcing elements: (1) frontier technologies that create new capabilities; (2) production systems that deploy them at scale; (3) standards that determine how others connect; (4) capital that decides which ecosystems expand; and (5) alliances that give ecosystems geographic reach and political durability. The central task of economic statecraft is therefore no longer simply protecting industries or reshoring factories. It is shaping who occupies the architectural control points of future technology ecosystems.

South Korea as an Ecosystem Power

South Korea possesses combined strengths across **four complementary technology domains**: the Stack (AI, semiconductors, and communications), Precision (batteries and advanced manufacturing systems), Production (machine tools and industrial robotics), and the Base (critical minerals and energy). Sustained leadership derives not from dominance in any one domain, but from the ability to combine them into resilient industrial ecosystems.

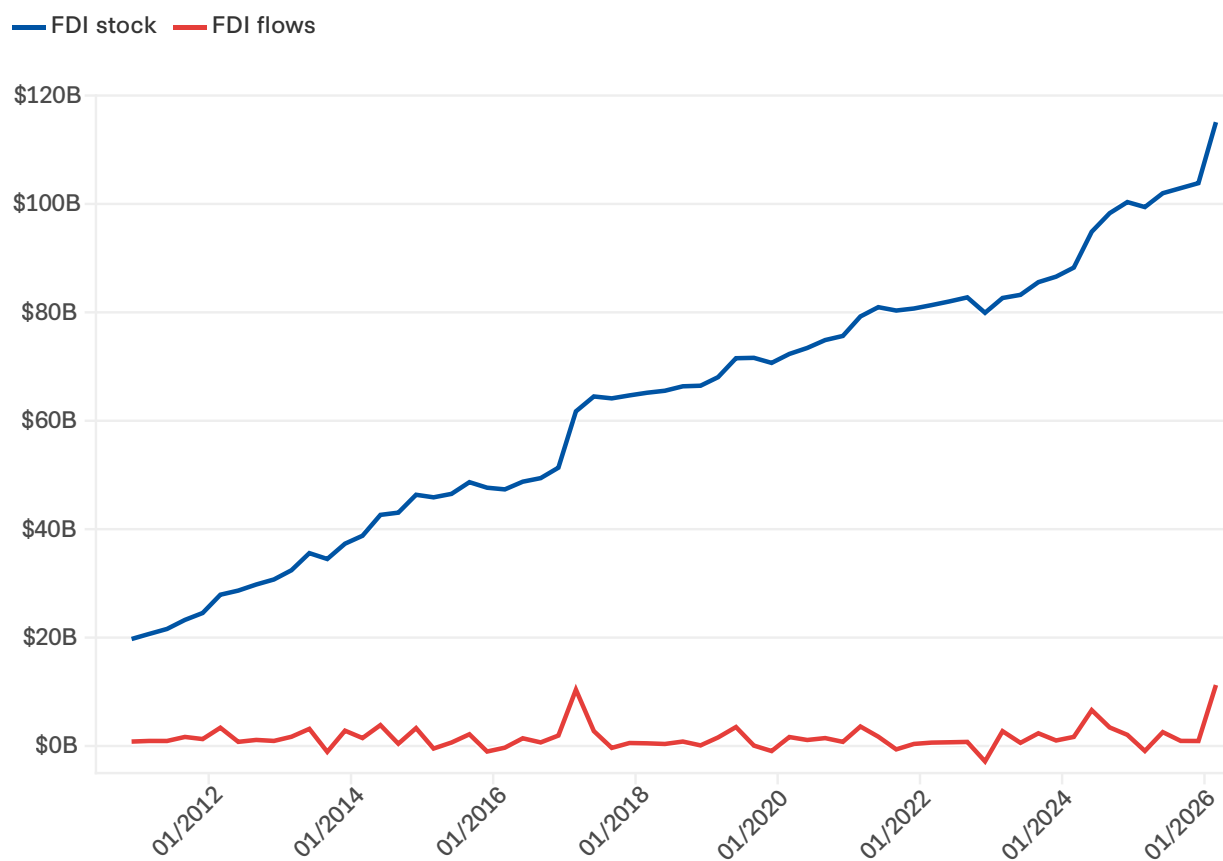
Few countries possess meaningful capabilities across all four of these domains. The United States leads in the Stack but remains dependent in parts of the Base, where China dominates the processing of rare earths and battery materials. Without secure access to critical minerals and energy, leadership in AI and semiconductors ultimately rests on Chinese forbearance. South Korea combines strengths in Stack and Precision technologies, offers competitive Production capabilities, and is rapidly strengthening in the Base. But capabilities alone do not translate into ecosystem power. The strategic objective is not simply to excel within each technology domain. It is to connect them—to position South Korean firms where technologies intersect and architectural control points emerge.

SK Hynix's high-bandwidth memory (HBM) illustrates the difference. HBM is not simply another semiconductor component. It has become connective tissue for the AI ecosystem. NVIDIA's accelerator

architectures are designed around HBM's specifications; replacing it would require redesigning chips, software stacks, packaging, and data center infrastructure across multiple industries. That is architectural power, not merely manufacturing capacity. Samsung's foundry capabilities, LG's battery process technologies, and Hanwha's naval engineering systems occupy similarly strategic interfaces within their respective ecosystems.

Likewise, Korea Zinc's rare-earth processing venture in Tennessee demonstrates that the U.S.-South Korea alliance is already evolving beyond trade toward shared industrial architecture. The participation of the U.S. Office of Strategic Capital reflects a broader shift in allied strategy: Capital is increasingly being deployed to shape ecosystems rather than simply finance production. South Korea is one of the few middle powers with the technological depth, manufacturing breadth, standards credibility, alliance trust, and capital partnerships to become not merely a supplier within the American technology ecosystem, but a co-architect of it.

Figure 2: South Korea's FDI into the United States



Source: EST's estimates of FDI stock based on FDI flows data from the Bureau of Economic Analysis and 2011's FDI position from the OECD. Data retrieved via CEIC.

Ecosystem competition rewards countries that integrate technologies across complete industrial systems rather than excel within isolated sectors. South Korea's comparative advantage will erode unless its industrial strategy evolves from strengthening industries to orchestrating ecosystems. The strategic challenge is no longer simply to export more. It is to become indispensable.

In the AI industrial age, the American advantage in models, platforms, and capital markets depends on secure access to chips, memory, energy, data centers, and critical minerals. South Korea supplies several of those layers and has reason to co-design the others.

That is why the U.S.-South Korea relationship cannot be understood through trade balances or the sharing of defense costs alone. The question is not whether South Korea sells too many cars or batteries but whether it helps the United States and its allies build ecosystems China cannot dominate. In the AI industrial age, the American advantage in models, platforms, and capital markets depends on secure access to chips, memory, energy, data centers, and critical minerals. South Korea supplies several of those layers and has reason to co-design the others. In shipbuilding, the U.S. Navy needs the production discipline and supplier depth South Korean firms possess. South Korean firms already operate across ASEAN countries, from which the United States can draw on allied-standard alternatives to Chinese industrial architecture. For example, South Korea is one of the largest foreign investors in Vietnam and has invested in battery supply chains in Indonesia, semiconductor assembly in Malaysia, and shipbuilding in the Philippines.

Building the Allied Ecosystem

South Korea's ecosystem power strategy begins with a question the export model never had to ask: Which partners strengthen ecosystem power rather than simply expand market access? The answer depends on three attributes: access to frontier science, demand that sustains long-term investment, and political alignment that makes technological integration durable. By those measures, the United States offers what China increasingly cannot.

South Korean firms operate in brutally cyclical industries. Memory prices **collapse**. Shipbuilding orders dry up. Battery margins compress. Embedding South Korean firms in American AI infrastructure, defense production, and critical minerals processing transforms that volatility into structural demand, providing the long-term certainty needed to finance the next generation of innovation. As **Philippe Aghion**, this year's Nobel laureate, has shown, proximity to the technological frontier generates disproportionate productivity gains.

Access to frontier AI capabilities cannot remain contingent on commercial licensing decisions. The **temporary suspension** of access for allied and partner countries to Anthropic's most capable models illustrated this vulnerability. South Korea should therefore help co-design the governance and standards that make **access structural** rather than discretionary. That is precisely what the Seoul Statement positions South Korea to do as the host of the inaugural International AI Standards Summit and the country whose Agency for Technology and Standards anchors global AI governance.

Critical minerals are where the U.S.-South Korea partnership has the clearest near-term test. South Korea chairs the Forum on Resource Geostrategic Engagement (FORGE), the successor to the Minerals Security Partnership, giving it convening authority over Australia, Japan, India, Canada, the European Union, and the Gulf states. South Korea has also committed **\$37 billion** through its Supply Chain Stabilization Fund for overseas critical minerals investment. But the opportunity is larger than procurement: Critical

minerals should be treated as a geoeconomic platform, combining South Korean capital, U.S. demand, Australian resources, ASEAN processing, and allied standards into bankable projects that reduce Chinese chokepoints while creating durable commercial relationships.

The **July 2025 tariff agreement** should not be viewed as the end of a negotiation, but as the opening move in a broader strategic bargain. If South Korea helps rebuild the American techno-industrial base, the United States should provide durable access to the frontiers of AI, defense, energy, and industrial demand. That is a bargain large enough for the AI industrial age.

Ecosystem Power Begins at Home

Ecosystem power is won internationally but built domestically. Countries cannot occupy the architectural control points of global technology ecosystems unless their own regulatory institutions, innovation systems, and security architecture prepare firms to compete at the frontier. Three domestic foundations therefore matter most: regulatory openness, cyber resilience, and entrepreneurial dynamism.

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Regulatory openness—not only to allies but also to domestic firms—is key: It rests on predictability, proportionality, and enforcement that scales with firm size, not origin. The Lee administration’s willingness to reconsider **mapping-data restrictions** shows that institutions can adapt when barriers impede shared innovation. Predictability, however, cuts both ways. **Six years** of proposing, withdrawing, and reintroducing **platform** bills—most recently the stalled Online Platform Fairness Act—impose an uncertainty tax that falls hardest on the domestic challengers South Korea most needs to grow, since only incumbents can staff a standing defense against a moving target. The **Coupang** case is instructive: Set aside the discrimination debate, and the predictability and proportionality of enforcement still matter for every platform that scales—**Naver and Kakao** no less than any foreign firm. **The AI Basic Act** points the better way, consolidating 20 scattered bills into one framework, with a grace period and published guidance. That predictability of process, more than any single rule, is what lets domestic firms plan.

Cyber resilience is the second foundation—and the one most urgently requiring a new framework. South Korea’s institutions were built primarily to counter North Korean espionage and disruption. But China now conducts **sustained cyber-espionage** against the semiconductor and telecommunications sectors across Asia—commercial in its cover, long-horizon in its objectives, industrial in its consequence. The Coupang breach, which exposed the data of **33.7 million** South Koreans through a former employee’s retained system access, was a different kind of warning: Even consumer-facing champions sit on soft infrastructure. A successful attack on a South Korean semiconductor fabrication facility would likely score at the top of **CSIS’s Cyberattack Severity Classification Framework**—which has a “severe” tier reserved for incidents such as Colonial Pipeline and Salt Typhoon—and would cascade across AI inference capacity

on multiple continents. South Korea cannot become an ecosystem co-architect while leaving the industrial knowledge that makes it indispensable undefended. This is now an alliance obligation.

Entrepreneurial dynamism—reflecting the need to continuously renew today’s ecosystem, not just protect it—is the third foundation. Three successive Korean administrations **have recognized** that *chaebols* need a deeper base of mid-tier innovators, but the productivity gap has nonetheless grown. An ecosystem built on a handful of irreplaceable firms remains vulnerable. One that continually attracts hundreds of innovative mid-sized firms becomes increasingly difficult to replicate. Platforms create value. Dense ecosystems create resilience.

Capital as Statecraft

Standards without capital are aspirational. Capital without standards may earn financial returns but will fail to build geoeconomic advantage. Deployed together across global value chains, they enable countries and their companies to play an orchestrating role in technology ecosystems. Washington’s policy debates have focused on tariffs, export controls, and subsidies. Seoul talks about industrial policy and export diversification. Both understate the central fact of the AI industrial age: Capital, combined with standards, can determine which ecosystems grow and which countries become their architects.

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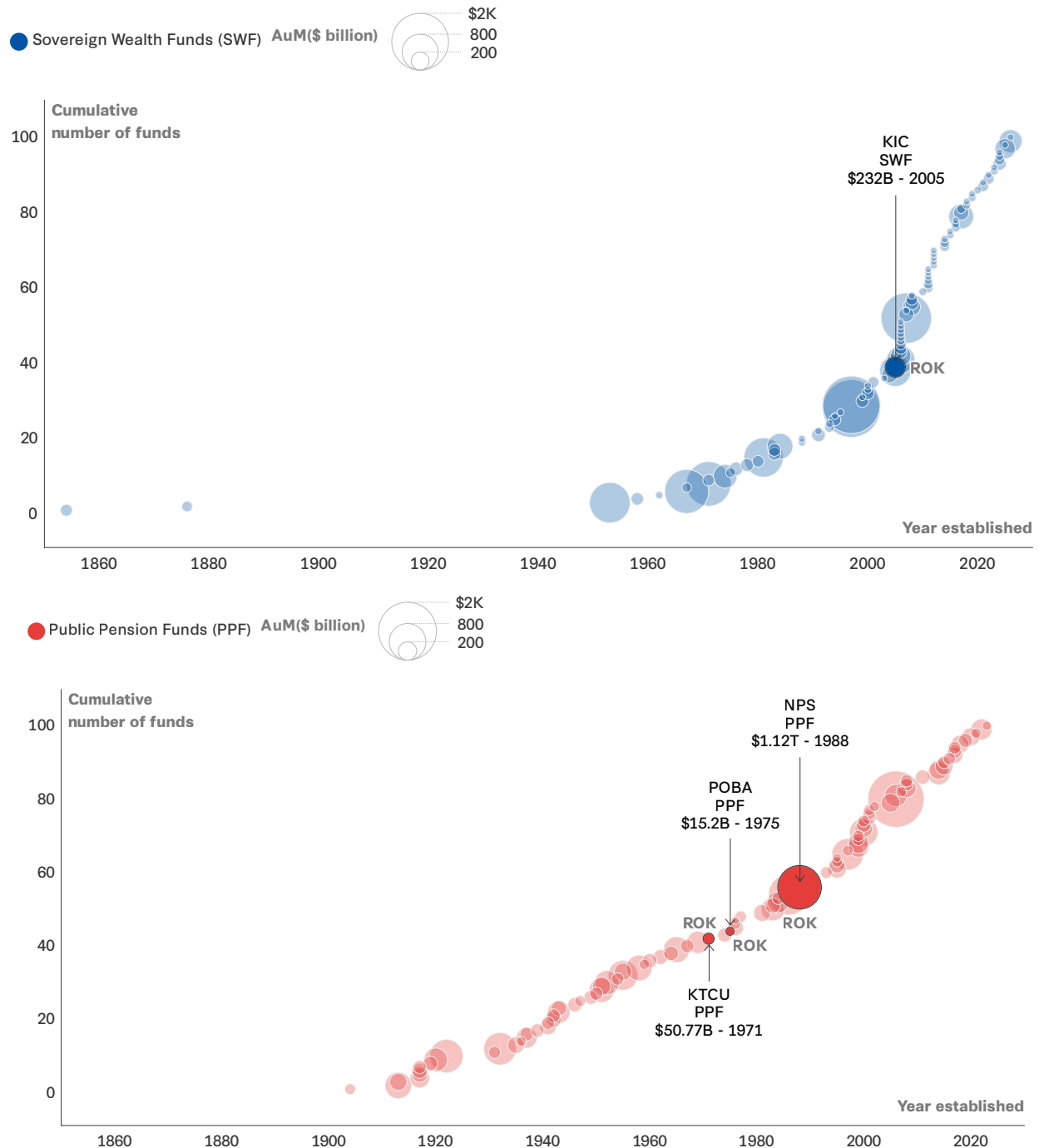
Industrial strategy builds capabilities. Trade strategy opens or restricts markets. Technology strategy protects the frontier. Capital strategy builds ecosystems. It decides who bears early risk, who lowers the cost of capital, who turns strategic projects into bankable assets, and who creates investable pathways where markets alone will not move fast enough. China understands this. Its patient state capital has tolerated losses, built capacity, and captured chokepoints. Allied market economies have deeper pools of private and institutional capital but have not yet built instruments capable of deploying that capital with strategic intent.

South Korea begins from an unusually strong position. Its sovereign institutional investment vehicles—including the **National Pension Service**, **Korea Investment Corporation**, and the new **Korea-U.S. Strategic Investment Corporation**—collectively manage roughly \$1.5 trillion in capital. Together, these entities are comparable in size to similar pools in Singapore or the United Arab Emirates. The prescription is not to politicize pension assets or to subordinate fiduciary duties to industrial policy. It is to use them to innovate instruments at the edge, including strategic equity funds, co-investment sleeves, export-credit guarantees, blended-finance facilities, and first-loss structures that mobilize return-seeking capital for projects aligned with South Korean and allied standards. By way of example, **Singapore’s Temasek** embedded Singaporean governance standards as conditions of investment. Abu Dhabi’s ADIA anchored technical standards in every infrastructure project it funded.

Figure 3: The Growth of Sovereign Capital

South Korea's public capital is pension-dominated, and Korea Investment Corporation is a savings-oriented sovereign wealth fund.

Each bubble represents an individual sovereign wealth fund or public pension fund world-wide, plotted by year of establishment and sized by assets under management (AuM).



Note: Includes sovereign wealth funds (SWFs) and public pension funds (PPFs) only. SWFs can pursue strategic, stabilization, or savings missions; PPFs carry an explicit stream of pension liabilities.

Source: "Ranking," SWF.

The test should be practical. South Korean capital should be evaluated not only by the returns it generates but also by the **strategic relationships** it creates. Does an investment embed South Korean firms more deeply within trusted technology ecosystems? Does it establish new technical standards? Does it strengthen critical interfaces? Does it create durable interdependence with allies? These questions matter as much as financial performance because they determine whether capital merely finances production or helps shape industrial architecture.

One opportunity would be a joint U.S.-South Korea **Technology Dexterity Fund** bringing together South Korean investments (agreed under the recent trade deal) with U.S. government and institutional capital in a fund structure. This could be used to invest across the technological and industrial base in ways that underpin allied competitiveness—from semiconductors and AI infrastructure to critical minerals and advanced manufacturing. Such a vehicle would reduce financing costs for strategically important projects while embedding South Korean firms more deeply within the industrial ecosystems like-minded countries seek to build together.

Capital deployed with strategic intent creates architectural power.

Japan offers an important cautionary lesson. Decades of investment across Southeast Asia created extensive manufacturing networks but not sufficiently durable ecosystems. When Chinese competitors emerged, many operations proved **substitutable** because Japan had embedded production rather than architecture. South Korea begins from a stronger position. Its firms already occupy strategic positions in AI hardware, memory, batteries, advanced manufacturing, and shipbuilding. The opportunity is not simply to invest abroad, but to deploy capital in ways that deepen technological interdependence and make those relationships increasingly difficult to replace. Export relationships create customers. Industrial integration creates stakeholders. Capital deployed with strategic intent creates architectural power.

From Export Nation to Ecosystem Power

South Korea faces pressure from both Washington and Beijing. But the two are different in kind, not merely degree, and treating them as equivalent **mistakenly encourages hedging**. Chinese pressure is structural, involving the deliberate use of commercial relationships to create technological dependence and advance self-sufficiency. The THAAD episode, the urea cutoff, and restrictions on rare earths were not isolated incidents but manifestations of that strategy. American pressure, by contrast, reflects domestic politics and a broader effort to rebalance relationships distorted by Chinese mercantilism. Tariffs and investment demands may be contentious, and ultimately aimed at building a more integrated industrial base, rather than creating long-term dependence.

South Korean society and industry have already begun responding to this changing landscape. Recent polling by the **Asan Institute** shows overwhelming support for alignment with the United States over China despite widespread skepticism toward President Trump himself. The distinction is revealing: South Koreans increasingly separate short-term American politics from the long-term value of the

alliance. The private sector has also **voted with its capital**. South Korean investment in the United States has accelerated dramatically, spanning semiconductors, batteries, shipbuilding, and advanced manufacturing, even as investment in China has steadily declined. The challenge for Seoul is to turn those corporate decisions into national strategy. The challenge for Washington is to stop treating South Korea as a tariff problem and start treating it as an ecosystem co-architect.

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Economic security cannot remain a purely defensive project. It comes not from protecting what already exists but from projecting capital, standards, technology, and know-how into the architecture of what is being built. The chips that enable AI inference, the ships that sustain allied deterrence, the batteries that power electrification, the standards that govern digital infrastructure, and the capital that finances critical minerals processing are not simply commercial assets. Together, they form the connective tissue of trusted technology ecosystems. Countries that shape those systems acquire influence that compounds over decades because other firms and governments increasingly organize around them.

When Chung Ju-yung, founder of Hyundai Group, built South Korea's first modern shipyard on an empty beach at Ulsan, he persuaded skeptical British financiers by **producing** a 500 won note depicting the sixteenth-century turtle ship, arguing that Korea had built great ships before and could do so again. "There can be no such thing as a miracle in economics," he later **reflected**. "Korea's economic growth was achieved through the entire nation's enterprising spirit, pioneering mindset, and passionate effort."

The transition from export nation to ecosystem power demands that same spirit applied to a different strategic landscape. The first Han River miracle was built by mastering global markets. The second will be built by helping architect the trusted technology ecosystems on which those markets increasingly depend. The question is whether South Korean statecraft will prove as ambitious as the industries and engineers who have already begun building them. ■

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