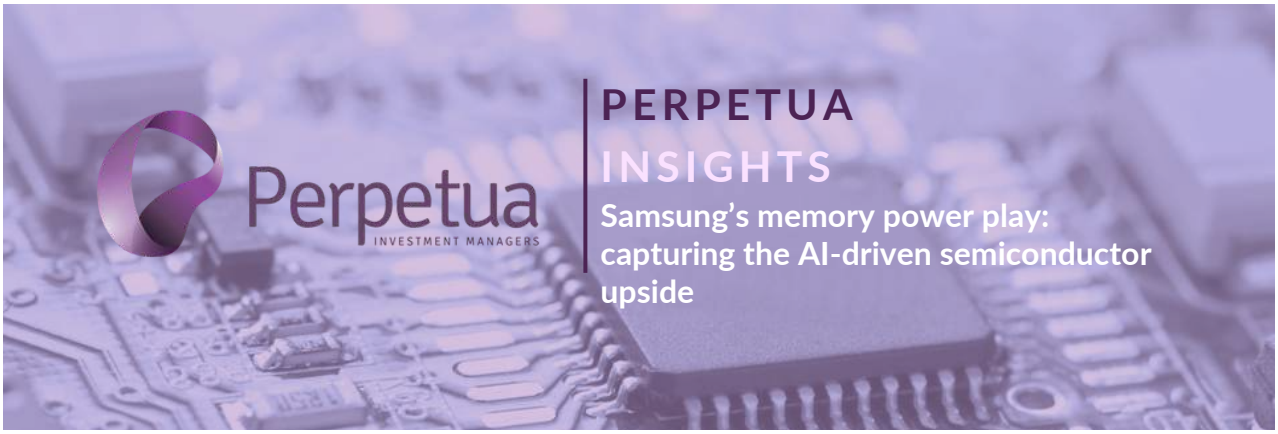


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Artificial Intelligence is reshaping demand for high-performance memory chips — the critical enabler of intelligent computing. Samsung, as a global memory leader, is poised to benefit from this surge, yet trades at a historically attractive valuation discount. Backed by strong financials and active shareholder returns, it offers both resilience and upside in the AI age. In this article, senior investment analyst Wium Malan explores how this opportunity aligns with our disciplined investment approach and focus on long-term value creation.

Structural tailwinds are driving the demand for semi-conductors

The rise of artificial intelligence (AI), cloud computing, and advanced data processing is driving a surge in demand for faster, denser, and more power-efficient memory semiconductors. These specialised chips underpin everything from generative AI models like ChatGPT to hyperscale data centres, enabling real-time data processing and intelligent computing at scale.

The global memory semiconductor market, currently valued at approximately $161 billion[1], is expected to grow to over $300 billion by 2030. This expansion is led by Dynamic Random Access Memory (DRAM), including High Bandwidth Memory (HBM), and NAND flash memory. Despite the market's technical complexity, it is dominated by just three players: Samsung Electronics, SK Hynix, and Micron, with Samsung alone supplying over one-third of global capacity.

As a global memory-chip powerhouse, Samsung Electronics stands out for its scale, R&D leadership, financial strength, and active shareholder value creation mindset. Currently trading at a rare sub-1.0x Price-to-Book multiple and supported by over $67 billion in net cash, the company is uniquely positioned to capture structural upside from the proliferation of AI, cloud infrastructure, and advanced computing. This article examines the memory semiconductor market, describes the competitive landscape, and outlines why Samsung Electronics represents a compelling investment opportunity in the era of AI.

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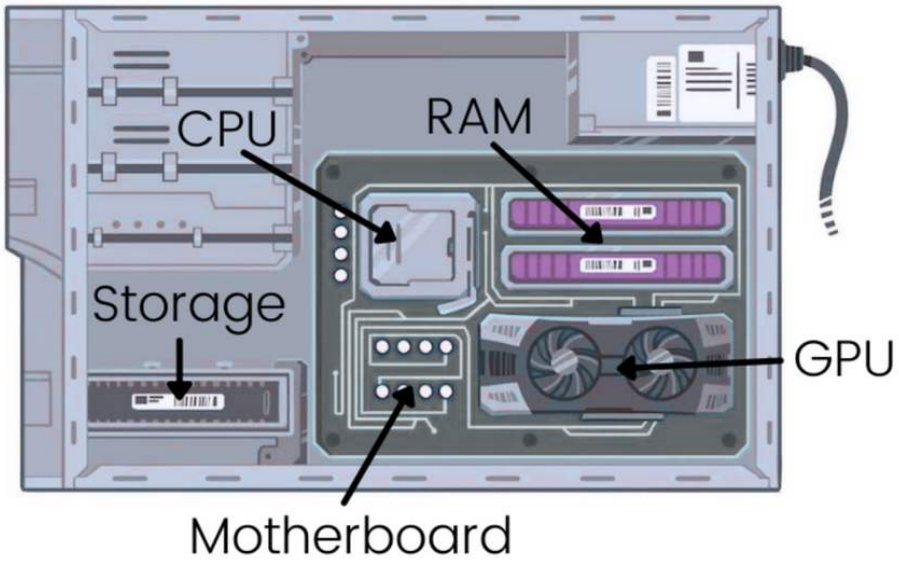
Breaking down the basics: the key elements of a computer

In understanding most things, context always matters. For semiconductors, first understanding the component parts of a computer and secondly the finer elements relating to computer memory is key.

A typical computer requires 4 main components to run applications:

1. **the Central Processing Unit (CPU):** also known as the "brain" of the computer, performing all the required calculations to run a program
2. **the Storage:** also known as "non-volatile memory", where data is captured and stored, even after the computer is switched off, such as the hard disk drive or, more recently, on the much faster Solid State Drive (SSD)
3. **the Memory, or "volatile memory"**, where data is temporarily stored for the current program in operation by the computer, and lost after the computer is switched off. This is typically referred to as Random Access Memory (RAM) and more recently as Dynamic Random Access Memory (DRAM). This article focuses specifically on memory, given its critical role in enabling AI and data-intensive applications.
4. **the Graphics Processing Unit (GPU):** specifically designed to perform the parallel computations needed to display complicated graphics on the computer screen whether playing games or running simple programs. This article focuses specifically on memory, given its critical role in enabling AI and data-intensive applications.

Figure 1: Key elements of a computer



Source: LinkedIn

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Memory semiconductors: a vital cog in delivering artificial intelligence

Memory semiconductors (or chips) are broadly divided into 3 different product categories:

Category	Term	Description
1. Double Data Rate (DDR)	DRAM / DDR5	Used in computers and servers where high speed, large capacity, and efficiency are required. Ideal for gaming, professional workloads, and data centres. DDR5 offers faster data processing, reduced loading times, and improved overall system performance, while supporting multiple applications simultaneously without bottlenecks.
More recently, there has been significant attention on the latest iteration of Dynamic Random Access Memory (DRAM) technology, known as:		
1.1 High Bandwidth Memory	HBM	Its stacked architecture allows for much higher data transfers compared to traditional DRAM.
One of the most advanced versions is:		
1.2 High Bandwidth Memory 3rd Generation Extended	HBM3	Offers even faster data transfer speeds, higher bandwidth, more stacked layers, and improved power efficiency. This makes HBM3 particularly well-suited for processing the massive data volumes required by Artificial Intelligence (AI) workloads, such as training Large Language Models (LLMs) including ChatGPT, Gemini and Llama.
2. Low Power Double Data Rate	LPDDR5	Used in mobile devices such as smartphones, tablets, and ultraportable laptops, requiring low power and high performance. It is designed for power efficiency, which is crucial for extending battery life, while still providing adequate processing speed.
3. "Not AND" (refers to the Boolean[2] algebra used in logical operations within integrated circuits)	NAND	Used in flash memory semiconductors used in SSDs for storage in computers, smartphones and USB flash drives.

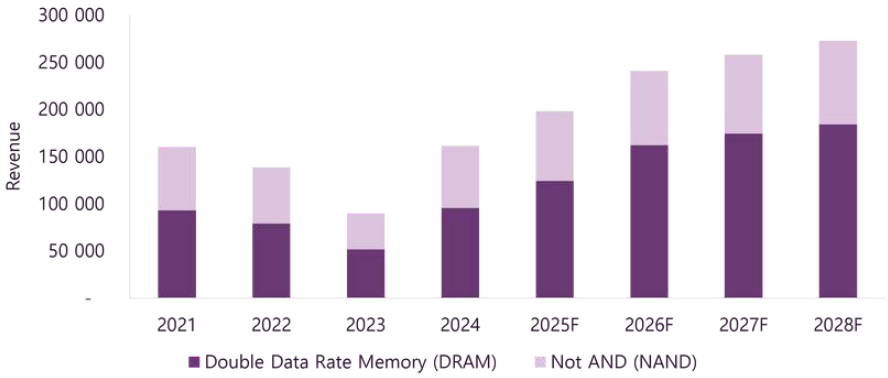
The $300 billion opportunity: global semi-conductor market dynamics

- *Significant market growth projected*

The global memory semiconductor market is estimated to be worth around $161bn, as of the end of 2024, split roughly 60/40 between DRAM and NAND [Figure 2]. More importantly, we anticipate the market to grow by 11.2% annually to reach over $300bn by the end of the decade. This growth will likely be led by HBM and DRAM products estimated to have a compounded annual growth rate (CAGR) of 13.7%, required to meet the rapidly growing needs in data centres and cloud computing infrastructure, whilst NAND is expected to grow at around 7.2% CAGR.

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Figure 2: Global memory semiconductor market ($billion)



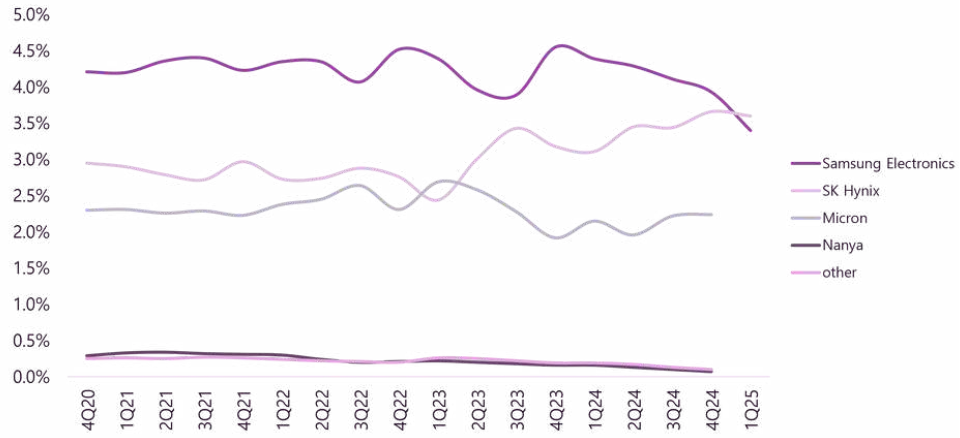
Source: Statista.com, TrendForce, Korea Times, Company reports PIM estimates

- *A highly concentrated market*

Remarkably, only 3 companies account for over 95% of the global memory semiconductor production and sales. The long-term leader in the industry has been the South Korean consumer electronics behemoth, Samsung Electronics, followed by their domestic rival, SK Hynix, and the lone US competitor, Micron [Figure 3].

Samsung Electronics' market share leadership was cemented through its technology leadership in the development of 3rd generation DRAM (DDR3) products back in 2007, its continued leadership through the development of DDR4 from 2012, and DDR5 since 2020. Over shorter periods, shifts in market share often result from incremental upgrades within existing product generations. For example, in 2023, Micron was delayed in mass-producing the 16 GB version of 5th generation DRAM, which expanded capacity from the previous 8 GB standard. This allowed Samsung Electronics to capture additional revenue share by being first to market with the 32 GB iteration later that year. SK Hynix followed with its own 32 GB product launch in the second half of 2024.

Figure 3: DRAM manufacturers revenue share worldwide



Source: Statista.com, TrendForce

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- *Product and production timeline*

The second half of 2024 and 2025 to date have, however, been characterised by SK Hynix leading the pack in providing the latest 12-layer High Bandwidth Memory 3rd Generation Extended (HBM3E) chips, as well as the first samples of HBM4 chips to Nvidia for use in their latest GPU and data centre accelerator products. At the time of writing this article, Samsung Electronics is still awaiting final approval of its 12-layer HBM3E products from Nvidia (samples have already been shipped out to major clients), whilst its HBM4 development seems to remain on schedule for mass production late in 2025. Micron only plans on mass production of HBM4 in 2026 [Figure 4].

Figure 4: Mass production timeline: HBM products



Source: Statista.com, TrendForce, DigiTimes, ChatGPT

- *Inconsistent capital allocation record*

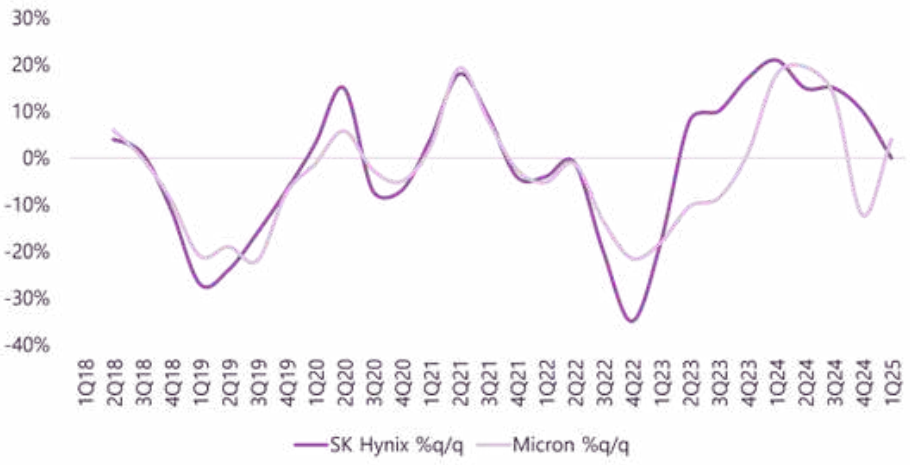
Despite DRAM production capacity being heavily concentrated amongst just three companies, the industry has been notoriously poor in its discipline towards managing capacity expansions against potential oversupply situations. This has been due to various factors, the most prominent of which are:

- **High capital intensity and long lead times:** Building or expanding a DRAM or NAND production facility (called a memory fabrication plant "Fab") can cost in the order of $5–15 billion and takes 18–24 months (or more) from groundbreaking to volume production.
- **Highly volatile end customer demand and limited forecast accuracy:** memory demand is dependent on PC, smartphone, data centre, AI-workload and other consumer electronics demand, which can shift rapidly.
- **Slow withdrawal of capacity during downturns:** "Turning off" a Memory Fab is more complex than powering off equipment. Shutting down the highly complicated tools used to manufacture the chips could mean losing process qualification from your clients and risk significantly impacting production yields when you start up again.

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Given none of the three dominant players can control demand volatility, and none has enough incentive to coordinate capacity cuts, they all tend to chase market share when times are good and scramble to cut losses when times get bad. This has been abundantly evident in the DRAM price cycle over the past decade or more, which has largely been driven by either under- or overcapacity in the industry. Memory pricing cycles tend to last around 4-6 quarters, and we are currently 3 or 4 quarters into a declining price cycle [Figure 5]. So far, this has not been as deep a cycle as the prior one given that prices have been supported by the growth in HBM, mainly from SK Hynix, and pre-buying across the supply chain and end markets ahead of anticipated U.S. tariffs.

Figure 5: DRAM price index, % quarter-on-quarter



Source: Company reports, FactSet

Investment case: Samsung Electronics – South Korean consumer electronics and memory semiconductor behemoth

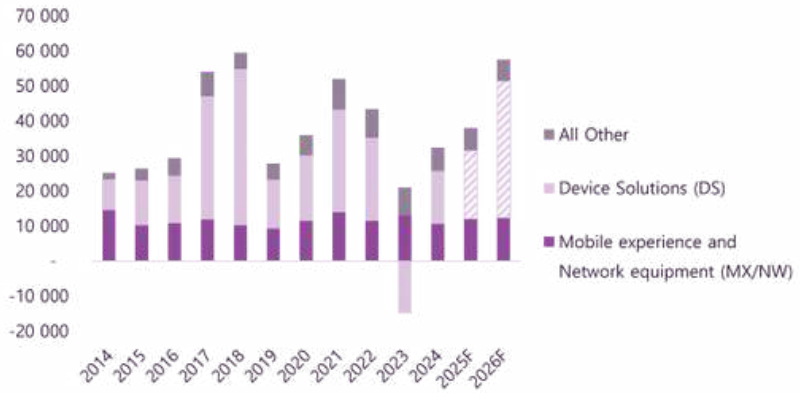
Samsung Electronics' loss of leading-edge technology leadership has had a significantly negative impact on Samsung Electronics' share price and market rating since mid-2024. We believe this offers an opportunity for heavily discounted exposure into one of the most well-known global consumer electronics brands with significant exposure to the massive growth optionality from the proliferation of generative AI.

Established in 1969, as part of the wider Samsung Group, Samsung Electronics is a global leader in consumer and industrial electronics, including appliances, televisions, smartphones, semiconductors, and memory chips. In the consumer electronics sector, Samsung Electronics has maintained its position as the world's largest television manufacturer since 2006 and has been a leading producer of smartphones, notably through its Galaxy series. The company's product lineup also encompasses home appliances such as refrigerators and washing machines. Beyond consumer products, Samsung is a major manufacturer of electronic components, supplying items like semiconductors, image sensors, and displays to clients including Apple and Sony.

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Although it reports its revenue through 8 different product subsegments, the most important contributors to its operating profit has been from the Mobile experience and Network equipment (MX/NW) segment, which mostly represents the profit earned from its smartphone, tablets, and wearable products as well as the Device Solutions (DS) segment which mostly represents profits earned from its memory semiconductor products [Figure 6].

Figure 6: Samsung Electronics: Segmental Operating Profit (KRW billion)



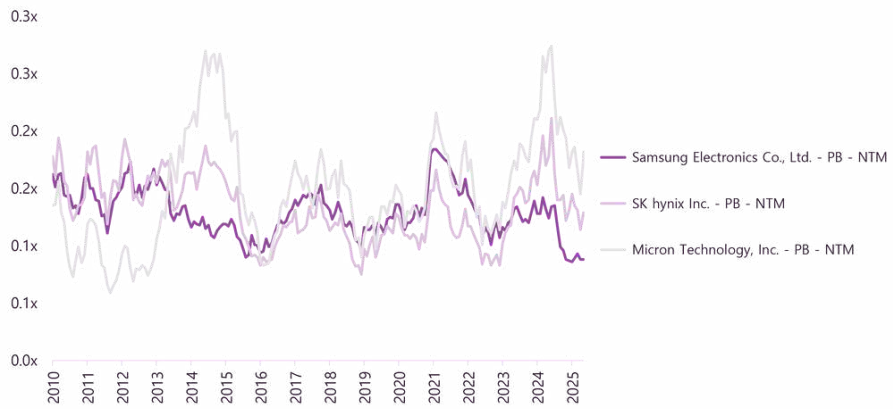
Source: Company reports

Following the weakness experienced in 2023, which was felt in equal measure across the industry due to global macro concerns and oversupply in the DRAM market, we have already witnessed a recovery in 2024 that we anticipate will accelerate throughout 2025 and 2026 as Samsung Electronics obtains approval for its leading-edge memory products from their key data centre accelerator and application specific integrated circuit (ASIC) manufacturer clients such as Nvidia, AMD, Intel, Microsoft, Meta, Apple and Google parent Alphabet to support their historically significant global AI data centre expansion plans.

Valuation reset: a compelling entry point

Driven by the developments in the global memory semiconductor market over the past twelve months, highlighted above, Samsung Electronics has de-rated significantly to now trade at a discount to SK Hynix and Micron [Figure 7].

Figure 7: Samsung, SK Hynix and Micron Price-to-Book ratios over time

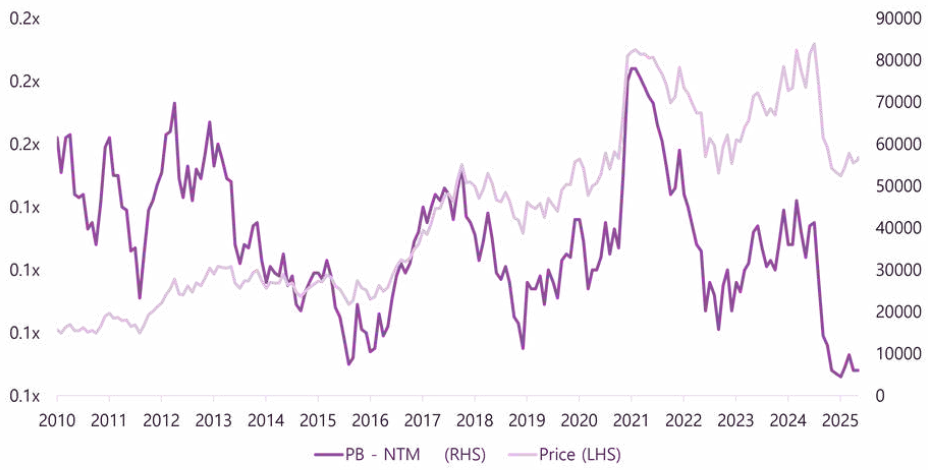


Source: FactSet financial data and analytics

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It is also trading on a less than 1.0x Price-to-Book ratio, a rare opportunity that has only presented itself 4 times since the onset of the smartphone age. Each prior instances (2015, 2018, and 2022) resulted in significant returns for shareholders [Figure 8].

Figure 8: Samsung PB and price over time



Source: FactSet

Apart from this, our investment thesis is supported by the product refresh cycle toward AI-enabled flagship products in the global smartphone market, where Samsung Electronics enjoys a market-leading 20%+ market share, and Samsung Electronics' recent initiatives to utilise its massive net cash balance sheet to unlock shareholder value.

The Value-Up program: a compelling strategy

South Korean Cheabols[3] have historically been plagued by having a "Korea discount", which is the tendency for Korean stocks to trade at lower valuations compared to global peers. This is due to their complex ownership structures and tendency to neglect minority shareholder returns.

South Korea's Corporate Value-Up Program, introduced in February 2024, is a government-led initiative aimed at addressing this "Korea discount" by encouraging listed companies to enhance corporate governance and shareholder value, similar to Japan's shareholder return initiatives of the past decade.

Samsung Electronics, supported by its massive KRW 93.2 trillion (US$ 67.2 billion) in net cash on its balance sheet, has taken the first tentative steps in unlocking significant potential value for its shareholders. Firstly, in November 2024, it unveiled a share buyback plan worth over $7 billion (KRW 10 trillion), planning to repurchase shares over the following year to enhance shareholder value. By the end of February this year, it had already repurchased and cancelled KRW 3.05 trillion worth of shares. Secondly, in January 2025, Samsung Electronics announced plans to compensate executives with treasury stocks under an Overachieved Performance Incentive (OPI) scheme whereby shares awarded are linked to the company's stock price performance, encouraging executives to focus on long-term shareholder value. There are also considerations to extend this stock compensation system to general employees from 2026.

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Given that its current net cash balance, along with the market value of its minority holdings in listed entities, represents a whopping 33% of its current market cap, these developments should support further value unlock for our clients, as minority shareholders in Samsung Electronics.

Investment implications: positive upside vs downside skew

Samsung Electronics presents a compelling asymmetrical investment opportunity at the intersection of valuation, innovation, and strategic relevance. With memory semiconductors emerging as critical assets for generative AI and cloud infrastructure, Samsung's leadership across DRAM and NAND technologies positions it as a core beneficiary of structural tailwinds.

At under 1.0x Price-to-Book, and with a balance sheet that includes over $67 billion in net cash, the company offers a rare combination of downside protection and long-term growth optionality. Combined with governance enhancements under South Korea's Value-Up program, we believe Samsung Electronics is well-positioned to deliver sustainable returns for long-term investors in the AI age.

*Samsung is a holding in the **Perpetua Global Focused Equity Fund** as well as the **Perpetua Global Core Equity Fund**.*

[1] Source: Statista.com, TrendForce, Korea Times, Company reports, PIM estimates.

[2] Boolean algebra is a branch of algebra dealing with logical operations on binary variables (0 or 1, representing false or true). It's fundamental in digital electronics and computer science for analysing and simplifying logic circuits.

[3] Chaebols are large, family-controlled business conglomerates in South Korea. Though many chaebols are publicly traded with diverse shareholders, they are often controlled by founding families through complex cross-shareholding structures. Major chaebols include Samsung, Hyundai, SK Group, LG Group, and Lotte.

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