Goldman Sachs Research

Economics Research
14 September 2026 | 1:15AM HKT

ASIA ECONOMICS ANALYST

Exports and Beyond—Asia's Broadening AI Dividend

- Capital spending on the artificial intelligence (AI) buildout continues to grow rapidly. The majority of that spending goes to equipment manufactured in Asia.
- Consequently, our estimates for the contribution of tech exports to GDP in key Asian producers continue to rise. For 2026, we estimate exports will provide a 7pp boost to real GDP growth in Taiwan, and 2-3pp in Korea, Vietnam, and Malaysia, with Singapore close behind.
- Beyond exports, we see increasing evidence of a lift to capital spending in Asia—both in terms of productive capacity for exports, and in local data center investment. Consumption is likely benefiting on the margin from positive equity wealth effects in several economies. And in Korea and Taiwan, surging corporate tax receipts are supporting faster growth in government spending. However, the overall AI-related boost to domestic demand remains small in comparison to the export impact — well under 1pp of GDP ex-Taiwan.

Andrew Tilton
+852-2978-1802 | andrew.tilton@gs.com
Goldman Sachs (Asia) L.L.C.

Goohoon Kwon, CFA
+852-2978-0048 | goohoon.kwon@gs.com
Goldman Sachs (Asia) L.L.C.

Irene Choi
+82(2)3788-1722 | irene.choi@gs.com
Goldman Sachs (Asia) L.L.C., Seoul Branch

Investors should consider this report as only a single factor in making their investment decision. For Reg AC certification and other important disclosures, see the Disclosure Appendix, or go to www.gs.com/research/hedge.html.

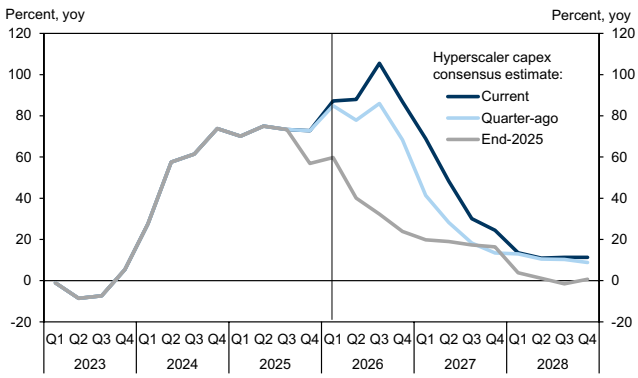
Exports and Beyond—Asia's Broadening AI Dividend

Investment in the artificial intelligence buildout continues to grow, with a large fraction of spend (roughly 2/3 the value of a data center) ultimately going to equipment producers in Asia. Earlier this year, we estimated the impact of surging tech exports on GDP growth across a range of Asian economies. In this week's *Asia Economics Analyst*, we update those estimates and also look at spillover effects on domestic demand, including investment (in manufacturing export capacity as well as local data centers), consumption (via estimated equity wealth effects), and government spending (on the back of large increases in exporter profits and thus corporate tax revenues).

Exports – A growing AI capex impulse

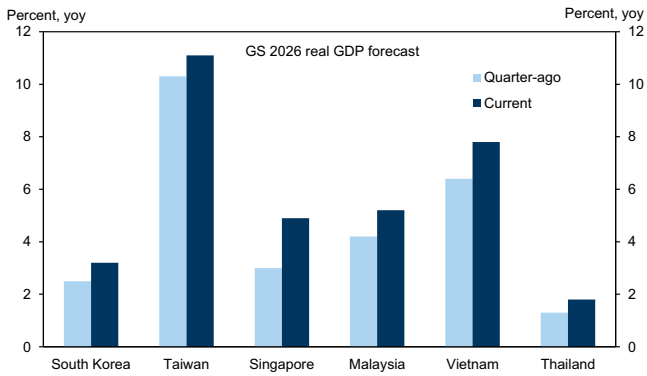
The global AI spending backdrop remains supportive for Asian tech exporters. Bloomberg consensus estimates for US hyperscaler capex continue to rise (Exhibit 1), and are now at $800bn in 2026 and $1.1tn in 2027. Stronger AI-related investment underpins our upward revisions to growth forecasts across Asian economies (Exhibit 2); most have reported stronger-than-expected Q2 GDP growth numbers. In August, officials in Korea, Taiwan and Singapore all revised up their 2026 growth forecasts, with stronger-than-expected AI demand cited among the supportive factors.

Exhibit 1: AI investment boom shows no signs of slowing…



Source: Bloomberg, Goldman Sachs Global Investment Research

Exhibit 2: …and we have further increased our growth forecasts for Asian tech exporters



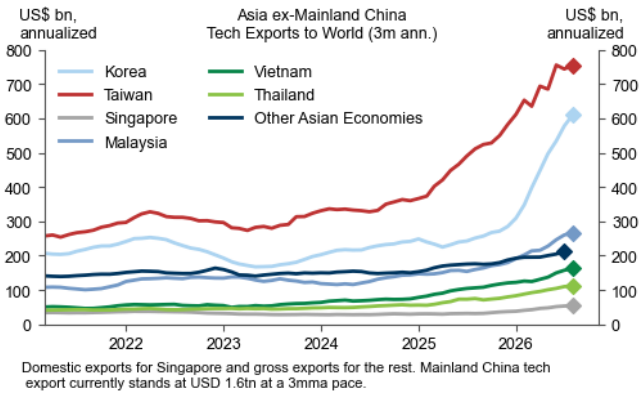
Alongside tech strength, part of the upward revision reflects easing in oil prices following the US-Iran ceasefire.

Source: Goldman Sachs Global Investment Research

Over the past year, high-bandwidth memory became a key supply constraint for AI servers, driving a sharp increase in pricing. As noted by our global technology team, LLMs require a huge amount of memory capacity to store trillions of parameters. As Samsung and SK Hynix together hold over 60% of the global DRAM market and just below half of NAND[1], Korean nominal export growth has accelerated rapidly in 2026 (Exhibit 3). In real terms, we estimate tech exports from Korea and Taiwan still expanded at mid-20% yoy in Q2, whereas real growth in tech exports from key ASEAN producers (Singapore, Malaysia, Vietnam and Thailand) was even more robust, at around 40%-50% yoy in Q2.

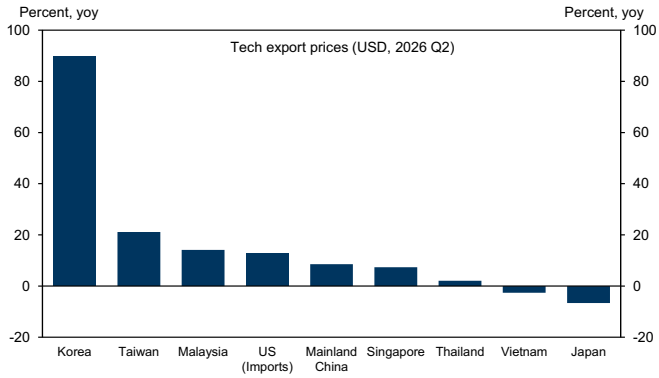
[1] Based on Q2 2026 revenue from TrendForce.

Exhibit 3: Asian tech exports are surging rapidly, especially from Korea…



Source: Haver Analytics, Goldman Sachs Global Investment Research

Exhibit 4: …as the memory price surge feeds into nominal export growth



Source: Haver Analytics, Goldman Sachs Global Investment Research

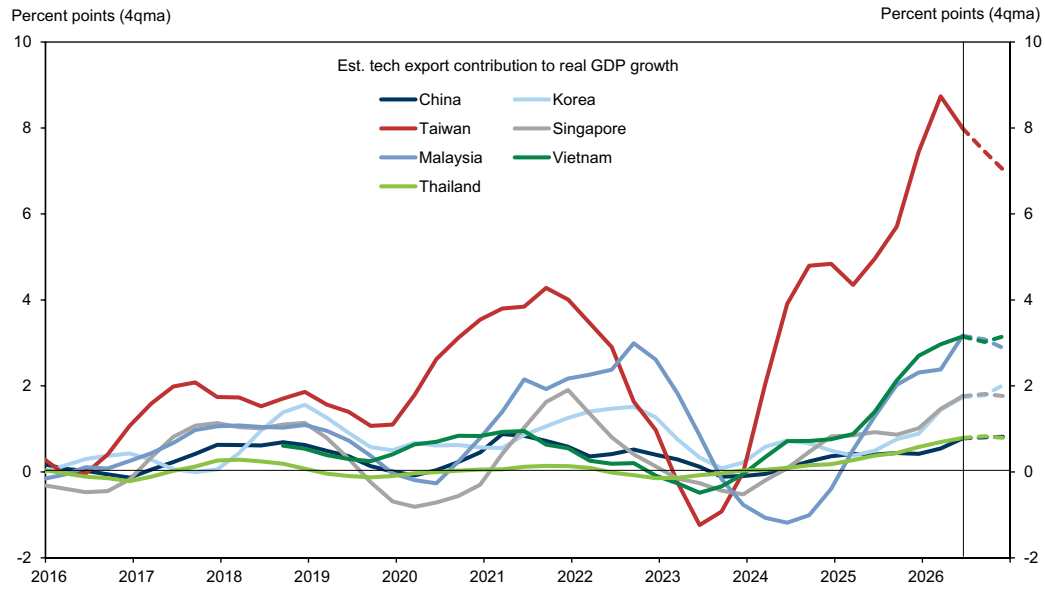
Incorporating the latest export figures, our estimates for the tech export contribution to GDP growth across several Asian economies rise further. Following the same approach as in our previous report, we compute the real contribution of tech exports to GDP growth[2] as gross tech exports deflated to volumes, multiplied by the domestic value-added share of gross exports from OECD inter-country input-output tables[3]. The upward revisions reflect a combination of stronger-than-expected Q2 export outturns and the upward revisions to hyperscaler capex guidance described above.

A few cautions apply to reading the exhibit. First, the contribution is gross of import leakage on the investment or consumption sides, hence the estimated contribution is inherently larger than the net-export contribution normally reported in national accounts. Second, we calculate the contribution from tech exports, which is conceptually broader than the purely AI-related export contribution, for reasons discussed in Box 1 below. Third, transshipment or processing trade might materially affect our value-added calculations, most notably for China. A Bank of Korea study in September pointed out that China serves as a major hub for semiconductor processing trade and a substantial number of wafers that complete front-end fabrication in economies including Korea, Taiwan, Japan and elsewhere undergo back-end processing in China. The same report also notes Korean-affiliated companies in China accounted for nearly 70% of the increase in China's semiconductor exports in H1 2026. These trends suggest potentially abrupt changes in China's value-added share in tech exports that may not be captured by lagged input-output tables.

[2] For China, we use PPI for Computers, Communication and Other Electronic Equipment, rather than unit-value indices (UVIs) reported by GACC, to deflate technology exports. UVIs can be materially distorted by shifts in product quality and export composition in a rapidly changing tech cycle; whereas for PPI, the NBS PPI reporting manual specifies quality adjustment requirements and methods, making it a more defensible, albeit imperfect, proxy.

[3] We are updating our value-added ratios using projected OECD inter-country input-output tables for 2023 and 2024, and extrapolating beyond 2024 incorporating adjustments. We note that while we now have two years of data since AI investment boom, calculations could still risk missing material shifts in 2025-26 (e.g., Taiwan server export boom in 2025, and unprecedented memory price upcycle in 2026). Given the scale of the investment boom this time, estimates based on 2023-24 input-output structures, even when adjusted, may still understate the magnitude of potentially very abrupt shifts in value-added distribution.

Exhibit 5: We expect tech exports' contribution to growth in key Asian producers to stay elevated in the remainder of 2026



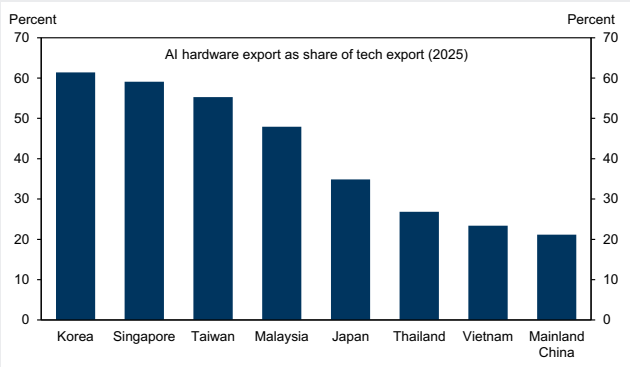
Source: Haver Analytics, OECD, Goldman Sachs Global Investment Research

Box 1: Methodological caveats – *AI-related* exports vs. *Tech* exports

In this report we estimate the growth contribution from tech exports—including consumer electronics for example—as opposed to solely AI-related exports. The reason for this choice is that the two inputs required by our method – deflators and domestic value-added ratios – are generally not available at the level of granularity needed to estimate real (volume) contributions for the most detailed goods categories. For example, the finest electronics category in OECD inter-country input-output tables is C26 *Computer, Electronic and Optical Products*, whereas export price indices are generally published at product-group level.

With that caveat noted, the majority of recent tech export growth appears AI-related. Exhibit 6 shows how much of each economy's tech exports are AI hardware. We defined broad tech exports (the noisier series) at the HS2/HS4 level that matches the sectoral granularity of price indices and inter-country input-output tables, and AI hardware (the signal) at HS6 using definitions adopted in IMF's World Economic Outlook Update. This share is high for Korea and Taiwan, and lower for Vietnam and Thailand, where broader non-AI electronics dilute the aggregate. It conceptually explains why tech contribution might be a better proxy for AI contribution in the former than in the latter. While one might be tempted to scale tech contributions by the AI-hardware share to obtain an "*AI-related export contribution*", that inherently assumes the same relative growth, inflation and value-added ratios between AI and non-AI tech products, which is unlikely to be the case.

Exhibit 6: AI hardware drives the bulk of Korea and Taiwan tech exports, with lower shares in Thailand and Vietnam



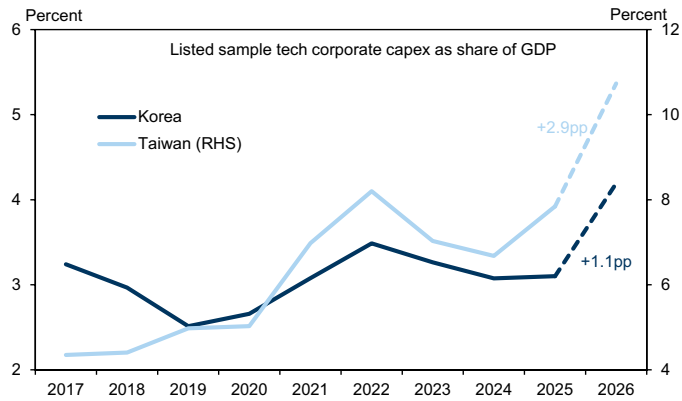
AI hardware export includes HS codes 847150, 847170, 847180, 847330, 848610, 848620, 848630, 848640, 848690, 854231 and 854232. Tech export includes HS codes 8471, 8473, 8486 and 85.

Source: Trade Map, Goldman Sachs Global Investment Research

Investment – Manufacturing capacity expansion

The local capex response to the AI boom has arrived in Asia. Major manufacturers are poised to ramp up investment to expand production capacity in anticipation of sustained AI demand. Samsung, SK Hynix and TSMC have all announced various investment projects to meet accelerating demand for high-end chips, and consensus forecasts imply capex for each of these firms will rise sharply into 2026 and beyond. We assess this trend via bottom-up aggregation of capital expenditures of listed Korean and Taiwanese tech companies. As a share of GDP, Korea tech capex is expected to rise by 1.1pp and Taiwan by 2.9pp in 2026 (Exhibit 7).

Exhibit 7: Both Korean and Taiwanese tech companies are expected to raise their capex sharply in 2026



Source: Bloomberg, Goldman Sachs Global Investment Research

However, headline capex should be heavily discounted when assessing its domestic growth contribution for two reasons.

First, capex plans are generally global and do not necessarily contain a clear split between domestic and overseas investments. Company-level evidence from Samsung Electronics, SK Hynix and TSMC[4] suggests a substantial domestic bias, potentially reflecting efficiency gains from existing local semiconductor clusters. Parent-company PP&E purchases accounted for around 80% of Samsung Electronics' total capex and over 90% of SK Hynix's in H1 2026. The equivalent ratio for TSMC was also around 80% in 2025[5]. They provide a geographic proxy because these companies' principal domestic fabs generally sit within their parent entities, while major overseas manufacturing facilities operate through subsidiaries.

More importantly, semiconductor manufacturing expansion contains heavy import leakage. Key production equipment for such investments, including lithography, deposition and etch equipment, is often sourced from the Netherlands or Japan. The Bank of Korea estimated that 60% of Korea's investment in semiconductor manufacturing equipment is imported, compared to a 35% import share across other types of manufacturing. Taiwan also reported in 2022 that, of Taiwan's TWD 1 trillion semiconductor wafer fab investment at the time, around TWD 600 billion was used for procurement of foreign equipment, implying a similar import share.

[4] Samsung and SK Hynix 2026 capex combined accounts for over 80% of our Korea listed sample total. TSMC 2026 capex is over 55% of our Taiwan listed sample total.

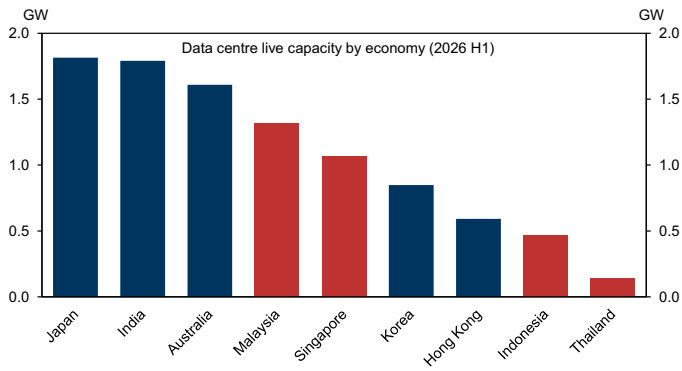
[5] Numbers derived from company disclosures, including their parent-only and consolidated statements.

Incorporating these two caveats, we estimate a modest real growth boost from semiconductor manufacturing investment – around 50bp to Korea and 1.2pp to Taiwan in 2026. Other parts of the supply chain, such as server assembly, are generally asset-light and their capex weight, and hence investment contribution, would be relatively small.[6]

Investment – Data center construction

AI-related investment includes not only export capacity, but also local data center facilities. ASEAN is emerging as a hotspot for such activity, as described in our TMT team's ASEAN Data Center Primer: "*As tier-1 markets hit power and grid constraints, hyperscalers are redirecting incremental builds to ASEAN, where power, land, and regulatory friction are generally lower*" and global players can "*run large-scale, early-stage LLM training leveraging ASEAN's lower-cost environment*". Another driver is export-control arbitrage, as Chinese players can use ASEAN as a platform for deploying US chips in model training for non-China markets.[7] Live capacity in ASEAN remains below primary markets including Tokyo, Sydney and Mumbai according to Cushman and Wakefield's data (Exhibit 8), but is larger relative to the size of local economies. Our TMT team expects ASEAN capacity to grow 4x in the next 5 years and Johor (Malaysia) to be the largest hub in ASEAN by 2030, as it stands to benefit from most of the cloud and AI-inference spillover from Singapore.

Exhibit 8: ASEAN, in particular Malaysia, is closing the gap with tier-1 markets



Red means ASEAN

Source: Cushman & Wakefield, Goldman Sachs Global Investment Research

Leveraging our TMT team's forecasts on future data center capacity across major ASEAN hubs, we map their forecast into a multi-year expenditure schedule, assuming 12-18 months of construction time on average[8] and leveraging Cushman and Wakefield's data

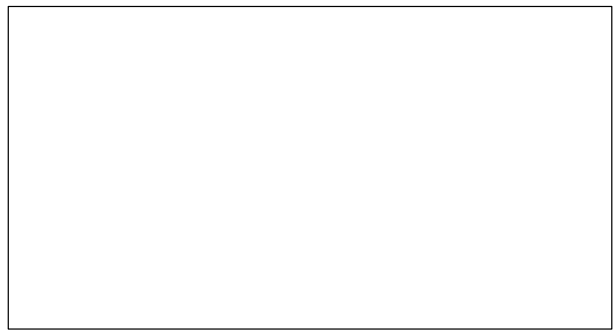
[6] Bloomberg consensus estimates that Hon Hai is only expected to raise its capex by TWD 25bn in 2026, compared to over TWD 700bn for TSMC. Consensus capex estimates of other AI server exporters, for example Quanta and Wiwynn, are likewise an order of magnitude smaller.

[7] One example is ByteDance, the Chinese owner of Tiktok, reportedly among the firms that train their newest LLMs in Southeast Asian data centers, according to Financial Times. Separately, Thailand's Board of Investment approved a $25bn data-infrastructure project by Tiktok in May 2026. The gross investment value is equivalent to 4.3% of Thailand's 2025 GDP.

[8] Data center construction (the physical build) typically takes 12-18 months per our TMT team, although timelines vary considerably by scale and design. Prefabricated modular solutions can be delivered in six to nine months, whereas construction of a large hyperscale or AI campus may extend over several years. That noted, assumptions around construction time would only change how the growth impulse is distributed intertemporally,

center construction cost data. We estimate an average growth boost of around 30/20/10bps to Malaysia/Thailand/Indonesia over 2026-2028 respectively (Exhibit 9). Similar to manufacturing investment, data center construction is also generating aairly modest growth contribution relative to headline investment figures since roughly 2/3 of data center costs reflect purchases of imported electronic components and heavy electrical equipment. Construction expenditure that actuallyeeds into domestic value added typically amounts to several billion US dollars annually, per our estimates.

Exhibit 9: We expect Malaysia to receive the biggest growth impulse from data center construction in 2027



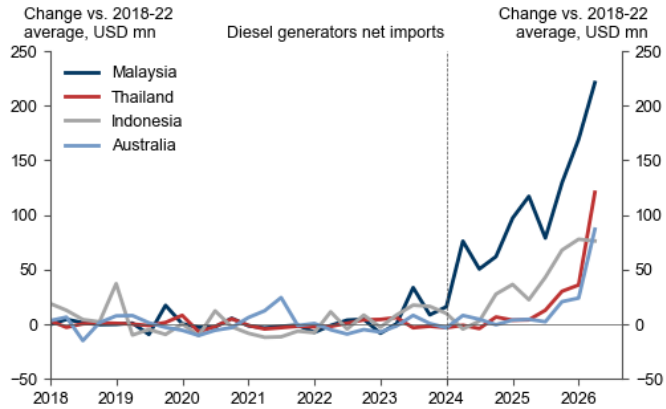
As a cross-check of the relative scale of data center construction across these economies, Exhibit 10 displays net imports of high-capacity diesel generators, one of the primary technologies employed as backup poweror data centers. [9] Hyperscale data centers typically require redundant backup poweror critical IT and essentialacility load. The figures are consistent with a substantial ramp-up in data centers across ASEAN and corroborate the relatively larger estimated impact in Malaysia.[10]

but order-of-magnitude of growth contribution, largely aunction of incremental GW, should remain in a range of 10-40bps annually.

[9] IEA, Energy and AI report (2025), p. 90-91.

[10] The prerequisiteor using generator imports as a proxy is that countries of interest should be net importers of such equipment. Mainland China,or example, is generally a net exporter of power equipment and hence it might be difficult to infer its domestic data center construction from trade data.

Exhibit 10: Upstream trade flows corroborate the scale of data center expansion, with net imports of diesel generators reaching multi-year highs across major hubs



Diesel generators are HS 850213. Data as of 2026 Q1.

Source: Trade Map, Goldman Sachs Global Investment Research

While construction activities lift domestic investment, data centers can also contribute to growth via service exports once in operation. To examine this, we compare tech service trade balance trends across APAC. Exhibit 11 shows that Malaysia ICT service balance improved from a deficit of 20bp of GDP as of Q2 2025 to a surplus of 30bp of GDP as of Q2 2026 on a rolling-four-quarter basis, as data center capacity expanded. Last year was also the first year since 2011 that Malaysia posted an overall services surplus. Johor's data center expansion, once completed, could translate into cross-border ICT service exports back to Singapore given its proximity and low latency.[11] By contrast, data centers in Thailand or Indonesia are more likely to be anchored on domestic activity[12] and hence completions in these countries might to a larger extent flow into intermediate business services and be less visible in the balance of payments.

Beyond these two channels, we note that data center investments can also generate second-order local spillovers through upward pressure on wages for related construction jobs[13], though we assess the effect to be limited at the macro level. Construction typically requires thousands of workers, which generate a front-loaded employment impulse anecdotally based on industry research and hyperscaler announcements, but permanent employment is generally in the low hundreds as operations are labor-light.[14]

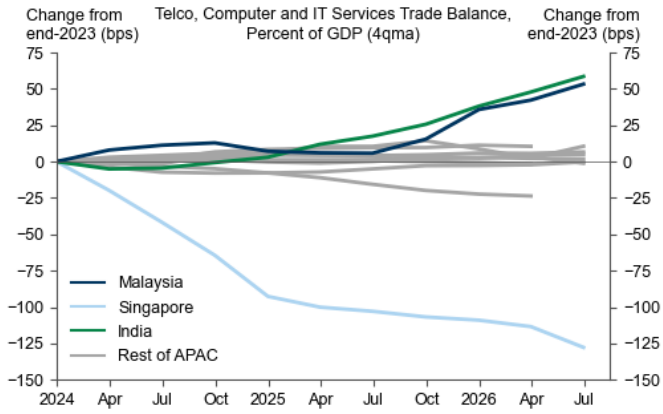
[11] Reuters in July described that Johor was "the overwhelming, $35 billion beneficiary of Singapore's 2019-2022 moratorium on new data centres" due to the latter's land, water and electricity constraint.

[12] From our TMT team, Bangkok serves domestic cloud and inference, whereas Jakarta growth is underpinned by data localization needs.

[13] BNM in its Q3 2025 Bulletin also decomposed data center GDP contribution into investment (construction), consumption and ICT services trade.

[14] Brookings study in 2026 found that, based on US data, data centers do create local jobs, though fewer than industry advocates claim, and wages are unaffected by data center builds.

Exhibit 11: Malaysia's ICT service trade balance improved as data centers came online



Growth in India's ICT service trade reflects strength in its service exports, as India has emerged as a preferred location for multinational GCCs. Several AI firms have also expanded their presence in India.

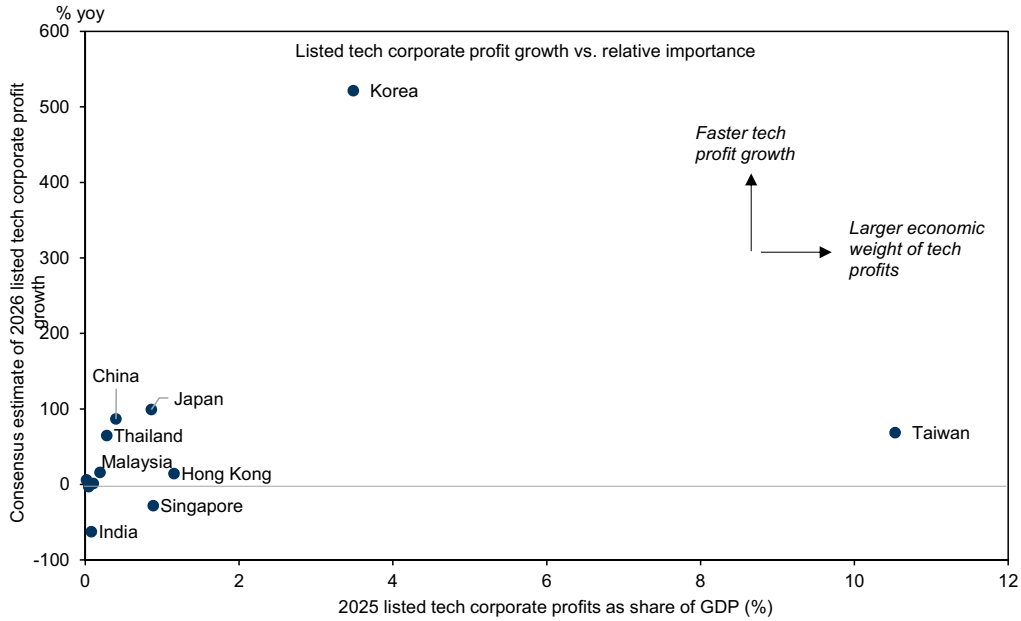
Source: Haver Analytics, Goldman Sachs Global Investment Research

Government spending – Revenue windfalls

For the most critical companies in the AI supply chain, revenues and profits have increased dramatically in recent years. This is most evident in Korea and Taiwan, where profits at the largest tech producers already account for a large share of total corporate profits, and are growing rapidly (Exhibit 12). Elsewhere in Asia, firms in ASEAN with downstream exposure tend to operate on thin margins, and in larger, diversified economies such as Japan and China, tech firms carry too little relative weight to move aggregate receipts substantially.[15]

[15] We acknowledge the methodological limitations of listed sampling, as some AI-relevant companies might be unlisted (e.g., ByteDance and Huawei in China) and some production facilities are foreign-owned (e.g., Micron's plant in Singapore or ASE's operations in Malaysia, for which standalone tax-payment data are unavailable). Nevertheless, these caveats do not alter the core conclusion regarding profit divergence between Korea/Taiwan and rest of Asia.

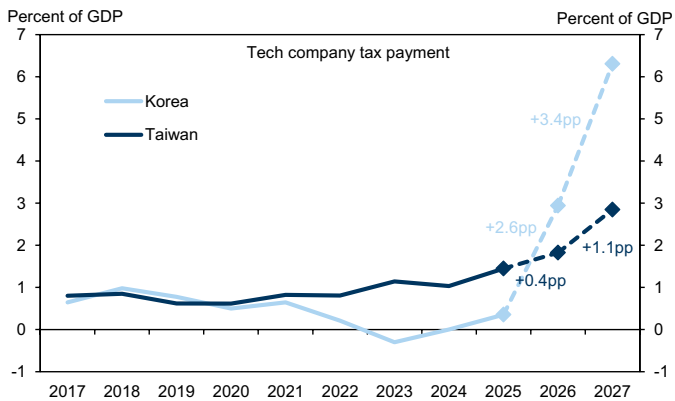
Exhibit 12: Outside of Korea and Taiwan, tech profits do not drive corporate tax revenues in most Asian economies



Source: Bloomberg, Goldman Sachs Global Investment Research

The growth boost from government spending is likely to become evident in 2027 and beyond. In Korea, taxes on 2026 earnings are paid once in August 2026 based on current-year estimated earnings, and finally settled in March 2027. The 2026 profit surge should therefore reach the Treasury partly by end-August and mostly by end-March. The main identifiable 2026 fiscal channel so far is April's supplementary budget, which was entirely funded by excess revenue and should boost 2026 GDP growth by 20bps per our earlier estimates. Similar dynamics apply to Taiwan, where interim settlement takes place in September and final settlement in May next year. Exhibit 13 shows our estimates for additional tax revenue in Korea and Taiwan, based on companies' accrued tax obligations adjusted for the tax calendar.

Exhibit 13: Rising corporate tax payments from tech exporters in Korea and Taiwan



Adjusted for calendar year basis. For example, 2026 is sum of final settlement for 2025 in March and interim payment in August.

Source: Bloomberg, Goldman Sachs Global Investment Research

We also caveat that excess revenue need not translate into concurrent excess spending one-to-one. A government can pursue consolidation, especially when it deems the revenue windfall as temporary or cyclical. Korea's recently-announced 2027 budget proposal saves around two-thirds of excess revenue (KRW104.4trn out of KRW162.3trn) as reserve funds within the Future Response Fund. This acts as a buffer against future tax-revenue volatility but limits the immediate growth pass-through for 2027. For Taiwan, the offsetting consolidation appears to be smaller, reflected in a much narrower change in budget balance from 2026 to 2027 and a universal TWD 10,000 payment in 2027 (80bps of GDP) framed as an AI dividend.[16]

Consumption – Equity wealth effect

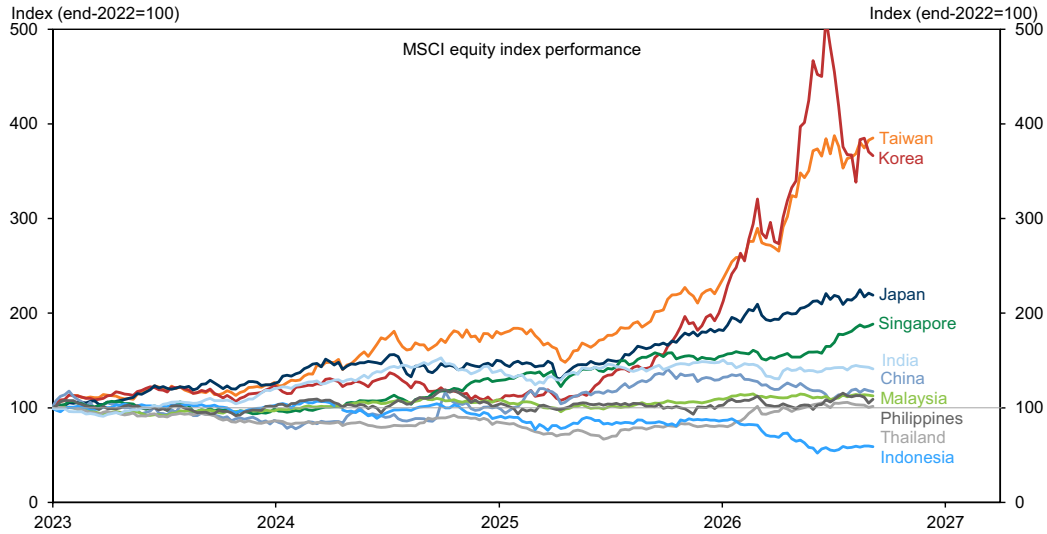
Regional equity indices have risen sharply in recent years, boosting household wealth. Post recent corrections, MSCI Korea and Taiwan are still up 85% and 65% year-to-date respectively, with tech producers driving the gains (Exhibit 14). We leveraged our portfolio strategy team's AI hardware baskets to decompose market capitalization gains attributable to AI-related stocks, and applied equity wealth coefficients from our earlier analysis. While the coefficient is small in Korea and Taiwan, due to factors including elevated existing leverage and concentrated equity ownership, the absolute scale of the equity boom still implies an estimated 15bp and 30bp GDP boost to Korea and Taiwan respectively.[17] For Japan, we previously estimated that a 10% rise in equity prices could boost consumption growth by around 30bp, which would also imply a 15bp GDP growth boost in 2026 from AI-related equity gains.

At the same time, we caveat that Asian households might also have substantial exposure to global/US equities that are AI-driven. This could potentially magnify our estimates above, though such transmission channels would again mostly apply to high-NIIP North Asia. We also expect labor-market transmission (wage effect) to be fairly muted, due to the capital-intensive, labor-light nature of tech manufacturing. We note that tech employment only constitutes around 10% of employment in Taiwan and 2% in Korea in 2025.

[16] Taiwan's central-government general budget would move from a small TWD 47.5bn deficit (less than 20bps of GDP) in 2026, to balance in the 2027 draft.

[17] We are applying the same equity wealth coefficient to Taiwan that we estimated for Korea. A CBC study in 2010 estimates the marginal propensity to consume at approximately 1.4 – 1.456 cents per TWD1 of additional equity wealth, similar to our estimate for Korea, which is around 1.6 cents.

Exhibit 14: AI-heavy Korea and Taiwan equity markets boosted household wealth significantly, whereas other local markets saw more moderate gains



Source: Bloomberg, Goldman Sachs Global Investment Research

Broadening AI dividend, though exports remain dominant

We present the aggregate results of our estimates by economy in Exhibit 15. AI remains the principal growth driver for Korea and Taiwan in 2026, reflecting their central positions in the value chain. Among ASEAN economies, Malaysia appears best placed to benefit, with meaningful exposure across semiconductor assembly and testing as well as data centers. The rest of Asia is also positioned to gain, though to differing degrees and through different channels. Taken together, however, tech exports remain the dominant transmission channel through which the AI investment cycle supports regional activity. Most other spillovers typically only amount to a few tenths of a percentage point of GDP. This is economically intuitive, as they are downstream effects of export strength, with export-generated profits ultimately funding additional investment, fiscal revenue and consumption.

This positioning is inherently double-edged. While the region is highly leveraged to the AI supply chain and has so far delivered robust growth thanks to the investment boom, such concentration leaves the region vulnerable to any reversal in AI investments. A moderation in hyperscaler capex, whether driven by higher financing costs, greater investor scrutiny of ROI or slower-than-expected progress in AI adoption, might generate a meaningful growth headwind for the region. However for now, signs of a broad-based retrenchment remain limited.[18]

Another risk is potential crowding out. Sustained demand for AI-related infrastructure could potentially divert productive resources – land, power capacity, and skilled technical labor – away from other sectors, leading to input cost inflation that squeezes non-AI industries. Evidence to-date, however, suggests that crowding-out has remained limited outside localized segments where demand-supply imbalances are most acute. Memory crowding-out is clearly visible, as memory suppliers prioritize HBM over

[18] Our global economics team in August utilized a broad set of leading indicators, including PMIs and price data, suggesting a still-robust near-term growth outlook.

consumer applications due to exceptionally strong AI-server demand,orcing PC and smartphone producers to absorb higher costs. Capital crowding-out is another example, with hyperscaler competitionor financing [19] among theactors driving up global yields, though thusar this does not appear to be presenting significantunding constraints in Asia.

Exhibit 15: We estimate substantial growth contributions from the AI investment boom—mostly via regional exports

[19] Our global economics team's rule-of-thumb estimate implies that, in the US, AI-related issuance last year had a roughly 5bps impact on borrowing rates and would reduce investments by about $10bn.

Appendix: Definitions

Sectoral definitions for tech corporates in Exhibit 7

GICS sub-industry	Name
45201020	Communications Equipment
45202030	Technology Hardware, Storage & Peripherals
45203010	Electronic Equipment & Instruments
45203015	Electronic Components
45203020	Electronic Manufacturing Services
45301020	Semiconductors

Source: Goldman Sachs Global Investment Research

Sectoral definitions for tech corporates in Exhibit 12

GICS sub-industry	Name
20104010	Electrical Components & Equipment
45102030	Internet Services & Infrastructure
45201020	Communications Equipment
45202030	Technology Hardware, Storage & Peripherals
45203010	Electronic Equipment & Instruments
45203015	Electronic Components
45203020	Electronic Manufacturing Services
45203030	Technology Distributors
45301010	Semiconductor Materials & Equipment
45301020	Semiconductors
50101010	Alternative Carriers
50101020	Integrated Telecommunication Services
60108050	Data Center REITs

Source: Goldman Sachs Global Investment Research

Samson Yau

Andrew Tilton

Samson Yau is an intern in the Asia economics research group.

Asia-Pacific Economics Team

Andrew Tilton
+852-2978-1802
andrew.tilton@gs.com
Goldman Sachs (Asia) L.L.C.

Andrew Boak, CFA
+61(2)9321-8576
andrew.boak@gs.com
Goldman Sachs Australia Pty Ltd

Goohoon Kwon, CFA
+852-2978-0048
goohoon.kwon@gs.com
Goldman Sachs (Asia) L.L.C.

Santanu Sengupta
+91(22)6616-9042
santanu.sengupta@gs.com
Goldman Sachs India SPL

Hui Shan
+852-2978-6634
hui.shan@gs.com
Goldman Sachs (Asia) L.L.C.

Danny Suwanapruti
+65-6889-1987
danny.suwanapruti@gs.com
Goldman Sachs (Singapore) Pte

Xinquan Chen
+852-2978-2418
xinquan.chen@gs.com
Goldman Sachs (Asia) L.L.C.

Irene Choi
+82(2)3788-1722
irene.choi@gs.com
Goldman Sachs (Asia) L.L.C., Seoul Branch

Will Maher
+61(2)9320-1013
will.maher@gs.com
Goldman Sachs Australia Pty Ltd

Tomohiro Ota
+81(3)4587-9984
tomohiro.ota@gs.com
Goldman Sachs Japan Co., Ltd.

Yuriko Tanaka
+81(3)4587-9964
yuriko.tanaka@gs.com
Goldman Sachs Japan Co., Ltd.

Lisheng Wang
+852-3966-4004
lisheng.wang@gs.com
Goldman Sachs (Asia) L.L.C.

Chris Poh
+65-6889-3454
chris.poh@gs.com
Goldman Sachs (Singapore) Pte

Oscar To
+61(2)9320-1367
oscar.to@gs.com
Goldman Sachs Australia Pty Ltd

Arjun Varma
+91(22)6616-9043
arjun.varma@gs.com
Goldman Sachs India SPL

Yuting Yang
+852-2978-7283
yuting.y.yang@gs.com
Goldman Sachs (Asia) L.L.C.

Chelsea Song
+852-2978-0106
chelsea.song@gs.com
Goldman Sachs (Asia) L.L.C.

Disclosure Appendix

Reg AC

I, Andrew Tilton, hereby certify that all of the views expressed in this report accurately reflect my personal views, which have not been influenced by considerations of the firm's business or client relationships.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

Contributing Authors: Andrew Tilton Goldman Sachs (Asia) L.L.C., Goohoon Kwon, CFA Goldman Sachs (Asia) L.L.C., Irene Choi Goldman Sachs (Asia) L.L.C., Seoul Branch.

Unless otherwise stated, the individuals listed in the Contributing Authors disclosure of this report are analysts in Goldman Sachs' Global Investment Research division.

Disclosures

Regulatory disclosures

Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; registered market maker. Goldman Sachs trades or may trade as a principal in debt securities (or in related derivatives) of issuers discussed in this report.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage. **Analyst compensation:** Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy generally prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director or advisor of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman Sachs & Co. LLC and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with a subject company, public appearances and trading in securities covered by the analysts.

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of Global Investment Research of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client's objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client's own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs' Australian Sell-Side Research Independence Policy Statement are available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Brazil:** Disclosure information in relation to CVM Resolution n. 20 is available at https://www.gs.com/worldwide/brazil/area/gir/index.html. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Resolution n. 20, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** This information is being provided to you for information purposes only and is not, and under no circumstances should be construed as, an advertisement, offering or solicitation by Goldman Sachs & Co. LLC for purchasers of securities in Canada to trade in any Canadian security. Goldman Sachs & Co. LLC is not registered as a dealer in any jurisdiction in Canada under applicable Canadian securities laws and generally is not permitted to trade in Canadian securities and may be prohibited from selling certain securities and products in certain jurisdictions in Canada. If you wish to trade in any Canadian securities or other products in Canada please contact Goldman Sachs Canada Inc., an affiliate of The Goldman Sachs Group Inc., or another registered Canadian dealer. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 10th Floor, Ascent-Worli, Sudam Kalu Ahire Marg, Worli, Mumbai-400 025, India, Corporate Identity Number U74140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. Registration granted by SEBI and certification from NISM in no way guarantee performance of the intermediary or provide any assurance of returns to investors. Goldman Sachs (India) Securities Private Limited compliance officer and investor grievance contact details, a copy of the annual compliance audit report and other relevant information and disclosures can be found at this link: https://www.goldmansachs.com/worldwide/india/research-analyst. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for "professional investors" within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither "registered banks" nor "deposit takers" (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for "wholesale clients" (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have

been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union and United Kingdom: Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council (including as that Delegated Regulation is implemented into United Kingdom domestic law and regulation following the United Kingdom's departure from the European Union and the European Economic Area) with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at https://www.gs.com/disclosures/europeanpolicy.html which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan Type II Financial Instruments Firms Association, and Investment Management Association of Japan. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Global product; distributing entities

Goldman Sachs Global Investment Research produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Public Communication Channel Goldman Sachs Brazil: 0800 727 5764 and / or contatogoldmanbrasil@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou contatogoldmanbrasil@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom.

Goldman Sachs International ("GSI"), authorised by the Prudential Regulation Authority ("PRA") and regulated by the Financial Conduct Authority ("FCA") and the PRA, has approved this research in connection with its distribution in the United Kingdom.

European Economic Area: Goldman Sachs Bank Europe SE ("GSBE") is a credit institution incorporated in Germany and, within the Single Supervisory Mechanism, subject to direct prudential supervision by the European Central Bank and in other respects supervised by German Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) and Deutsche Bundesbank and disseminates research within the European Economic Area.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by Global Investment Research. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (https://www.sipc.org).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

We and our affiliates, officers, directors, and employees will from time to time have long or short positions in, act as principal in, make a market or act as liquidity provider in, and buy or sell, any securities, derivatives, or other financial instruments referred to in this research (including any financial instruments issued by the companies referred to herein), unless otherwise prohibited by regulation or Goldman Sachs policy.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is focused on investment themes across markets, industries and sectors. It does not attempt to distinguish between the prospects or performance of, or provide analysis of, individual companies within any industry or sector we describe.

Any trading recommendation in this research relating to an equity or credit security or securities within an industry or sector is reflective of the investment theme being discussed and is not a recommendation of any such security in isolation.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at https://www.theocc.com/about/publications/character-risks.jsp and https://www.goldmansachs.com/disclosures/cftc_fcm_disclosures. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by Goldman Sachs Global Investment Research may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your

individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to https://research.gs.com.

Disclosure information is also available at https://www.gs.com/research/hedge.html or from Research Compliance, 200 West Street, New York, NY 10282.

© 2026 Goldman Sachs.

You are permitted to store, display, analyze, modify, reformat, and print the information made available to you via this service only for your own use. You may not resell or reverse engineer this information to calculate or develop any index for disclosure and/or marketing or create any other derivative works or commercial product(s), data or offering(s) without the express written consent of Goldman Sachs. You are not permitted to publish, transmit, or otherwise reproduce this information, in whole or in part, in any format to any third party without the express written consent of Goldman Sachs. This foregoing restriction includes, without limitation, using, extracting, downloading or retrieving this information, in whole or in part, to train or finetune a machine learning or artificial intelligence system, or to provide or reproduce this information, in whole or in part, as a prompt or input to any such system.