Timothy Moe, CFA
+65-6889-1199
timothy.moe@gs.com
Goldman Sachs (Singapore) Pte

Alvin So, CFA
+852-2978-1585
alvin.so@gs.com
Goldman Sachs (Asia) L.L.C.

Sunil Koul
+65-6654-5042
sunil.koul@gs.com
Goldman Sachs (Singapore) Pte

Kinger Lau, CFA
+852-2978-1224
kinger.lau@gs.com
Goldman Sachs (Asia) L.L.C.

John Kwon
+65-6654-6337
jongmin.kwon@gs.com
Goldman Sachs (Singapore) Pte

Amorita Goel
+65-6654-5445
amorita.goel@gs.com
Goldman Sachs (Singapore) Pte

GLOBAL STRATEGY PAPER NO. 58

The Asian earnings enigma

A decade of underperformance. From 2000-2010, Asian regional equity markets (MXASJ) outperformed developed markets (MSCI World) by 90%. However, from 2011-2021, the region underperformed the MSCI World index by 45%, unwinding all its previous outperformance. We focus on why this happened and how it might change.

Earnings growth fell short. Weak profit growth accounts for most of the region's underperformance, notably vs. the US. After compounding at 13% during 2000-2010, profit growth dropped to 7% during 2011-2021, with most years below 4%.

Why did earnings disappoint? The *mechanics* of the drop in earnings growth are mainly lower non-financial ROEs on slower revenue growth and slimmer margins; weaker financial profit growth as interest rates declined; and index rebalancing effects as tech company inclusion diluted index EPS. The *reasons* for poor earnings growth are largely a structural shift in the competitive environment, driven by a lower contribution from trade, a reversal in commodity prices, and technology disruption which pressured companies with low pricing power.

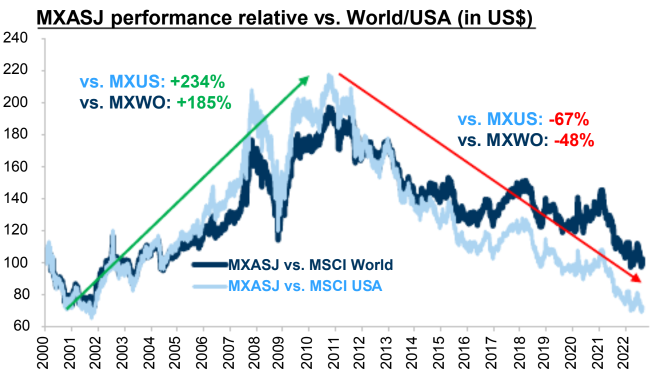
How might this change? Regional trend earnings growth may improve to 10% over the next five years based on our macro model which accounts for the expected macro backdrop, changes in macro sensitivities, and shifts in sector weights. India and parts of ASEAN are apt to grow fastest, as are parts of tech and consumer sectors. China and north Asia are likely to grow in line with the region. Leveraging our sector analysts, we highlight 30 sub-themes in 8 key areas that account for 30% of current regional earnings and may drive growth in coming years.

What should investors do? 1) 2-year 80/110% risk reversals on HSCEI and KOSPI200, and 2-year total return swaps on MSCI India, Indonesia and Philippines; 2) country-sectors with attractive EPS growth and valuation trade-offs; 3) GS buy-rated stocks in thematic growth areas: our list of 50 names offers median 24%/29% 2022-2024 revenue/earnings CAGRs at 0.8x PEG ratio and >50% upside to GS 12m target prices.

Table of Contents

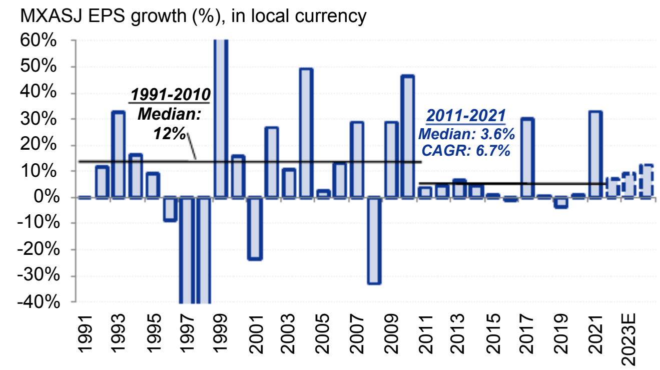
The Asian earnings enigma: Key thesis in 10 charts

Exhibit 1: A perplexing roundtrip: after a decade of outperformance vs. developed markets, Asian regional equities have underperformed for the past ten years



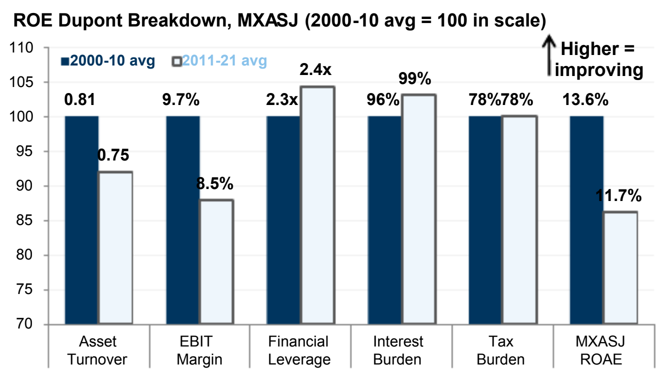
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 2: Weak profit growth accounts for most of the region's underperformance; After low-to-mid teens growth in the 1990s and 2000s, Asian regional earnings growth downshifted to 7% CAGR over the past 11 years, with most years <4%



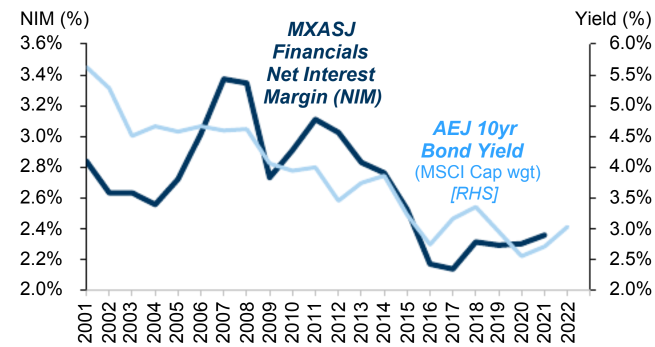
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 3: DuPont ROE breakdown shows declining asset turns and margins were the main drivers of lower profitability



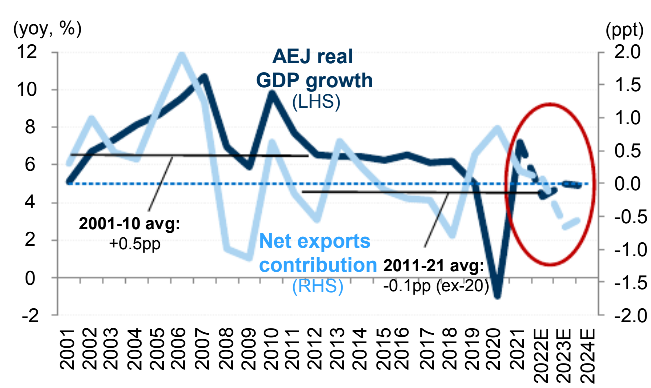
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 4: The heavyweight financial sector also posted lower earnings growth in the past decade as interest rates declined



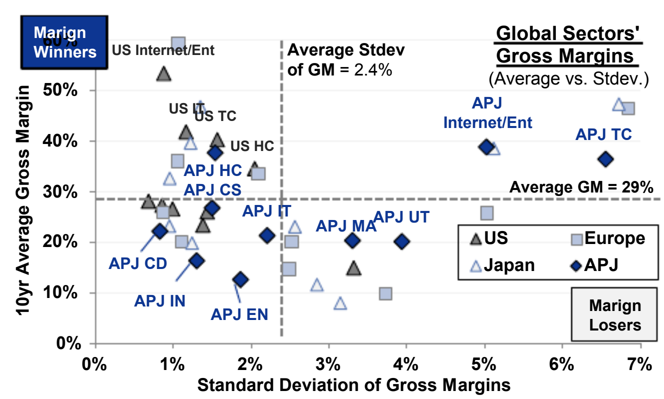
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 5: Earnings have had a lower boost from trade in the past decade as Asia's competitive advantage moderated



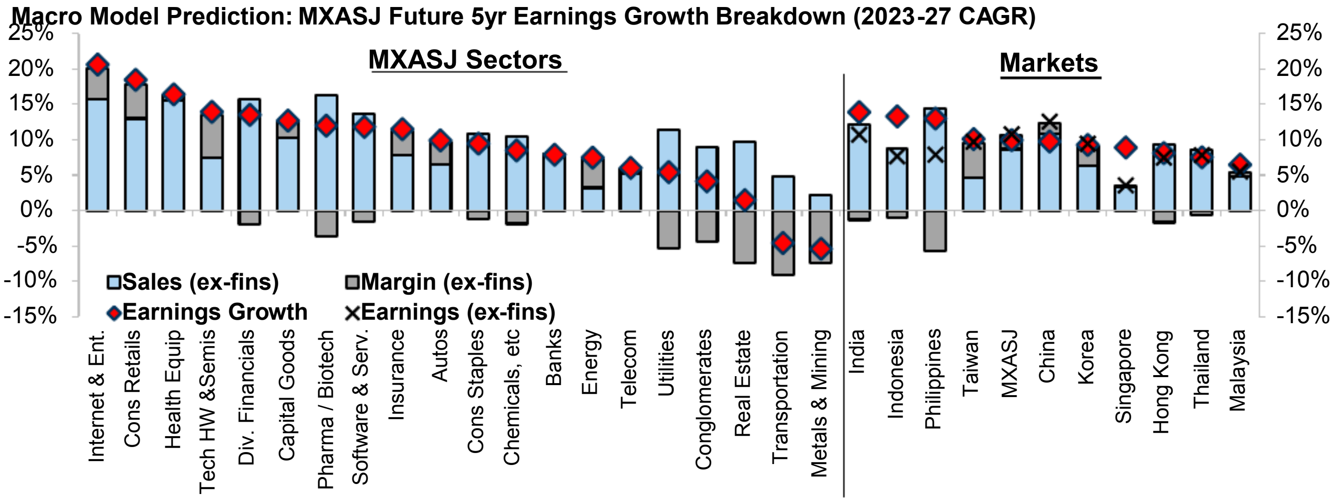
Source: CEIC, Goldman Sachs Global Investment Research

Exhibit 6: Technology disruption has pressured Asian companies more than DM counterparts given lower pricing power



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 7: Regional earnings growth may improve to 10% over the next five years; India and parts of ASEAN are apt to grow fastest as are parts of tech and consumer sectors; China and north Asia are likely to grow in line with the region



Source: Goldman Sachs Global Investment Research

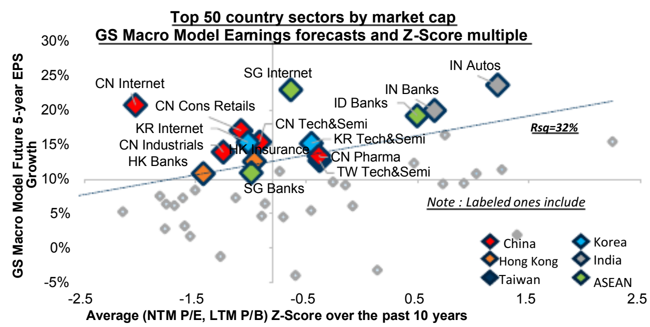
Exhibit 8: Macro variable sensitivities help gauge how the various regions may respond to changes in the macro environment

Earnings Growth Sensitivity to Macro Variables
(shown in t-Stats significance)

MXASJ Markets	Growth	Inflation	Rates	Commodity	Asian FX	Rsq
MXASJ	6.1	3.6	(0.8)	(1.1)	1.0	74%
China	5.6	3.8	(0.9)	(1.9)	1.2	77%
Taiwan	8.6	2.6	0.0	0.8	(0.5)	78%
Korea	6.3	4.7	(1.1)	0.4	2.8	71%
Hong Kong	4.7	2.8	(0.6)	(0.6)	0.4	69%
Singapore	7.4	0.6	0.9	(2.1)	(0.5)	66%
India	5.0	3.6	(1.4)	(2.0)	0.3	60%
Indonesia	7.6	5.9	(0.6)	2.4	(2.6)	82%
Malaysia	4.1	3.5	(0.7)	0.2	(0.0)	72%
Thailand	5.2	3.7	(2.1)	1.6	0.2	72%
Philippines	8.6	2.6	(0.9)	(0.1)	1.6	68%

Source: Goldman Sachs Global Investment Research

Exhibit 9: We highlight the the top 15 country-sectors with attractive EPS growth and valuation trade-offs



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 10: We highlight 8 broad growth themes and 30 specific sub-themes that hold the prospect of significant growth in coming years, along with 3 implementation ideas

Key Growth Areas in the Asia ex-Japan region

S.no	Key Themes	Sub-themes/Key growth areas	Key markets
1	Technology upgrade / Tech self-sufficiency	Autonomous driving software; Cloud computing/data storage; Cybersecurity; DRAM; Factory automation; Foundry (core semiconductor mfg.); Silicon carbide (SiC) transition	China, Korea, Taiwan
2	Import substitution / Supply chain security	Advanced materials: Fine ceramics, polymers; Speciality chem.: Performance additives, lubricants	China
3	Green-economy / De-carbonization	Batteries; Electric vehicles adoption; Energy storage (ESS); Green energy: Solar installation ; Precision cooling	China, Korea
4	Agritech / Food security	Advanced feed additives; Animal health; Bio-tech seeds	China
5	Healthcare / Biotech	Biotech; Generic injectables; Medical devices	China, India
6	Digitization of consumption and services	Digital advertising ; Digital payments; E-commerce ; Food Delivery /Local services; Immersive short-form video (SFV); Staffing (Formalization of workforce)	China, India, SG
7	Financialization of household savings / Fin-tech	Brokers, Insurance/Mutual funds; Supply chain finance (SCF) technology	China, India
8	Traditional growth areas	Consumption recovery (Sportwear, Food Service); Mfg. / Infrastructure (EMS, Logistics)	China, India

Implementation Ideas

1	Long-dated options/swaps	2-year 80/110% risk reversals on HSCEI and KOSPI 200; 2-year total return swap (TRS) on India/Indo/Phils
2	Attractive country-sectors	Top 15 country-sectors with attractive growth/valuation trade-off; Examples include internet in China, Korea and Singapore, select banks, tech H/W, semi; China industrials and pharma; Indian autos, among others
3	Stocks in thematic growth areas	50 GS buy-rated stocks in thematic growth areas, offering 24%/29% 2022-24 sales/EPS CAGR at 24x P/E

Source: Goldman Sachs Global Investment Research

The Asian earnings enigma

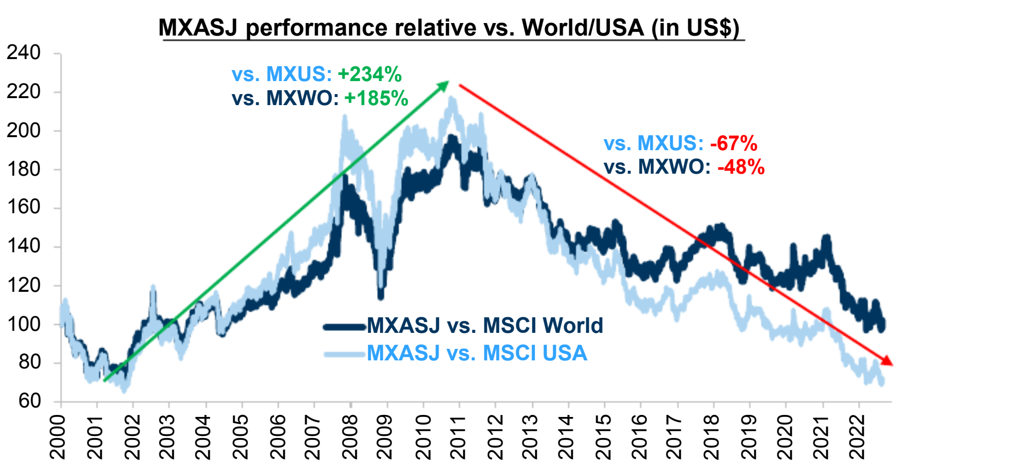
At its core, the investment case for emerging markets is that they have the potential to deliver higher returns than developed markets, albeit with higher volatility. The key to this argument is that emerging economies have higher growth potential because they are at earlier stages in their development and therefore should be able to grow more quickly than their more mature counterparts, as long as the appropriate policy and regulatory conditions are in place to ensure that potential growth can become actual growth.

For Asia ex-Japan markets, this was the case for the first decade of this century. From the start of 2000 to the peak in relative performance at the end of 2010, the MSCI Asia ex-Japan index outperformed the MSCI World index by 90% in dollar terms. **However, from 2011-2021, the MXASJ index underperformed developed markets** (MSCI World Index) **by 45%**, unwinding virtually all its previous outperformance in a disappointing round trip return to its starting level in 2000. The performance disparity vs. the world ex-US during the two decades is striking but not as extreme: from 2000-2010, the MXASJ index outperformed the MSCI World ex USA index by 70% but only delivered in-line performance during the 2011-2021 period. Understanding why this happened and how it might change is the focus of this piece.

We address four key questions in this report:

- Why have Asian markets not performed as well as economic growth - and growth differentials with DM economies - might suggest?
- Why have Asian earnings disappointed?
- How might this change in future?
- What should investors do?

Exhibit 11: A perplexing roundtrip: after a decade of outperformance vs. developed markets, Asian regional equities have underperformed for the past ten years



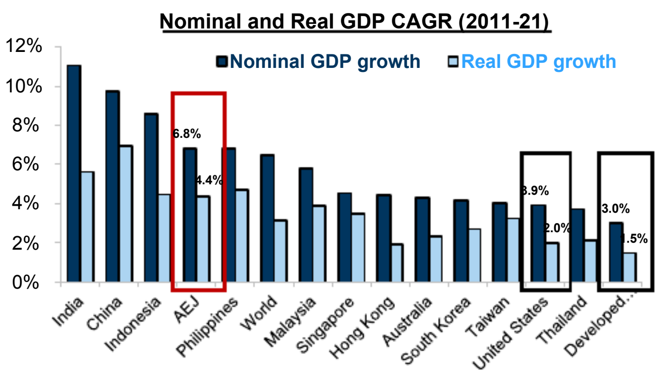
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Q1: Why have Asian markets not performed as well as economic growth might suggest? Because earnings growth has fallen short

Asian economic growth has generally been robust over the 11 years from 2011-2021 and surpassed that of developed markets. GDP growth in both nominal and real terms has been led by India and China (roughly 10% and 7%, respectively), with the Asia ex-Japan region registering 6.8% and 4.4% annualized nominal and real growth overall. This outstripped aggregate developed market economic growth (3.0%/1.5% nominal/real) and the US individually (3.9%/2.0%).

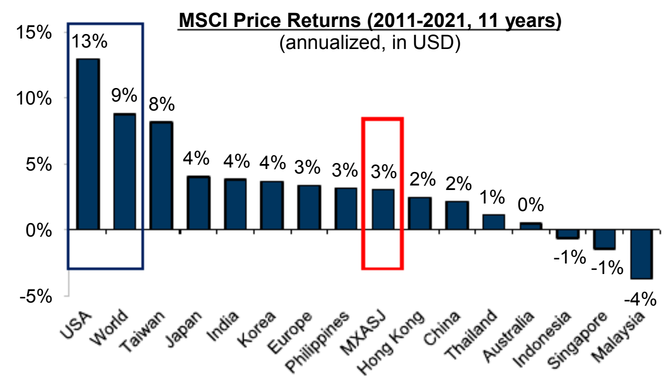
However, Asia's equity market performance has generally not matched its economic growth. The MXASJ index's compound annual growth rate from 2011-2021 was 3%, less than half its nominal economic growth rate. There were wide variations within the region, with Taiwan and India/Korea delivering 8% and 4% annual returns on the high end and HK/China (+2%) and the ASEAN markets (-4% to +3%) on the low end. But overall, the region's market performance paled in comparison to the US (13% annual return) and the developed world index (9%), both about 3x nominal GDP.

Exhibit 12: Asia's economic growth has generally surpassed that of developed economies over the past decade...



Source: Goldman Sachs Global Investment Research

Exhibit 13: ... but the region's equity market performance has not matched its economic growth, with only a few exceptions

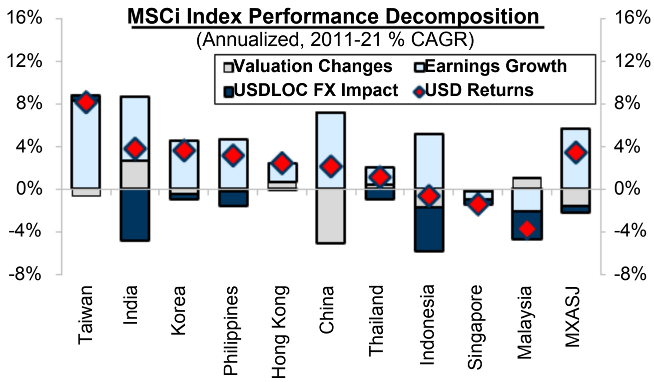


Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Decomposing USD returns into the contributions from earnings, valuation and currency changes, **weak earnings growth was generally the main factor driving the overall softer equity performance.** For the region as a whole, annual earnings growth was just 6.6%, ranging from Taiwan and China on the high end (8% and 7%) to Malaysia on the low side (-2%). Even though US equity returns were boosted by 4% annual P/E expansion, underlying earnings growth was robust at 9%. The contrast between strong DM earnings delivery, both in absolute terms and relative to economic growth, and weaker Asian regional earnings growth is striking.

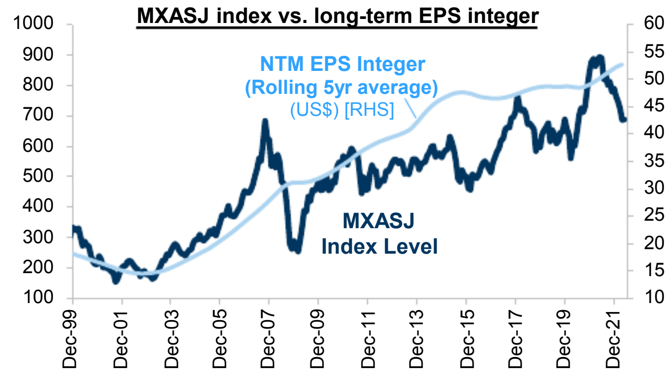
The centrality of earnings to equity performance can be easily seen by plotting the regional equity index vs. its underlying earnings. Index moves are generally more pronounced than the constituents' profits because valuations tend to expand and contract as investor optimism waxes and wanes. Over time, however, valuations tend to mean revert leaving profits as the main driver of market returns.

Exhibit 14: Valuation and currency change explain part of the region's underperformance, but the key factor is earnings



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 15: Earnings drive equity performance over the long run; valuation change drives shorter-term performance

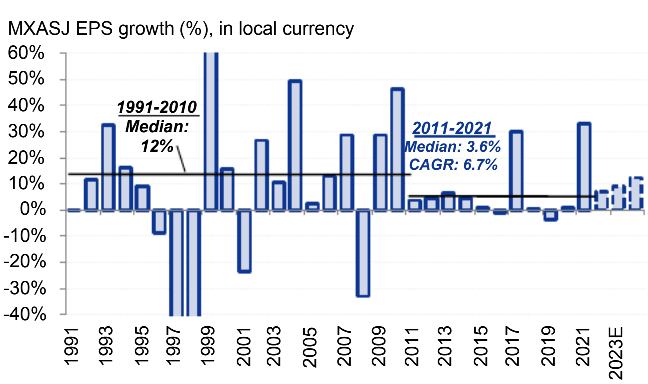


Source: Datastream, FactSet, I/B/E/S, MSCI, Goldman Sachs Global Investment Research

The long-term time series of regional earnings growth shows the downshift in earnings growth that occurred starting in 2011. From the index's inception at end-1987 until 2010, median EPS growth was 12%. Annual growth variation was quite high, because these two-plus decades include two periods of extreme macro turmoil: the Asian Financial Crisis and the Global Financial Crisis. If the sharp profit declines of these crises are excluded along with the immediately ensuing recovery years, annual growth would have been even higher at 14%. Since 2011, median annual earnings growth fell to just 3.6% and the CAGR was a modest 6.6%. We examined why this occurred in a ~~previous strategy paper, and~~ we update and expand the analysis in this one.

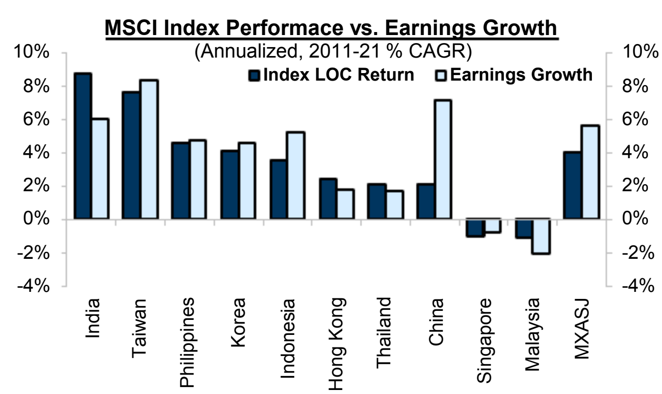
Within the region, earnings growth rates have generally aligned well with local currency annual returns. A few markets (notably India) have seen persistent valuation expansion and some (Taiwan and China) have seen index performance fall short of profit delivery as valuations compressed. But overall, regional performance has closely matched profit growth which underscores the importance of this fundamental driver.

Exhibit 16: After low-to-mid teens growth in the 1990s and 2000s, Asian regional earnings growth downshifted to 7% CAGR over the past 11 years



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 17: Across the region, earnings growth and local index returns have generally been well-aligned, which demonstrates the importance of profits to equity performance



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Q2: Why have regional earnings fallen short?

As we have shown, a marked downshift in earnings growth is the key reason why Asian regional equity markets underperformed developed markets over the past decade. Changes in valuations and exchange rates also contributed, but earnings have been the key driver. So the obvious question is: why have earnings fallen short?

We address the earnings shortfall in two broad ways**. First, we examine the accounting and statistical evidence to identify the mechanics of the drop in earnings growth**. The main insights are a) non-financial ROEs compressed, largely because of a drop in asset turns; b) financial sector (mainly banks) earnings growth dropped in a low interest rate environment; and c) index rebalancing- notably the addition of high valuation tech companies- had a substantial dilutive effect on index earnings per share.

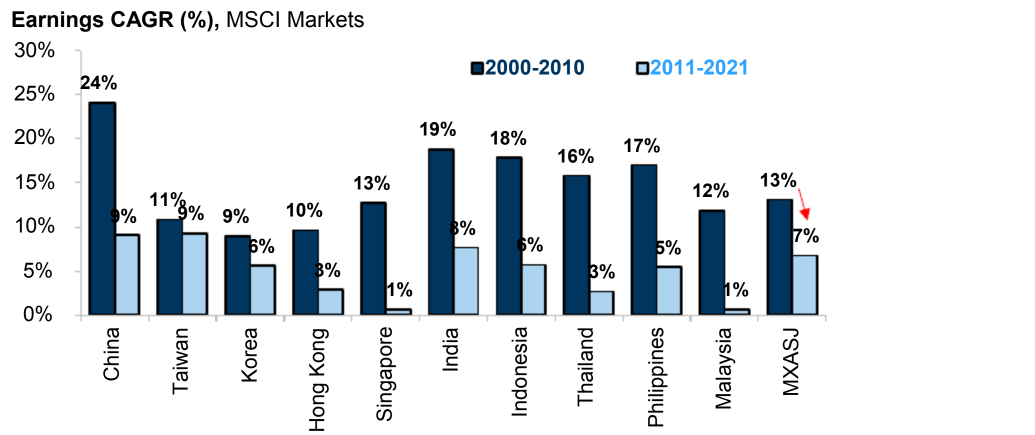
Second, we consider the fundamental reasons why Asian earnings growth slowed during the past decade. These include a) a lower boost from trade as competitive advantage moderated; b) lower interest rates which impacted earnings through financials and the investment cycle; c) lower commodity prices which appear to have contributed to a downshift in revenue growth; and d) technology change and disruption, which has been less favorable and more challenging for Asia than the US. While these factors do not account for the entirety of the downshift in earnings growth, we believe they help explain the persistently low level of earnings growth from 2011-2021.

Understanding the mechanics of the deceleration in regional earnings growth

We compare financial performance of the Asia ex-Japan regional index and its component markets over the 2000-2010 and 2011-2021 periods. The insights from this analysis are essential to understanding why equity markets generally performed poorly during the most recent decade and how they might do better in coming years.

- **Earnings growth fell across the region**. The compound annual growth rate (CAGR) of regional index profits decreased from 13% from 2000-2010 to 7% over the 2011-2021 period. The median annual growth rate over the past decade was less than 4%, with the 7% CAGR boosted by strong growth in just 2 years (2017 and 2021).
- **Growth in every market dropped**. The most substantial changes were in China, India and ASEAN; Taiwan was most resilient with growth moderating from 11% to 9%.

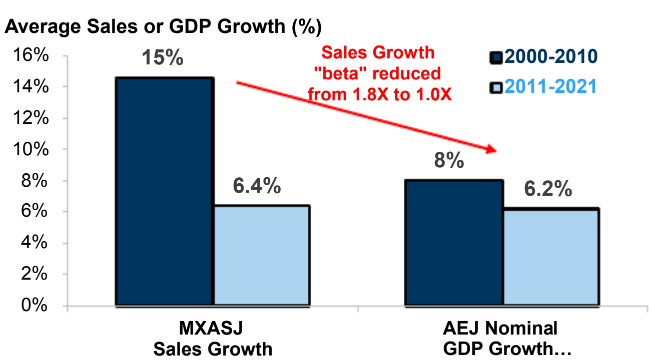
Exhibit 18: Profit growth declined across the region during the past decade



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

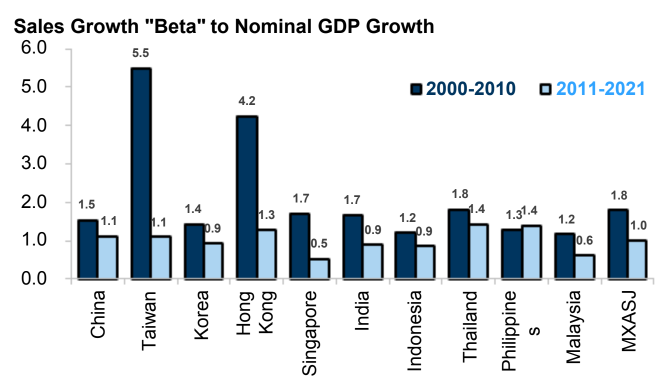
- **Revenue growth dropped sharply and to a much greater degree than nominal economic growth.** Non-financial revenue growth dropped from 15% to 6% whereas nominal GDP only eased from 8% to 6% over the respective 2000-2010 and 2011-2021 periods. This means that **revenue growth fell from nearly 2x nominal GDP to 1x** during these periods. This reduction in 'economic growth beta' is the main reason for the earnings growth shortfall. We explore some apparent drivers of this after our financial analysis.
- **Higher operating leverage magnified the decline in revenue growth.** Operating leverage increased over the two study periods from 0.8x to 1.3x EBIT/sales. This shows that companies improved their efficiency but also that their earnings sensitivity to slower revenue growth increased.

Exhibit 19: The 'economic beta' of regional revenues vs. nominal GDP fell from nearly 2x to 1x



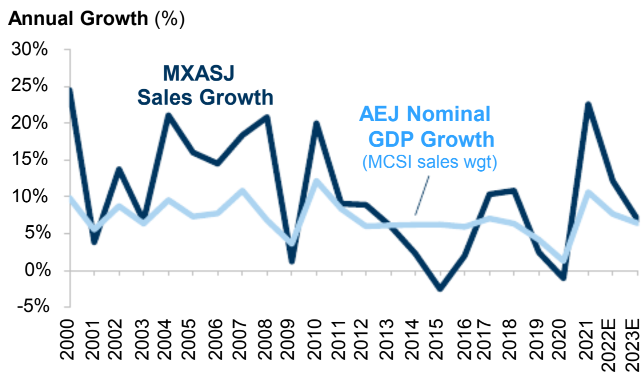
Source: FactSet, MSCI, Haver, Goldman Sachs Global Investment Research

Exhibit 20: The sensitivity of revenue growth to nominal GDP growth dropped in every market between 2000-2010 and 2011-2021



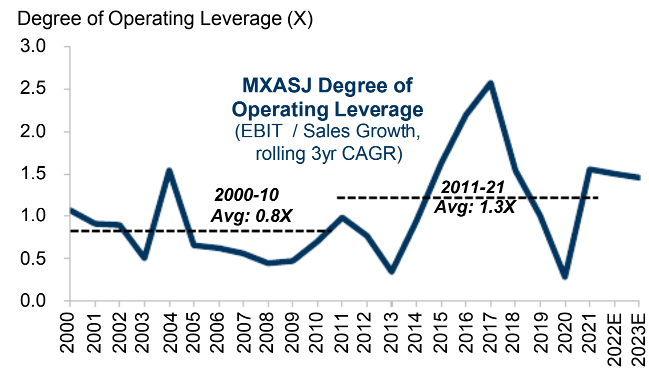
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 21: Revenue growth was typically above nominal GDP growth in the early 2000s but much less so in the next decade



Source: FactSet, MSCI, Haver, Goldman Sachs Global Investment Research

Exhibit 22: Operating leverage increased which heightened sensitivity to slower revenue growth

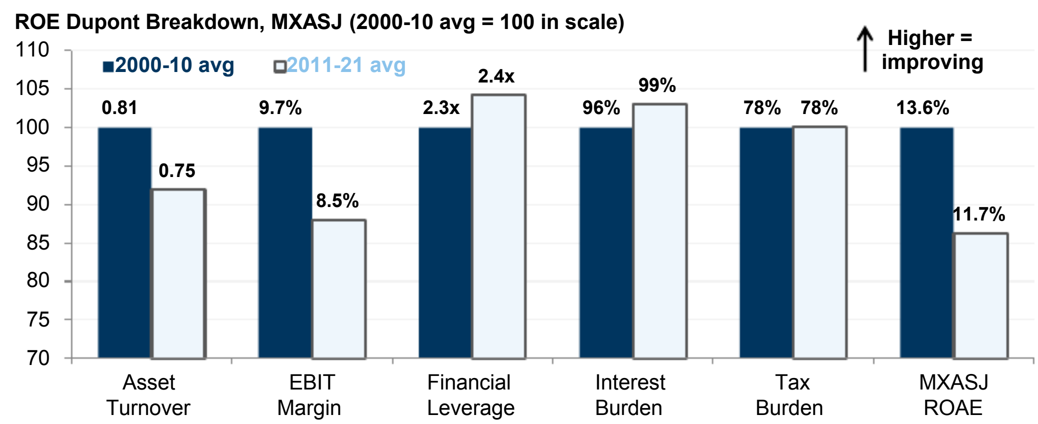


Source: FactSet, MSCI, Goldman Sachs Global Investment Research

- **DuPont ROE breakdown shows declining asset turns and margins were the main drivers of lower profitability**. The region's return on average equity declined nearly 200bp from 2000-2010 to 2011-2021. Disaggregating ROE into its DuPont constituents shows that the main factors behind this decline were the core fundamentals of asset turnover and EBIT margins. Financial leverage increased mildly, interest costs reduced a bit and tax effects were stable.

We show individual market details in Appendix I. Most markets recorded lower ROEs in the second period, driven by lower asset turns and margins.

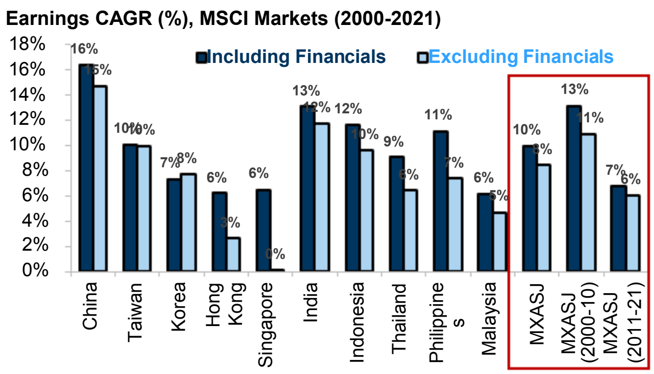
Exhibit 23: Lower asset turns and EBIT margins are the main reasons regional ROE declined 200 bp



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

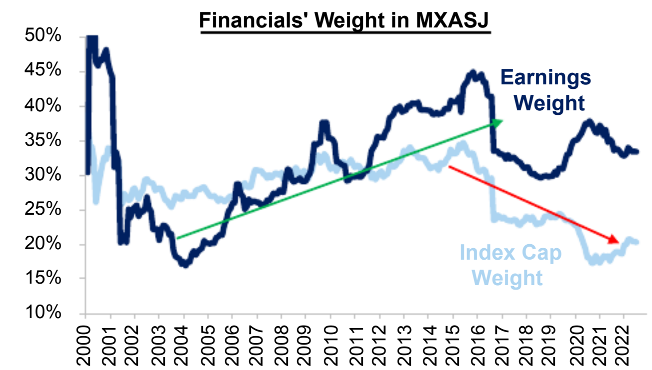
- **The heavyweight financial sector also posted lower earnings growth in the past decade.** Although the index cap weight of financials in the MXASJ index has dropped from roughly 30% to 20% in the past decade, its contribution to aggregate index earnings remains substantial at close to 35%. Index profit growth has been slightly better with financials than without them: in the two successive decades it was 13% and 7% overall, but 11% and 6% excluding financials. However, net income growth still dropped for this substantial part of the market- from 18% to 9% in the successive decades- reflecting slower loan growth, lower net interest margins, and reduced non-interest income growth, driven by the lower rate environment and heightened competitive pressure.

Exhibit 24: Regional earnings growth has been somewhat better with financials



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 25: Financials earnings weight in the regional index is close to 35%, well above their index cap weight of 20%



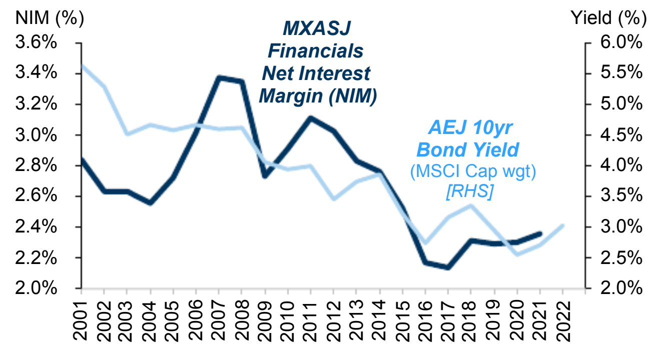
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 26: Financials earnings growth declined between 2000s and 2010s

MXASJ Banks Aggregate	Avg 2001-10	Avg 2011-21	Avg 2011-15	Avg 2016-21
Gross Loan Growth	13%	9%	9%	9%
Net Interest Income Growth	13%	7%	9%	5%
NIM	2.9%	2.5%	2.9%	2.3%
Provision as % of Gross Loan	1.0%	0.6%	0.5%	0.7%
Non-Interest Income Growth	19%	9%	10%	8%
Net Income Growth	18%	9%	10%	7%
Financial Leverage	13.7	13.1	13.5	12.9
ROA	0.9%	1.0%	1.1%	0.9%
ROE	12.2%	12.6%	14.9%	11.3%

Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 27: Bank net interest margins compressed, reflecting a lower rate environment and increasing competition

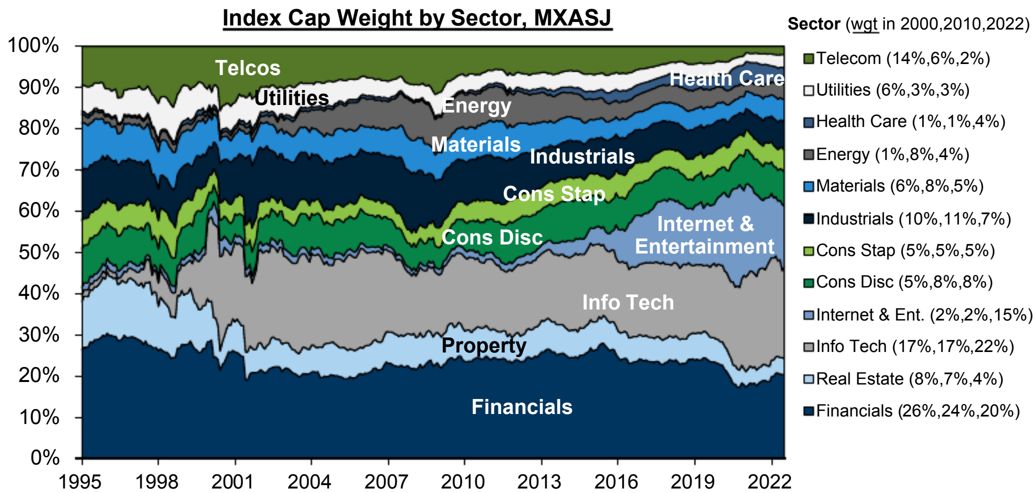


Source: FactSet, MSCI, Goldman Sachs Global Investment Research

- **Index composition change has generally been positive for net income but suppressive for index EPS growth**

Sector weighting in the MXASJ index has evolved over time: financials and property have reduced from 34% in 2000 to 24% currently, and telecoms has fallen from 14% to 2%. In contrast, the internet and entertainment segment has risen from just 2% in 2000 to 15%, info tech is up from 17% to 22%, and healthcare is also becoming more important, now at 4% compared to 1% in 2010.

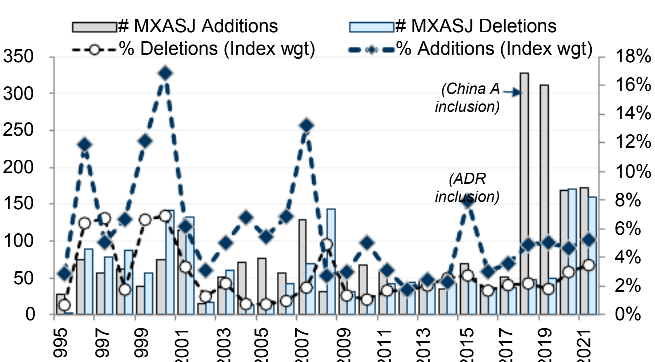
Exhibit 28: Asia's regional sector weights have changed significantly over the past 20 years



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

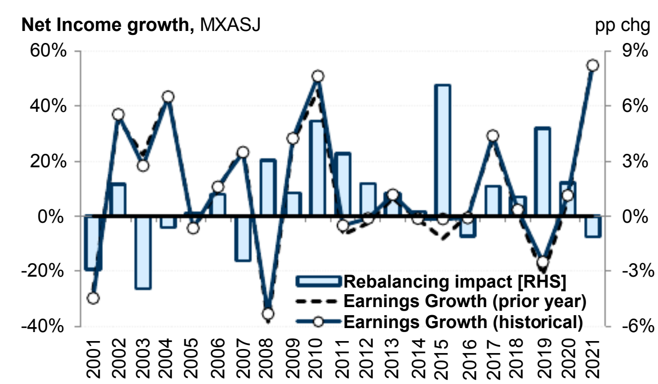
Index constituents have consistently changed and generally enhanced earnings growth. Over the past two decades, about 4% of the market cap (and 10% by number of stocks) has changed on average each year. The stocks that are removed are generally less successful with poor earnings and the ones that are added tend to have more rapid growth. Index rebalancing has added about 2% to earnings growth per year to MXAPJ index over the past decade and has improved margins by 10-15bp per year.

Exhibit 29: Over the past two decades, about one-tenth of the stocks and 4% of the aggregate cap have on average turned over each year; the stocks that are removed tend to have poor earnings growth while those that are added tend to grow faster



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

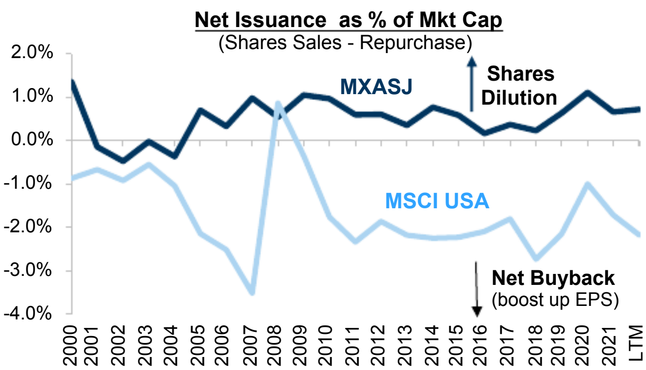
Exhibit 30: Index rebalancing has added about 2% earnings growth per year to MXASJ over the past decade



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

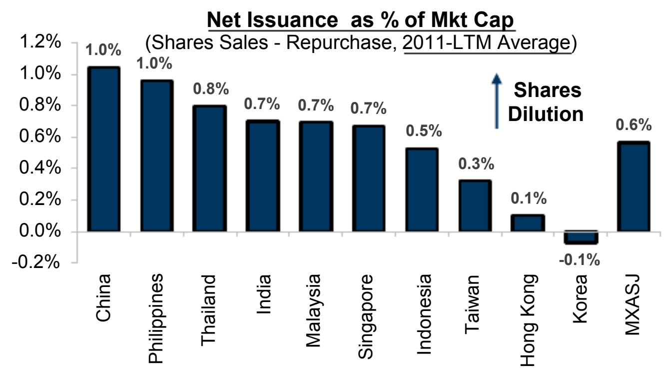
Net issuance has been a drag to earnings as opposed to a tailwind in the US. Net issuance- the difference between share issuance and share repurchases- has averaged 0.6% for the MXASJ index over the past decade, with China having the greatest dilution of 1% per annum on average. This contrasts with the US market where share repurchases are much more common: the boost to EPS from net repurchases has averaged about 2% per year.

Exhibit 31: Net share issuance (vs. backback) has been a drag on EPS growth in Asia vs. a tailwind in the US



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 32: China and Philippines have had the greatest net share issuance dilution



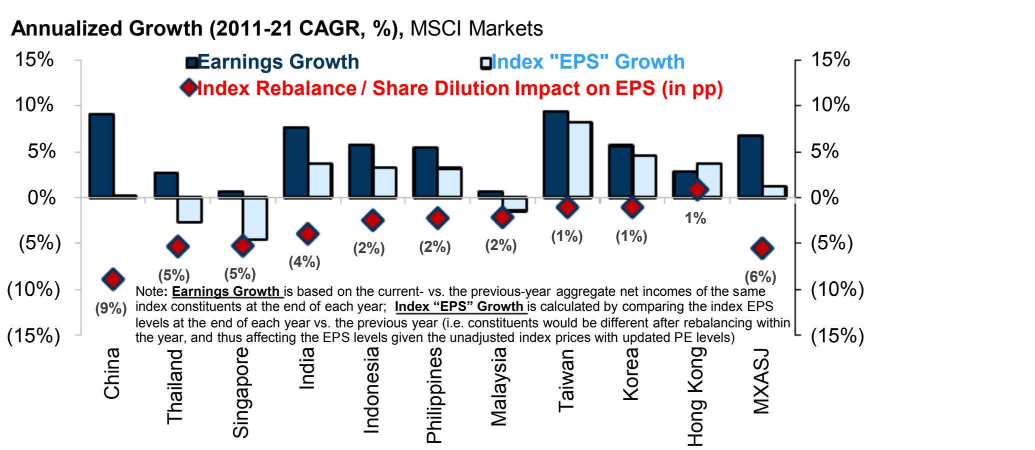
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Index rebalancing from adding high valuation stocks suppresses EPS growth. An under-recognized aspect of adding high growth but high valuation index constituents is that this mechanically reduces a given year's EPS growth. The reason is that index constituent changes do not affect the level of the index. Therefore, when a higher P/E stock replaces a lower P/E one, this lowers the implied EPS of the index.

The large number of index constituent changes and the tendency for new additions to be at higher valuations has had a meaningful impact on the regional EPS growth time series and on China in particular. For the region, the impact of index rebalancing (major driver) and net issuance has reduced the index EPS CAGR for the 2011-2021 period by 6pp from 7% to 1%. In China's case, rebalancing and share issuance has reduced 9% net income CAGR by 8% and thereby resulted in close to zero EPS growth.

This is a critical point to be aware of when commentators aver that China has not produced much market EPS growth over the past decade: net income growth has been fairly good but this has been neutralized at the index level by this compositional change effect.

Exhibit 33: Index rebalancing and net share issuance have had an annualized -6pp impact on MXASJ index EPS, most significantly in China and Singapore



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Reasons why Asian earnings growth slowed in the past decade

The preceding analysis focuses on the *mechanics* of the slowdown in Asian earnings growth from 2011-2021. We now consider the *reasons* why this has occurred, which in turn set the stage for evaluating how this might change in the future.

Significant contributors to the drop in earnings growth include a) a lower boost from trade as competitive advantage moderated; b) lower interest rates which impacted earnings through financials and the investment cycle; c) lower commodity prices which appear to have contributed to a downshift in revenue growth; and d) technology change and disruption, which has been less favorable and more challenging for Asia than the US.

- **A lower boost from trade as competitive advantage moderated**

Asia's growth model for many decades was an export-driven one that relied on low factor cost advantages. The rapid growth of Japan, the east Asian 'tiger' economies of Hong Kong, Singapore, South Korea and Taiwan, many ASEAN economies and most significantly China has been propelled by similar dynamics. This has been well-documented and demonstrated in formal econometric models; analysis of this and how it is changing can be found in papers by the Asian Development Bank and the IMF.

The decade following China's 2001 entry into the WTO was arguably the pinnacle of the export-driven model. China's exports grew 15-30% per year from 2002-2011 with the sole exception of the GFC in 2009. Close to half of this was due to market share gains in the G10 economies, which demonstrates the significance of WTO entry to China's growth and development. Exports together with export-related investment contributed 4.4pp of China's GDP growth annually from 2002-2011 and nearly 40% of overall growth. Excluding the GFC period, exports contributed 5.4pp annual growth and nearly half the yearly total. The large size of China's economy and extensive supply-chain linkages within the region created positive spill-over effects which manifested as an increase in regional GDP growth and a rise in the net export contribution.

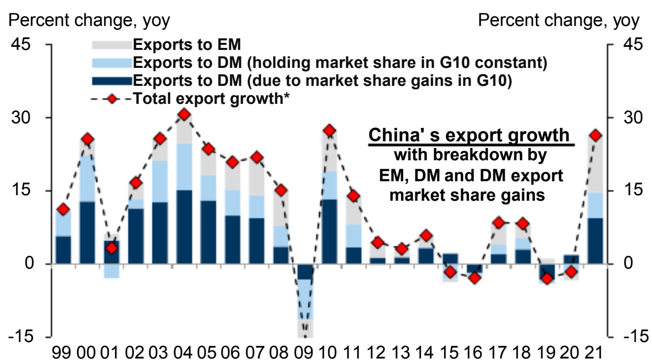
However, **several changes occurred in the ensuing decade which dampened export growth**, in turn contributing to a moderation in overall economic growth as well as corporate earnings growth. First, **labor costs rose**, eroding competitive advantage in low value-added goods and forcing shifts into higher added-value areas where competitive pressures with developed economy counterparts may be greater. In 2011-2021, average nominal wages in Asia ex-Japan increased 110%, leading to a sharp rise in labor costs as a percent of sales (from 6% to 10%) and a narrowing of the gap with average wages in the US (from 15% to 22%).

Second, **many regional currencies appreciated** from a point of substantial undervaluation vs. the US dollar in 2001 to being overvalued by 2011. This erosion of competitive advantage at the start of the recent decade may have contributed to the slower earnings growth that occurred. More encouragingly, however, many regional currencies have again become undervalued, suggesting a better competitive position looking ahead.

Third, **competitive pressures within the region have increased** given the high similarity that many regional economies have with China along the dimensions of export baskets and end markets.

Last, **the exceptional market share gains that China enjoyed during the 2002-2011 period have reduced significantly,** due to a combination of a fading 'step-change' effect of WTO admission, relative cost changes, and, in recent years, an increase in trade barriers. From 2012-2021, China exports mostly grew less than 10%, contributed 1.5pp to average annual GDP growth and accounted for about a fifth of each year's growth, much less than in the preceding decade.

Exhibit 34: China's export growth increased significantly post its end-2001 WTO entry, in large part due to market share gains

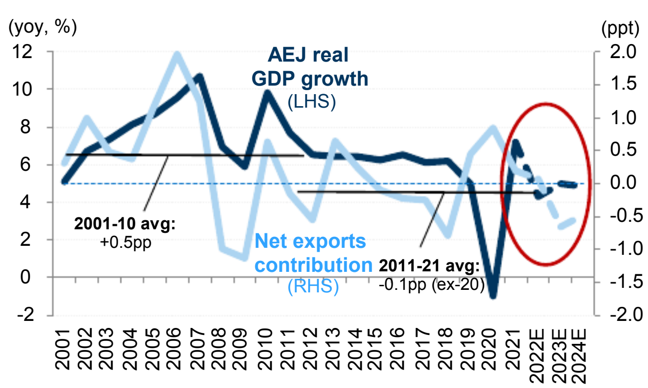


Source: China NBS, Haver

Exhibit 35: Exports and export-related investments contributed over 4pp to China's annual GDP growth from 2002-2011 but just 1.5pp from 2012-2021

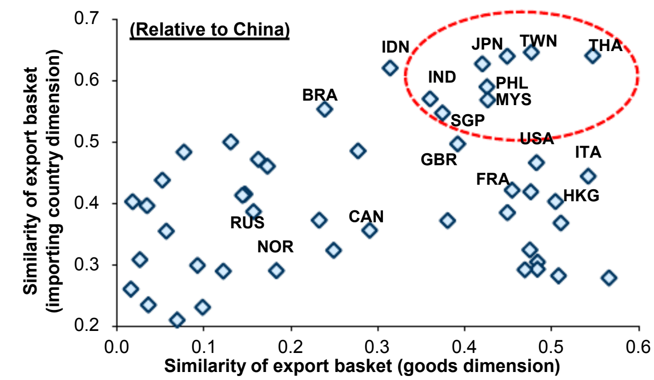
Source: China NBS, Haver

Exhibit 36: The contribution of trade to economic growth is moderating



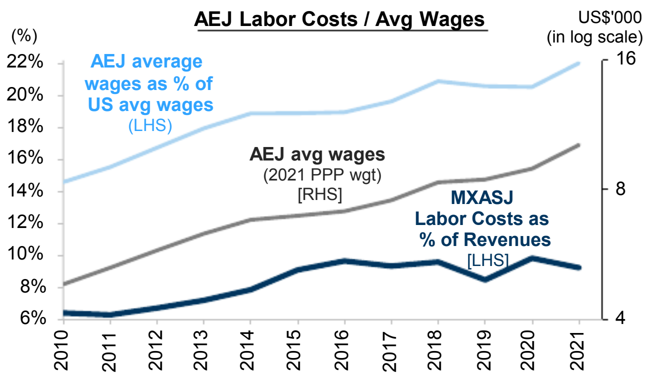
Source: CEIC, Goldman Sachs Global Investment Research

Exhibit 37: Many Asian economies have strong export similarity to China, resulting in higher competition in the traded goods sectors



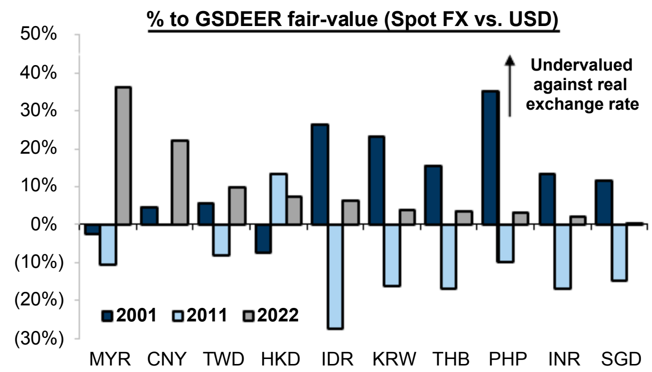
Source: CEIC, Goldman Sachs Global Investment Research

Exhibit 38: Wage costs in Asia ex-Japan have risen in absolute terms, as a share of revenues and relative to US wages



Source: ILO, Haver, CEIC, Goldman Sachs Global Investment Research

Exhibit 39: Regional currency valuations became overvalued vs USD by 2011 which may have impaired competitiveness during the last decade; looking ahead, many regional currencies have again become undervalued suggesting a better competitive position



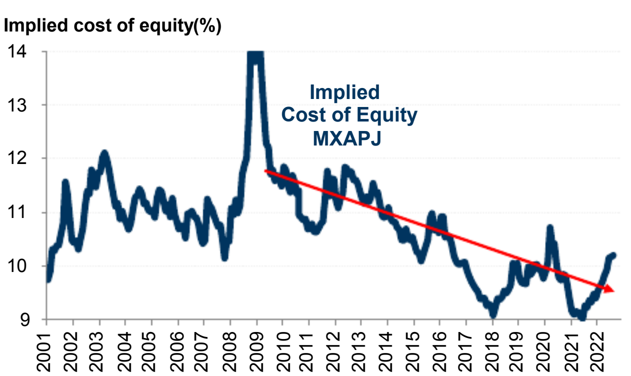
Source: FactSet, Goldman Sachs Global Investment Research

- **Lower interest rates impacted earnings through financials and the investment cycle**

The decline in interest rates that persisted during the past decade impacted Asian regional earnings in two main ways. First, as we discussed above, the heavyweight financial sector saw a compression in net interest margins and lower overall net income growth which coincides with the lower interest rate environment.

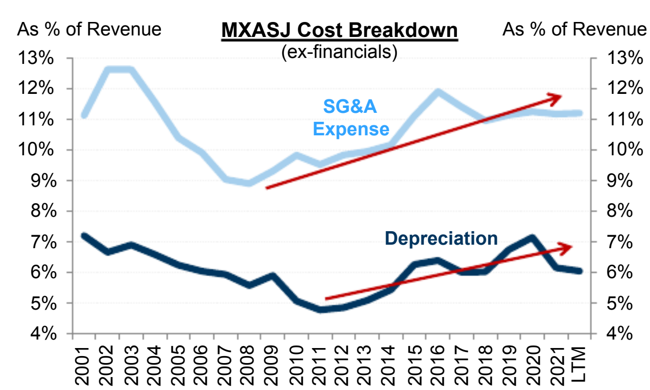
Second, as interest rates fell so too did the cost of capital, which may have led to less investment discipline on the part of corporates. Depreciation charges as a share of revenues increased from 2011-2021, which indicates reduced asset efficiency, and SG&A costs as a percent of revenues also increased during this period which demonstrates lower operating efficiency.

Exhibit 40: Regional cost of equity declined since 2010, in part due to lower interest rates



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 41: Lower cost of capital may have led to reduced investment efficiency as suggested by higher depreciation and SG&A expenses relative to revenues

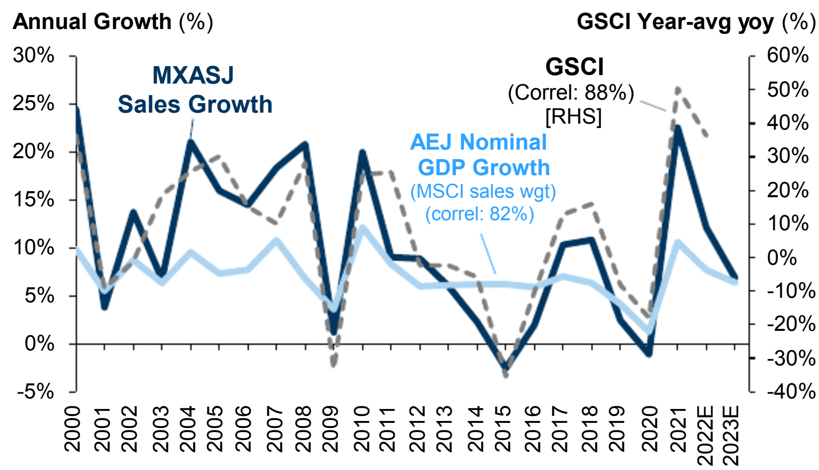


Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Lower commodity prices appear to have contributed to lower revenue growth

In addition to trade and interest rates, the commodity price cycle helps explain the downshift in regional earnings growth in the recent decade. Although most regional economies are commodity importers (only Indonesia and Malaysia are net exporters), commodity prices are empirically highly correlated with regional revenues: 88% for annual changes of the GSCI index and MXASJ sales. The linkages are partly direct through the energy and materials sectors but are mainly indirect through the impact that higher commodity prices have on the nominal growth environment and the ability for companies to increase both revenues and profits in this environment. Over the past decade, the generally weaker commodity backdrop compared to the upcycle in the early 2000s appears to be a contributing factor to lower earnings growth.

Exhibit 42: Regional revenue growth is highly correlated with commodity price changes, mainly through the impact that commodities have on the nominal GDP backdrop; broadly lower commodity prices in the recent decade help explain the decline in regional profit growth



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Technology change and disruption: less favorable and more challenging for Asia than the US

The rapid- and accelerating- pace of technological progress over the past decade has had mixed effects for listed companies. On the positive side, successful tech companies are often more profitable than companies in other sectors. Reasons include the inherent economics of some industries that tend towards a few dominant players, the scalability of digitalization and high returns on successful intellectual property development.

Empirically, the info tech and internet sectors have shown consistently higher returns on equity than other parts of the equity market. In the US market, ROE for the broad tech sector has averaged well above 20% for the past decade whereas the rest of the market has posted about 15% during this period. Higher profitability has led to the tech share of aggregate market earnings rising from 20% to 30%.

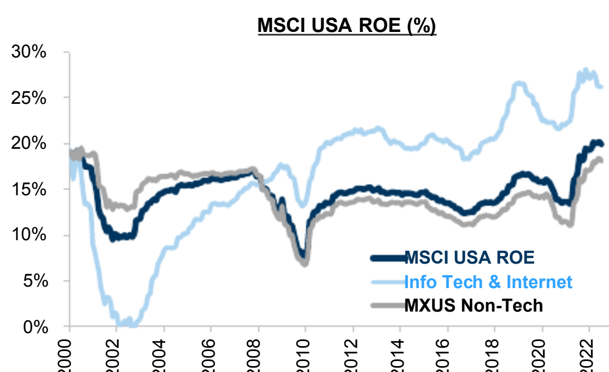
Tech is also more profitable in the Asia ex-Japan region, but not to the same extent as in the US. Regional tech ROE has averaged 15% over the past decade, above 10% for the non-tech part of the market but not as high as US tech ROEs and not as great a premium to the other sectors. This may reflect the greater weight of tech hardware in Asia which is more asset heavy than software/internet (and therefore tends to have lower ROE) and also the global dominance of many US leading tech companies. However, even with generally lower tech sector profitability, there has been a positive relationship in the region between rising tech weights and earnings growth, as the north Asia markets of China, Korea and Taiwan clearly show.

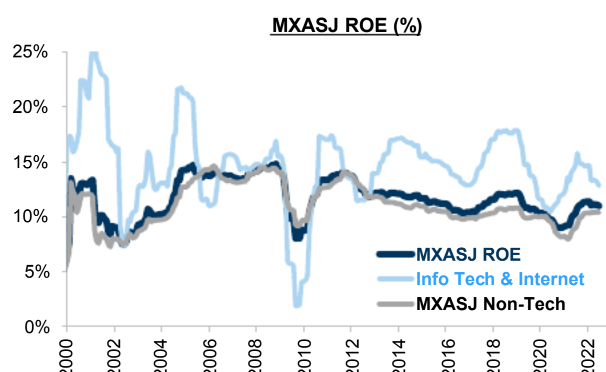
Rapid tech progress has also had negative effects on Asia's corporate earnings, as we have noted on many occasions in recent years. This mainly stems from the disruptive effects that rapid change can have on industry competitive dynamics and companies that are slow to adapt to such changes. A common thread through many industries is how widespread internet access (driven significantly by the proliferation of smartphones) increased pricing transparency and lowered geographic barriers, thereby pressuring margins for companies with low pricing power.

Importantly, **many Asian companies exhibit low pricing power,** both in absolute terms and relative to US and other DM counterparts. This can be shown by a scatterplot of the longer-term average level and volatility of sector margins: more of Asia falls into the low and volatile quadrant, which is indicative of low pricing power. In turn, this helps explain the shortfall in regional earnings growth relative to the nominal growth backdrop during the past decade.

On a more constructive and forward-looking note, **there are signs that Asian corporates are adapting to the competitive pressures from technology change.** Both tech-related capex and research & development expenditures are rising, which suggests companies are investing in IP and may improve their pricing power in the future.

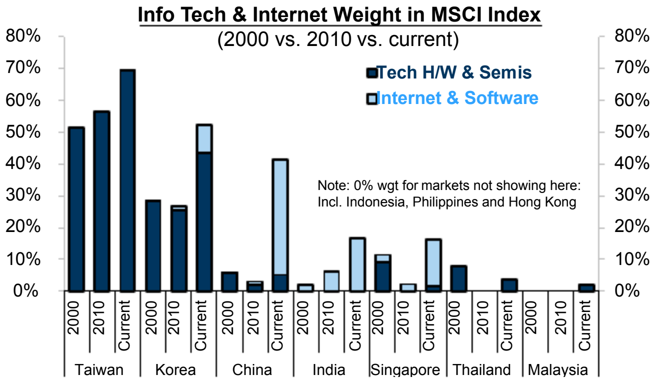
Exhibit 43: Profitability of the info tech and internet sectors is generally higher than other parts of the market, but to a much greater extent in the US than in Asia ex-Japan





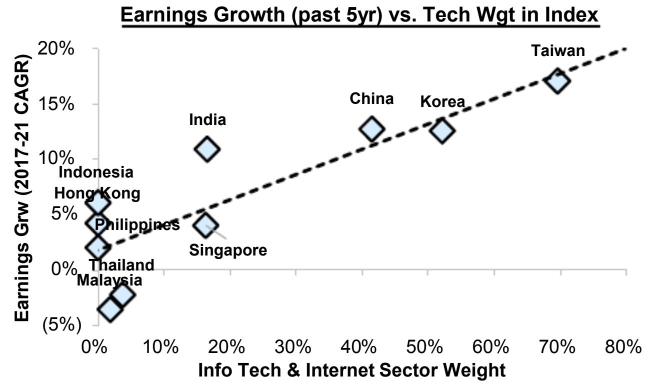
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 44: The index weight of the info tech and internet sectors rose significantly in Taiwan, Korea and China in the past decade, but lagged in other regional markets



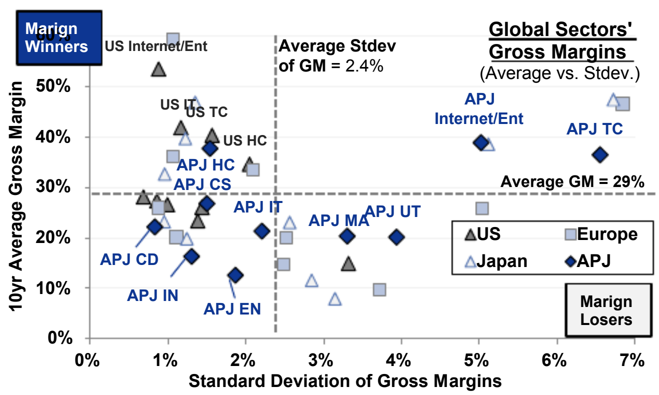
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 45: The index weight of the IT + internet sectors is well correlated with aggregate market earnings growth



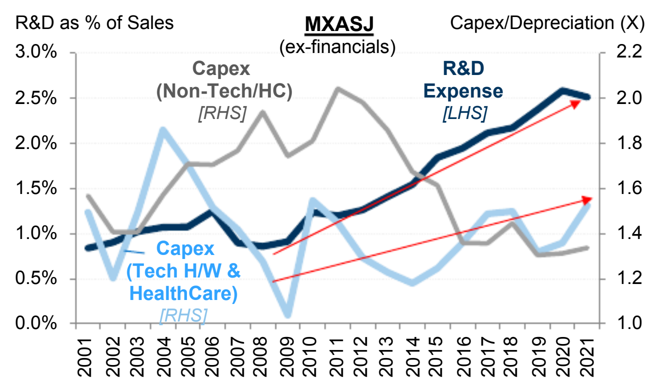
Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 46: Asian regional companies have demonstrated weaker pricing power than many DM counterparts as indicated by low and volatile margins over the past decade: this may reflect in part the impact of technology change



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 47: The region is showing signs of adapting to technology change: tech-related capex and R&D expenditures are both rising



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Q3: How might earnings growth change in future?

Having examined both the mechanics of and fundamental reasons why regional earnings growth slowed in the past decade, the next question is how earnings might grow in coming years. We address this in two ways.

First, we estimate aggregate regional earnings by modeling individual country-sector earnings as a function of key macro variables. This accounts not only for the expected macro backdrop that companies will be operating in but also for the changes in macro growth sensitivities and the shift in sector weights that has occurred in recent years. It also implicitly captures adaptations that companies have made to technology change.

Second, leveraging the work of our sector analysts, we compile a list of regional sectors that have strong growth prospects, and which may become more significant components of the market over time. This thematically-driven approach adds further detail and support to the formal modeling framework.

The bottom line is there are good reasons for expecting better trended earnings delivery in coming years.

Modeling regional earnings growth

Our macro modeling work indicates that **regional earnings growth may improve to a 10% CAGR over the next five years (2023-27)**. This would represent a clear improvement over the 7% compound annual growth over the past decade. Together with the valuation derating that has occurred, this indicates that potential returns in the next five years could also improve compared to the generally lackluster returns that the region has posted over the past decade.

Our earnings analysis focuses on the MSCI Asia ex Japan region, broken down into 10 markets and their 20 sub-sectors (GICS level 1 and 2). The dependent variables are net income growth, sales growth, and net margin change. The independent macro variables are nominal and real GDP growth (regionally and for developed economies), inflation, 10Y government bond yields, foreign exchange rates (vs. USD) and commodity prices. In total, we evaluate 160 variables, and each market has roughly 50 variables as potential inputs. The sample size is quarterly data since 2012 or 42 time-series data points. Our predictions are for the 5 years from 2023-2027 using macro inputs based on GS economics, IMF and OECD forecasts.

We estimate potential earnings growth using a stepwise regression model for the region, each market, the market subsectors and the three target variables (earnings, sales and margins), resulting in over 600 individual models. The modelling process involves including a variable with the highest explanatory power (p-value <0.1), dropping variables with p-values >0.15, and rotating through all potential inputs (with some economically logical sign restrictions) until the best model for a particular market or sector is found. We then compare the adjusted r-squares of the earnings growth model with the average adjusted r-squares of the sales and margin models and select the models with the highest adjusted r-squares.

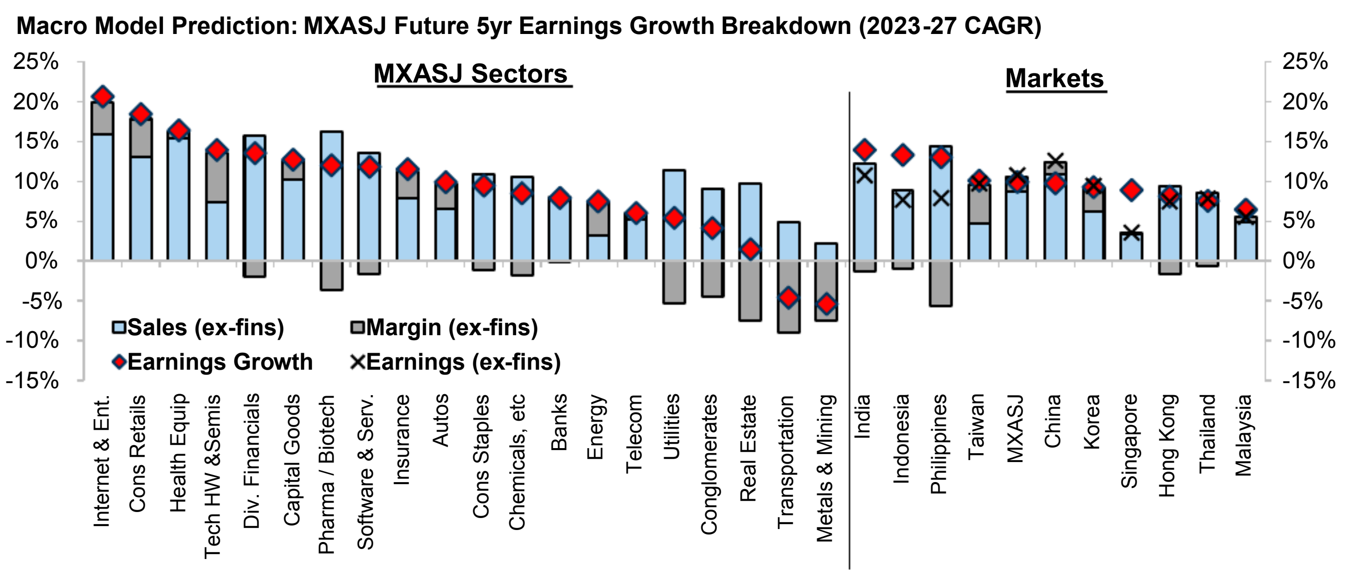
Our model r-squares range from 60%-82% for markets (74% for the aggregate region) and 64%-85% for sectors (except 47% for pharma/biotech). Although constant and trend terms contribute to the high r-square levels, the results show the expected macro context can be mapped to earnings forecasts in a robust manner.

An improving earnings outlook with wide variance within the region

In aggregate, regional earnings may grow at a 10% compound annual rate over the next five years. By market, India (14%), Indonesia (13%) and Philippines (13%) are apt to grow fastest, with Hong Kong (8%), Thailand (8%) and Malaysia (6%) growing slowest. Taiwan, China, Korea, and Singapore are likely to grow roughly in line with the region.

Sector variation is likely to be greater: internet & entertainment (21%), consumer retail (18%), health equipment (16%) and tech hardware & semiconductors (14%) may post the strongest earnings trends, while real estate (1%), transportation (-5%) and metals & mining (-5%) may show the weakest trend growth (in some cases due to a high starting base).

Exhibit 48: Regional earnings may grow at a 10% CAGR in the next 5 years, led by India and parts of ASEAN and by tech, consumption, and healthcare



Source: Goldman Sachs Global Investment Research

Exhibit 49: Earnings growth may vary widely by sector and market in the coming 5 years

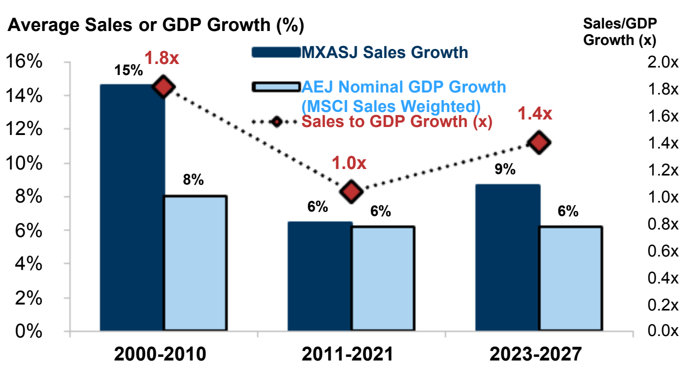
Ranked	Macro Model Prediction			
	Earnings Growth	Sales (ex-fins)	Margin (ex-fins)	Earnings (ex-fins)
Internet & Ent.	21%	16%	4%	
Cons Retails	18%	13%	5%	
Health Equip	16%	15%	1%	
Tech HW &Semis	14%	7%	6%	
Div. Financials	13%	16%	(2%)	
Capital Goods	13%	10%	2%	
Pharma / Biotech	12%	16%	(4%)	
Software & Serv.	12%	14%	(2%)	
Insurance	11%	8%	3%	
Autos	10%	7%	3%	
Cons Staples	9%	11%	(1%)	
Chemicals, etc	8%	11%	(2%)	
Banks	8%	8%	(0%)	
Energy	7%	3%	4%	
Telecom	6%	5%	1%	
Utilities	5%	11%	(5%)	
Conglomerates	4%	9%	(4%)	
Real Estate	1%	10%	(7%)	
Transportation	(5%)	5%	(9%)	
Metals & Mining	(5%)	2%	(7%)	
India	14%	12%	(1%)	11%
Indonesia	13%	9%	(1%)	8%
Philippines	13%	14%	(6%)	8%
Taiwan	10%	5%	5%	10%
MXASJ	10%	9%	2%	11%
China	10%	11%	2%	13%
Korea	9%	6%	3%	9%
Singapore	9%	3%	0%	4%
Hong Kong	8%	9%	(2%)	7%
Thailand	8%	9%	(1%)	8%
Malaysia	6%	5%	1%	5%

Source: Goldman Sachs Global Investment Research

Our modeling also indicates that **the sensitivity of revenue growth to the nominal GDP backdrop may improve** from the surprisingly low levels in the past decade.

Average nominal GDP growth for AEJ is forecast to be 6.2% in 2023-27 and predicted sales growth is 8.7%, implying an "economic beta" of 1.4x. This would be greater than the 1.0x average level in 2011-21, albeit lower than the 2000-10 average of 1.8x. This finding is driven by the shifting composition of the index (inclusion of more high-growth constituents and higher earnings weight of more successful sectors) and reflects the adaptation that companies are making to their changing environment.

Exhibit 50: The sensitivity of revenue growth to nominal GDP may improve in the next 5 years compared to the past decade



Source: FactSet, MSCI, Haver, Goldman Sachs Global Investment Research

Macro variable sensitivities also help gauge how the various parts of the region may respond to changes in the macro environment. For example, north Asia markets that are more sensitive to trade (Taiwan, Korea) tend to have higher growth sensitivities, while commodity exporters like Indonesia have positive sensitivity to commodities in contrast to commodity importers like India and Singapore. By sector, cyclicals such as banks, auto and tech hardware have high growth sensitivity whereas internet & entertainment is much less so given its greater structural dynamic.

Exhibit 51: Macro variable sensitivity varies widely between markets and sectors

Sensitivity to Macro Variables
(aggregate based on individual market sectors model results)
(shown in t-Stats significance)

MXASJ Markets/Sectors	Growth	Inflation	Rates	Commodity	Asian FX	Rsq
MXASJ	6.1	3.6	(0.7)	(1.0)	1.0	74%
China	5.6	3.8	(0.9)	(1.9)	1.2	77%
Taiwan	8.6	2.6	0.0	0.8	(0.5)	78%
Korea	6.3	4.7	(1.1)	0.4	2.8	71%
Hong Kong	4.7	2.8	(0.6)	(0.6)	0.4	69%
Singapore	7.4	0.6	0.9	(2.1)	(0.5)	66%
India	5.0	3.6	(1.4)	(2.0)	0.3	60%
Indonesia	7.6	5.9	(0.6)	2.4	(2.6)	82%
Malaysia	4.1	3.5	(0.7)	0.2	(0.0)	72%
Thailand	5.2	3.7	(2.1)	1.6	0.2	72%
Philippines	8.6	2.6	(0.9)	(0.1)	1.6	68%
Banks	9.1	3.0	4.4	(3.5)	(0.5)	79%
Insurance	4.1	1.8	4.2	(0.3)	0.6	78%
Div. Financials	5.1	2.4	(2.6)	(3.5)	0.9	70%
Real Estate	5.0	0.7	(2.4)	(2.1)	3.5	71%
Energy	6.8	1.7	(2.2)	4.7	0.0	82%
Metals & Mining	2.9	4.2	(3.1)	7.1	1.6	69%
Chemicals, etc	4.0	4.3	(1.2)	2.3	4.8	85%
Capital Goods	3.9	3.2	(0.2)	(4.4)	1.7	71%
Conglomerates	7.3	4.7	(2.1)	(1.7)	(2.6)	72%
Transportation	6.6	1.0	(2.2)	3.4	(2.2)	71%
Autos	9.6	5.6	(2.0)	(0.2)	0.7	77%
Cons Retails	8.5	1.7	(1.3)	(1.9)	(0.1)	67%
Cons Staples	3.7	4.9	(4.8)	(1.4)	(0.4)	82%
Pharma / Biotech	3.5	1.6	(3.1)	3.0	(1.3)	47%
Health Equip	7.8	1.0	(7.1)	(3.5)	0.6	68%
Tech HW &Semis	7.4	2.0	(0.5)	0.5	2.9	74%
Software & Serv.	3.7	7.0	(0.1)	(1.1)	(2.2)	70%
Internet & Ent.	1.6	2.6	(1.2)	(4.2)	1.7	64%
Telecom	4.9	3.4	(3.3)	(1.4)	0.7	65%
Utilities	5.0	2.0	(0.6)	(2.5)	1.3	67%

Source: Goldman Sachs Global Investment Research

Caveats

Models structure the analytical process and add essential rigor to it, but are far from perfect. The main caveats are:

- **Model forecasts are only as good as the independent macro variable inputs.** These will no doubt change through time as new information surfaces, but the impact of changes can be evaluated through the sensitivity of the earnings variables to the macro inputs.
- **Macro models do not capture all influences on earnings:** more granular sector and company-specific analysis are important complements to top-down analysis.
- **Our model does not account for policy change,** which is especially important in China's case. Intensified domestic regulatory tightening in recent years has had a pronounced negative impact on many internet-related tech companies' share prices and earnings (see here and here). In particular, the growth trend for some companies in this sector has reduced because anti-competitive regulations and data sharing requirements have eroded competitive advantage. Furthermore, emphasis on common prosperity may reduce the intention or ability of companies to generate profits at the level that economic conditions alone might suggest.
- **The modeling process does not account for further index compositional change** nor for **further adaptation** by Asian corporates (on the positive side) or **geopolitical or other shocks** (on the negative side). Investors will need to be alert to these risks and adjust expectations accordingly.

Investors will need to dynamically adjust expectations given these caveats along with other factors. But our key point is that our baseline macro view signals an improvement in the trend of regional earnings delivery in the coming 5 years.

Future growth drivers

As discussed in the previous section, our macro modeling demonstrates that Asian regional earnings growth may improve in the next 5 years given our baseline macro forecast. This begs the question as to which pockets in the region could see strong growth potential over the next few years. To answer that, we leverage our sector analysts and the extensive studies they have done.

More specifically, we highlight **8 broad growth themes** and **30 specific sub-themes** that hold the prospect of significant growth in coming years (see exhibits 52 and 53). The overarching themes are technology upgrading and self-sufficiency; import substitution and supply chain security; green economy/de-carbonization; agritech/food security; healthcare/biotech; digitization of consumption and services; financialization of household savings/fin-tech; and traditional growth areas such as mass consumption and infrastructure investment.

Of note, many of these themes are driven in part by geopolitical issues that have been headwinds for equity markets. Elevated and continuing US/China tension is fostering a **focus on self-sufficiency and supply chain security**, climate change and geopolitics are a driver of **green economy and agritech growth**, and the global Covid pandemic is accelerating **investment in healthcare and biotech**.

Although this list is not exhaustive, it does give a specific indication of where attractive growth opportunities may lie, especially for investors with a longer-term outlook. The areas we have identified account for roughly 30% of current earnings and 60% of MXASJ index market cap and will likely become a much larger share of regional earnings in 5 years given their growth premium to the 10% regional average that we project.

Last, we include links to many of our sector analysts' deep-dive industry reports for investors who wish to explore specific themes in greater detail (see Appendix II).

Exhibit 52: We highlight 8 broad growth themes and 30 specific sub-themes that hold the prospect of significant growth in coming years

Key Growth Areas in the Asia ex-Japan region				
S.no	**Sub-themes/Key growth areas**	**Key markets**	**Potential size of opportunity / Total addressable market (TAM)**	**Potential trended growth (Industry/Key market-leaders)**
Technology upgrade / Tech self-sufficiency				
1	Autonomous driving software	China	Automotive software market: China TAM: US$12bn/29bn in 2025/30E	China: 28% CAGR in 2021-30E
2	Cloud computing/data storage	China	China's 14th 5YP targets the software enterprise revenues to reach ~ Rmb14tn by end-2025; 12% CAGR in 2021-25E	China: 60% NI growth for market leaders over 2023-25E
3	Cybersecurity	China	China cybersecurity spending expected to grow to US$26bn by 2026; 10% of global market share	China: 30% NI growth for market leaders over 2023-27E
4	DRAM	Korea	DRAM market to reach US$110bn by 2025 (10% CAGR between 2020-2025E)	
5	Factory automation	China	Infrared / FA component TAM: Rmb 50/85 bn in 2025E	Revenue/EPS CAGR 21-25E: c. 40%
6	Foundry (core semiconductor mfg.)	Taiwan, China	Global foundry market expected to grow by 16% CAGR in 2021 - 2025E to ~US$ 180bn	2020-25E revenue CAGR : 23% (advanced node)
7	Silicon carbide (SiC) transition	China	China EV SiC TAM: US$1.3bn/2.1bn in 2025/30E, contributing 39%/28% of the global TAM	2022-25E revenue CAGR : 22% for key players
Import substitution / Supply chain security				
8	Advanced materials: Fine ceramics, polymers	China	MLCC (multi-layer ceramic capacitors) powder: Global TAM - US$1.2bn; Catalytic: China TAM: US$2.1bn by 2025E	Revenue/EPS CAGR 21-25E: 29%/35% CAGR
9	Speciality chemicals: Performance additives, lubricants	China	China's polyoflefin capacity expansion: 15% CAGR over 2020-23E	Additives: c.30-40% earnings CAGRs over 2021-25E
Green-economy / De-carbonization				
10	Batteries	Korea, China	EV battery TAM of US$234bn in 2030; Global annual installations to grow at a 30% CAGR	20% revenue CAGR (after accounting for pricing declines)
11	Electric vehicles adoption	China	Chinese new energy vehicle sales volume to rise from 5.2mn in 2022E (at 27% penetration) to 7.9mn in 2025E (40%), and 11.0mn in 2030E (56%)	New energy car market: 10% revenue CAGR; EV battery market's 7% revenue CAGR in 2022-30E
12	Energy storage (ESS)	China	Global TAM of ESS components to reach from expected US$10bn in 2022E to US$33bn by 2030E (16% CAGR)	
13	Green energy: Solar installation	China	Solar installation demand to grow at 20% CAGR to 350GW between 2021-2025E	50% NI CAGR growth for market leader over 2022-25E
14	Precision cooling	China	Global ESS cooling market to grow to US$5.9bn by 2025E at a 62% CAGR pace	Revenue/EPS CAGR (2021-25E): 28%/37%
Agritech / Food security				
15	Advanced feed additives	China	TAM (longer-term): US$10-20bn	5-yr forecasts: 20%/16% revenue/profit growth
16	Animal health	China	TAM: Livestock: US$8bn, Pets: US$1.7bn (2020/21)	5-yr forecasts: 10%/23% revenue/profit growth
17	Bio-tech seeds	China	TAM: US$11.2bn (2020); US$13.6 (Medium-term)	5-yr forecasts: 21%/58% revenue/profit growth

Source: Goldman Sachs Global Investment Research

Exhibit 53: We highlight 8 broad growth themes and 30 specific sub-themes that hold the prospect of significant growth in coming years (Cont'd)

Key Growth Areas in the Asia ex-Japan region				
S.no	Sub-themes/Key growth areas	Key markets	Potential size of opportunity / Total addressable market (TAM)	Potential trended growth (Industry/Key market-leaders)
Healthcare / Biotech				
18	Biotech	China	35% NI growth for leading player over next 3 years	
19	Generic injectables	India	US$138bn by FY27E (~7% CAGR over FY22-27E)	Revenue: 11% CAGR; double digit core EBITDA/ EPS CAGR over FY22-FY24E
20	Medical devices	China	30%/55% sales/NI growth for leading player over next 3 years	
Digitization of consumption and services				
21	Digital advertising	India	Digital ad spend TAM globally of US$65bn, expected to grow at a 30% CAGR over CY21-25E, reaching US$185bn by CY25	Revenues to grow at 32% CAGR over FY22-25 for market leaders
22	Digital payments	India	India: US$2.3 tn TAM in FY30E	India: 33% FY22-25E CAGR in merchant payments
23	E-commerce	China, India, ASEAN	China: US$6.7tn by 2024E; India: US$1.6tn total retail-spend/TAM in FY30E; ASEAN: US$210bn by 2025E	India: 28% FY22-25E CAGR in E-commerce retail value; China 11% NI CAGR; SG: 25% sales CAGR (3-yr)
24	Food Delivery /Local services	China, India, ASEAN	China: US$1.6tn by 2024E; India: US$155 bn food services TAM in FY30E; Indonesia food-delivery GTV (23% CAGR FY20-25E)	India: 33% FY22-25E CAGR in online food delivery GMV; China: 30% sales CAGR; SG: 55% sales CAGR (3-yr)
25	Immersive short-form video (SFV)	China	SFV: 2025E TAM - 36% share in digital ads (Rmb 494bn), 26% share in China online GMV (Rmn 5.7tn), Rmb 107bn in livestreaming	18% revenue CAGR over 2021-25E for leading players
26	Staffing (Formalization of workforce)	India	TAM to grow 6X over the next decade from $10.4bn currently to $61bn by 2030	Revenue CAGRs of 22%/23% in FY22-24E for leading players
Financialization of household savings / Fin-tech				
27	Brokers, Insurance/Mutual funds	India, China, ASEAN	India: Life industry TAM of US$210bn by FY30E with 11% CAGR; Indonesia Fintech lending: FY20-25 CAGR of 47%	India: High teen revenue and 30% NI 3-yr CAGR (private players)
28	Supply chain finance (SCF) technology	China	China's SCF asset growth of 11% CAGR in 2021-26E; Third-party SCF tech solutions of Rmb4.7tn in terms of transaction volume by 2025E	Revenue/EPS CAGR (2022-25E): 30%/45% for market leaders
Traditional growth areas				
29	Consumption recovery (Sportwear, Food Service)	China	~12% CAGR in consumption growth; low teen sportswear industry growth; restaurants: normalized industry growth of HSD to 10%.	Sportswear:mid-high teen revenue growth and c. 20% profit CAGR; Restaurants:10% in revenue and mid teen in profits for leading brands
30	Mfg. / Infrastructure (EMS, Logistics)	India	India EMS market to reach US$73bn by FY26E (12% CAGR);	EMS: 30-40% Revenue/NI 3-yr CAGR; Logistics: Mid teen revenue 3-yr CAGR

Source: Goldman Sachs Global Investment Research

Q4: What should investors do?

We have examined the reasons why Asian earnings growth has generally fallen short during the past decade and ways in which it might improve in coming years. This begs the question of how investors should position portfolios to align exposure with these insights.

We focus on three implementation ideas at the market, country/sector and stock level: **1)** we propose **long-dated options/swaps** on select Asian indices for aggregate market level exposure; **2)** we flag **country-sectors with attractive EPS growth trends and valuations; 3)** we include a list of 50 GS Buy-rated **stocks in our preferred thematic growth** areas.

1) Longer-dated upside options/swaps on Asian indices

We think investors should get long exposure in Asian equities via upside option structures and swaps. Specifically, we recommend buying **2-year 80/110% risk reversals on HSCEI** (offshore China) and **KOSPI 200** (Korea) **and 2-year total return swap (TRS) on South Asian indices** - MSCI India, Indonesia and Philippines. There are several reasons that underpin these recommendations:

- First, profit growth has the potential to improve in coming years both for the region and many individual markets, as we showed in the previous section.
- Second, earnings drive equity performance over the longer run, while valuation changes impact shorter-term performance, but tend to mean revert and become less influential over longer periods. This suggests potential for strong earnings-led returns over the longer-term for various Asian markets.
- Third, current forward valuations for markets like China and Korea are at 10.6x and 8.6x respectively, which are at the low end of their historical range. With HSCEI down about 50% and KOSPI 200 down about 30% from their respective peaks last year, we think a lot of macro and regulatory risks are priced in. **Given low valuation and significant price correction, we see risk reversals as an attractive way to gain upside exposure in China/ Korea**. Selling 20% out-of-the-money (OTM) puts to fund 10% OTM calls (i.e. **80/110% risk reversals**) appears attractive, given put strike levels near GFC lows for HSCEI and April 2020 levels for the KOSPI 200 index.
- Indicatively, 2-year 80/110% risk reversals on HSCEI and KOSPI 200 cost 4.1% and 3.6% of spot respectively, providing a 50-60% discount to outright 2-year 110% calls.
- From an options perspective, we think risk reversals would also benefit if skew, which is currently elevated, normalizes to average levels as macro concerns abate over the medium-term. However, we note that buyers of 2-yr 80/110% risk-reversals risk unlimited loss if markets fall significantly more than 20% over the next 2 years.
- For South Asian markets like **India**, **Indonesia** and **Philippines**, where we expect the largest trended earnings growth over the next 5 years, option implementations are harder either due to higher rates (i.e expensive pricing) or due to lack of liquid

futures/options markets. We prefer going long via **2-year swaps on MSCI net total return USD indices**. Indicatively, 2-year TRS swaps on MSCI total return USD indices (NDEUXXX) on India, Indonesia and Philippines cost between Fed funds rate + 60-95bps spread.

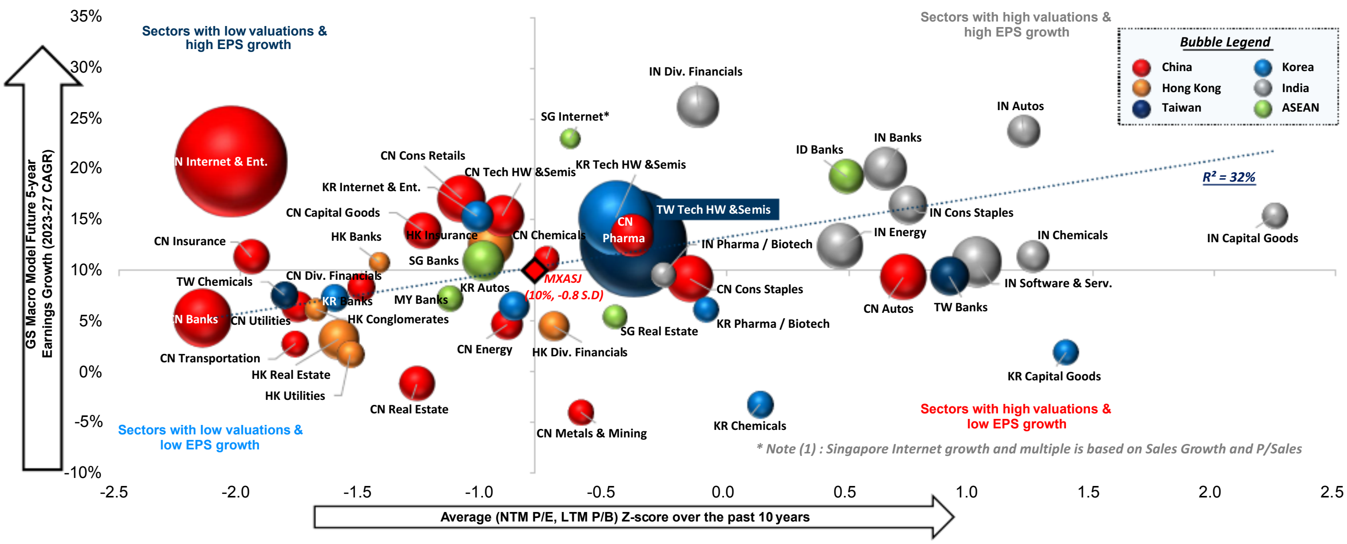
2) Country-sectors with attractive growth/valuation trade-off

Beneath the headline index level, we focus on the top 50 country/sectors (86% of MXASJ index market cap) that have the potential to deliver strong profit growth in coming years and contrast these with the country/sectors that appear less likely to post attractive growth, with consideration for the valuation entry point. As shown in scatterplot in Exhibit 54, based on our 5-year earnings growth forecasts and valuation z-scores over past 10 years (average for forward PE and trailing PB), we find several pockets with attractive growth/valuation trade-off.

The top 15 country-sectors that appear attractive on this framework include **a) internet/e-commerce** in China, Korea and Singapore; **b) banks** in India/Indonesia and DM Asian markets (HK/SG); **c) Tech H/W, semi** in Korea, Taiwan and China; **d) China industrials** and **pharma;** and **e)** domestic cyclicals like **autos** in India. Taken together, these 15 country-sectors represent about 50% of MXASJ index market cap and 30% of MXASJ CY2022 profits.

Exhibit 54: Country-sector opportunities: Internet sector in China, Korea and Singapore; select banks, tech H/W and semi; China industrials and pharma and domestic cyclicals like autos in India offer strong long-term earnings growth with attractive growth/valuation trade-off

GS Macro model driven EPS growth forecasts (2023-27 CAGR) and average multiple z-score (past 10-year history) for top 50 country sectors in MXAPJ



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

3) Preferred stocks in thematic growth areas

At a more micro level, we show a list of 50 GS Buy-rated stocks that align with one or more of the longer-term growth themes that we discussed in Section 3.

The median stock offers 24%/29% 2022-2024 revenue/earnings CAGRs at 24x 2023E P/E or 0.8x PEG ratio, with about 54% upside to GS 12-month target prices.

Exhibit 55: We highlight 50 GS Buy-rated stocks that align with one or more of the longer-term growth themes in the region

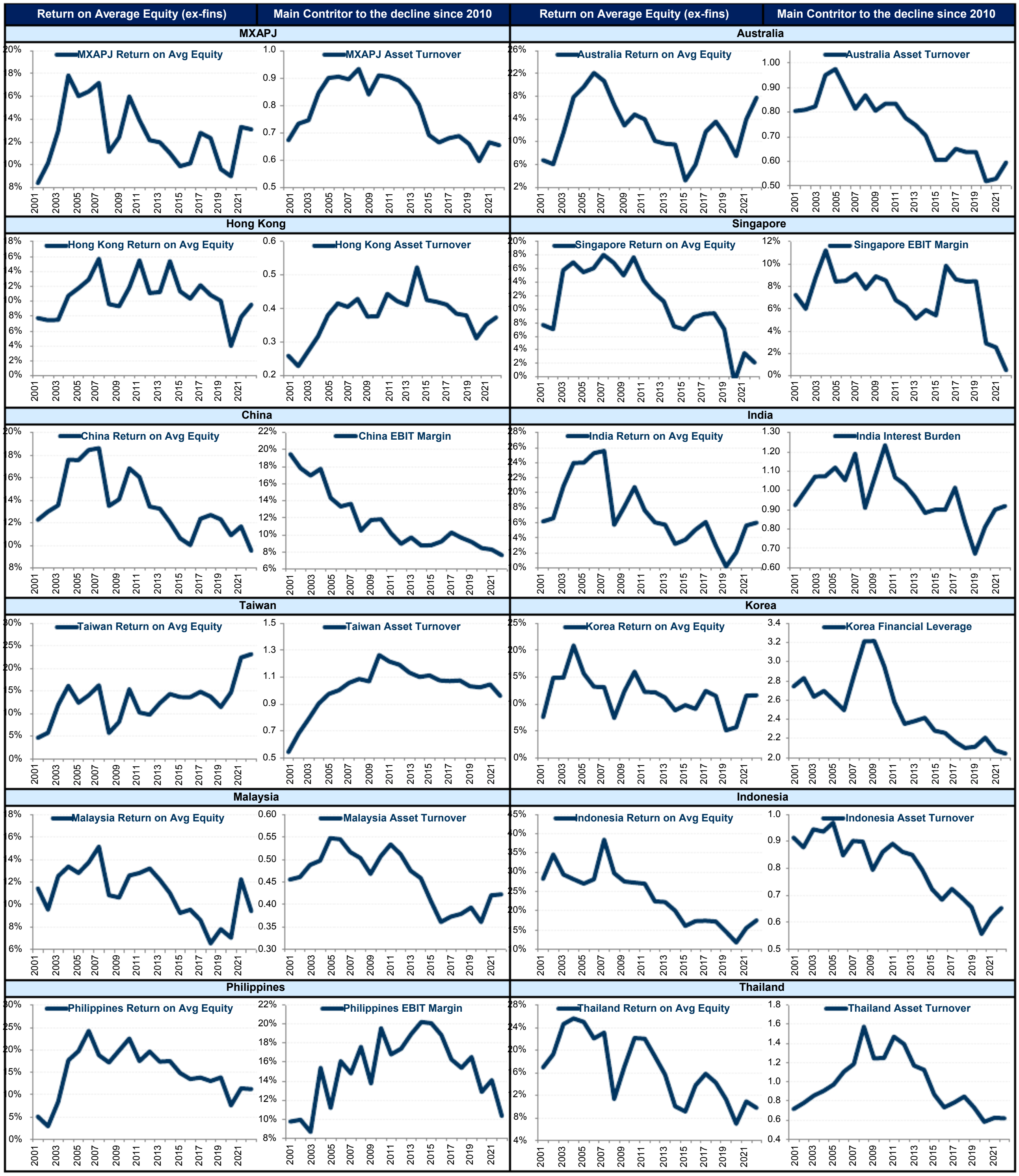
				>US$1bn	>US$4mn				>5%	>3%		
				Size and Liquidity		Growth and Valuations					GS	
BBG Ticker	Company Name	Market	GS Sub-Theme / Key Growth Area	Listed market cap (US$ bn)	6M ADVT (US$mn)	2023E P/E (X)	2022E P/B (X)	Fwd. PEG ratio (2023 PE vs. 23/24 EPSg)	2022/24E Sales Growth CAGR (%)	2022/24E EPS Growth CAGR (%)	GS Rating	Upside / Downside to Target Price (%)
GS Buy-rated stocks within Thematic Growth areas												
2330 TT	TSMC	Taiwan	Foundry	**410**	510	13	4.4	1.1	**23**	**25**	B*	55
005930 KP	Samsung Electronics	Korea	DRAM	**249**	730	9	1.2	3.3	**5**	**3**	B	49
BABA UN	Alibaba Group Holding Ltd.	China Offshore	E-commerce	**243**	2,690	11	1.6	0.7	**11**	**9**	B	62
3690 HK	Meituan	China Offshore	Food Delivery /Local services	**122**	640	89	7.7	-	**29**	**-**	B	58
PDD UW	Pinduoduo, Inc.	China Offshore	E-commerce	**91**	733	21	6.8	1.9	**23**	**34**	B	32
JD UW	JD.com, Inc.	China Offshore	E-commerce	**83**	619	22	2.9	0.6	**14**	**34**	B	42
002594 CS	BYD Company Limited	China Domestic	Electric vehicles adoption	**70**	864	57	7.6	1.1	**42**	**89**	B	61
601012 CG	LONGi Green Energy	China Domestic	Green energy	**55**	640	21	6.3	0.7	**29**	**41**	B*	84
000660 KP	SK hynix Inc.	Korea	DRAM	**48**	247	8	0.9	1.1	**10**	**3**	B	48
300059 CS	East Money Information	China Domestic	Brokers, Insurance/Mutual funds	**35**	706	24	4.5	0.9	**18**	**11**	B	25
051910 KP	LG Chem Ltd.	Korea	Batteries	**32**	99	14	1.5	0.3	**18**	**14**	B*	23
SE UN	Sea Ltd. (Singapore)	Singapore	E-commerce /Local services	**31**	544	-	6.4	-	**25**	**-**	B	165
2020 HK	ANTA Sports Products Ltd.	China Offshore	Consumption recovery (Sportwear)	**31**	97	20	6.3	1.1	**16**	**16**	B	43
1211 HK	BYD Company Limited	China Offshore	Electric vehicles adoption	**30**	257	40	5.3	0.8	**42**	**89**	B*	95
1024 HK	Kuaishou Technology	China Offshore	Immersive short-form video	**30**	247	-	7.2	-	**19**	**-**	B	71
006400 KP	Samsung SDI	Korea	Batteries	**28**	112	19	2.4	1.2	**21**	**23**	B	41
LI UW	Li Auto, Inc.	China Offshore	Electric vehicles adoption	**23**	303	122	4.5	1.1	**69**	**109**	B*	73
2331 HK	Li Ning Company Limited	China Offshore	Consumption recovery (Sportwear)	**22**	125	26	6.2	1.2	**20**	**20**	B*	38
300124 CS	Shenzhen Inovance Tech	China Domestic	Factory automation	**19**	101	30	8.1	1.3	**22**	**22**	B*	54
300274 CS	Sungrow Power Supply	China Domestic	Green energy	**19**	518	37	9.5	0.7	**49**	**61**	B*	51
BGNE UW	BeiGene Ltd	China Offshore	Biotech	**17**	42	-	45.0	-	**35**	**-**	B	94
SBILIFE IS	SBI Life Insurance	India	Brokers, Insurance/Mutual funds	**16**	19	61	10.1	2.5	**22**	**30**	B	8
2303 TT	United Microelectronics Corp.	Taiwan	Foundry	**16**	124	8	1.5	6.7	**12**	**15**	B	70
096770 KP	SK Innovation	Korea	Batteries	**13**	60	8	0.8	-0.6	**21**	**-**	B	56
002920 CS	Huizhou Desay SV Automotive	China Domestic	Autonomous driving software	**12**	95	49	12.8	1.2	**37**	**43**	B	48
600745 CG	Wingtech Technology	China Domestic	Silicon carbide (SiC) transition	**11**	232	16	2.1	0.5	**20**	**29**	B	160
GRAB UW	Grab Holdings Ltd. (Singapore)	Singapore	Food Delivery /Local services	**11**	69	-	1.8	-	**55**	**-**	B	77
881 HK	Zhongsheng Group Holdings Ltd.	China Offshore	Electric vehicles adoption	**11**	24	7	1.6	0.2	**17**	**24**	B*	158
603290 CG	StarPower Semiconductor Ltd.	China Domestic	Silicon carbide (SiC) transition	**10**	118	68	12.3	1.2	**57**	**67**	B*	29
688396 CG	China Resources Microelectronics	China Domestic	Silicon carbide (SiC) transition	**10**	63	23	3.4	1.0	**24**	**18**	B	47
600460 CG	Hangzhou Silan Microelectronics	China Domestic	Silicon carbide (SiC) transition	**8**	191	30	7.3	0.7	**27**	**22**	B	57
300496 CS	Thunder Software Technology	China Domestic	Autonomous driving software	**7**	78	41	8.5	0.8	**44**	**41**	B	59
ZOMATO IS	Zomato Ltd.	India	Food Delivery /Local services	**6**	77	-	3.1	-	**42**	**-**	B	68
PAYTM IS	One 97 Communications Ltd.	India	Digital payments	**6**	49	-	3.6	-	**40**	**-**	B	55
002385 CS	Beijing Dbn Technology Group	China Domestic	Bio-tech seeds	**5**	114	25	3.4	0.1	**22**	**-**	B	55
GLAND IS	Gland Pharma Ltd.	India	Generic injectables	**5**	13	29	5.1	1.4	**13**	**12**	B	14
301029 CS	Dongguan Yiheda Automation	China Domestic	Factory automation	**4**	9	35	10.5	0.9	**37**	**39**	B*	55
300454 CS	Sangfor Technologies, Inc.	China Domestic	Cloud computing/Cybersecurity	**4**	38	72	5.8	0.4	**27**	**98**	B	45
600299 CG	Bluestar Adisseo Co.	China Domestic	Advanced feed additives	**4**	10	16	1.9	2.8	**9**	**5**	B	36
300285 CS	Shandong Sinocera	China Domestic	Speciality chemicals	**3**	21	24	4.6	0.6	**29**	**30**	B*	72
002439 CS	Venustech Group, Inc.	China Domestic	Cybersecurity	**3**	31	14	2.3	0.5	**25**	**14**	B*	48
002335 CS	Kehua Data	China Domestic	Energy storage	**2**	78	25	4.3	0.7	**19**	**23**	B	22
354 HK	Chinasoft International Ltd.	China Offshore	Cloud computing/data storage	**2**	11	10	1.3	0.3	**20**	**22**	B	117
300910 CS	Xinxiang Richful Lube Additive	China Domestic	Speciality chemicals	**2**	10	40	6.3	0.7	**46**	**40**	B	31
AFFLE IS	Affle (India) Ltd.	India	Digital advertising	**2**	6	53	12.5	1.6	**36**	**34**	B	17
600195 CG	China Animal Husbandry Industry	China Domestic	Animal health	**2**	19	18	2.5	0.4	**11**	**25**	B	30
002837 CS	Shenzhen Envicool Technology	China Domestic	Precision cooling	**2**	41	38	6.6	1.0	**29**	**39**	B*	50
300596 CS	Rianlon Corp.	China Domestic	Advanced materials	**2**	13	17	3.8	0.5	**31**	**30**	B*	59
688088 CG	ArcSoft Corporation Limited	China Domestic	Autonomous driving software	**2**	21	50	4.2	0.8	**38**	**41**	B	64
AMBER IS	Amber Enterprises India Ltd.	India	Mfg. / Infrastructure (EMS)	**1**	4	30	4.1	0.7	**30**	**44**	B	24
Median				**11**	**96**	**24x**	**4x**	**0.8x**	**24**	**29**		**54**

Source: Goldman Sachs Global Investment Research

The authors would like to thank Sam Hung, who is an intern in the Asia Portfolio Strategy team, for his contributions to this report.

Appendix I: ROE trend of individual markets

Exhibit 56: ROE trend of individual markets and the main contributor to the decline since 2010



Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Appendix II: Related industry reports on specific longer-term growth themes

Exhibit 57: Related industry reports on specific longer-term growth themes

Key Growth Areas in the Asia ex-Japan region			
S.no	**Sub-themes/Key growth areas**	**Related Research**	**Publication Date**
Technology upgrade / Tech self-sufficiency			
1	Autonomous driving software	Automotive Software: Framing the growth potential	3/18/2022
2	Cloud computing/data storage	Initiation: Cloud Software Investing Framework in a $1 Trn TAM; Buy MSFT, CRM, SPLK, NOW, Sell ORCL, ADSK	1/21/2021
		China Software: Better growth for cybersecurity in 2H22; vendors with higher government exposure to benefit	8/29/2022
3	Cybersecurity	Sangfor (300454.SZ): Cloud computing to drive near term revenues growth; while cybersecurity to stay soft in 3Q22. Buy	8/28/2022
4	DRAM	DRAM deep-dive: Shorter cycles within the structural growth to a US$100bn+ industry; upgrade Hynix to Buy	1/10/2022
5	Factory automation	10 key themes for a smarter and greener industrial economy; initiate on 8 stocks	11/8/2021
6	Foundry (core semiconductor mfg.)	Higher foundry market opportunity into 2025; revising up our global foundry forecast; Buy TSMC (2330.TW on CL)	5/16/2022
7	Silicon carbide (SiC) transition	Raising China EV SiC TAM on faster SiC adoption and higher SiC content	6/24/2022
Import substitution / Supply chain security			
8	Advanced materials: Fine ceramics, po	Formulating China's fine ceramics; initiate at Buy, add to CL	8/10/2022
9	Speciality chemicals: Performance additives, lubricants	Performance additives: Big enhancement comes in small doses; initiating on Rianlon (on CL), GCH, and Richful	3/6/2022
Green-economy / De-carbonization			
10	Batteries	The Great Battery Race: Key piece of the renewables transition is ready for prime time	11/29/2021
11	Electric vehicles adoption	Analyzing the technologies, TAMs, and earnings. A mega cap on the rise; Buy (H on Conviction list)	7/4/2022
12	Energy storage (ESS)	Liquid cooling adoption in energy storage propels growth acceleration; raise TP and reiterate Buy (add to CL)	8/22/2022
13	Green energy: Solar installation		
14	Precision cooling	10 key themes for a smarter and greener industrial economy; initiate on 8 stocks	11/8/2021
Agritech / Food security			
15	Advanced feed additives	Addressing China food security – revolution of tradition	8/8/2022
16	Animal health	Animal health - healthier and safer future; Initiate CAHIC and Adisseo at Buy, Ringpu at Neutral	8/8/2022
17	Bio-tech seeds	Seeds – maximizing yield potential; initiate Dabeinong at Buy, Denghai at Neutral	8/8/2022

Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Exhibit 58: Related industry reports on specific longer-term growth themes (Cont'd)

Key Growth Areas in the Asia ex-Japan region			
S.no	Sub-themes/Key growth areas	Related Research	Publication Date
Healthcare / Biotech			
18	Biotech	China Clean Energy: 2Q22 wrap: 4Q22 solar demand to pick up on potential poly price moderation, ESS to continue strong momentum	9/5/2022
19	Generic injectables	Long-term injectable monetisation narrative intact; initiate at Buy	8/22/2022
20	Medical devices	1H preview: focus shifting towards 3Q recovery and regulatory/policy evolution; Prefer Buy-rated AK/NHH	8/3/2022
Digitization of consumption and services			
21	Digital advertising	Maximizing digital ad effectiveness for EM clients; Initiate at Buy	8/23/2022
22	Digital payments	India Payments: RBI Payments Vision 2025: Payments TAM, MDRs, BNPL/credit and fintechs in focus	6/19/2022
23	E-commerce	2H Outlook: An easier set up; prefer local services & eCommerce; advertising to inflect in 4Q	7/12/2022
24	Food Delivery /Local services	TechNet Conference Asia Pacific 2022 - Key Takeaways	6/3/2022
25	Immersive short-form video (SFV)	Short-form video-rization: Assessing the potential ceiling and lessons from China	9/4/2022
26	Staffing (Formalization of workforce)	TAM to grow 6x over the next decade; initiate TeamLease, Quess Corp at Buy	2/3/2021
Financialization of household savings / Fin-tech			
27	Brokers, Insurance/Mutual funds	India Life insurance 1QFY23 preview: Growth healthy off a low base	7/10/2022
28	Supply chain finance (SCF) technology	China's largest SaaS provider in supply chain finance; Initiate at Buy	5/11/2022
Traditional growth areas			
29	Consumption recovery (Sportwear, Food Service)	Revisiting the sportswear market growth and factoring in the near-term disruptions	6/1/2022
30	Mfg. / Infrastructure (EMS, Logistics)	Earnings Review: Strong growth with improving profitability; remain Buy	5/6/2022

Source: FactSet, MSCI, Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

We, Timothy Moe, CFA, Alvin So, CFA, Sunil Koul, Kinger Lau, CFA, John Kwon and Amorita Goel, hereby certify that all of the views expressed in this report accurately reflect our 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.

Disclosures

Affle India Ltd. (Rs1,323.10), Alibaba Group (ADR) ($89.52), Amber Enterprises India Ltd. (Rs2,300.60), Anta Sports Products (HK$88.80), Arcsoft (Rmb26.79), BYD Co. (A) (Rmb278.26), BYD Co. (H) (HK$216.20), BeiGene Ltd. (ADR) ($167.21), Bluestar Adisseo (Rmb10.98), CR Micro (Rmb52.02), China Animal Husbandry (Rmb13.22), Chinasoft Intl (HK$5.63), Dabeinong (Rmb8.67), Desay SV (Rmb159.10), East Money Information Co. (Rmb22.22), Gland Pharma Ltd. (Rs2,440.55), Grab ($3.09), JD.com Inc. (ADR) ($59.91), Kehua Data Co. (Rmb39.80), Kuaishou Technology (HK$62.40), LG Chem (W644,000), LONGi Green Energy Technology Co. (Rmb53.39), Li Auto Inc. (ADR) ($26.03), Li Ning Co. (HK$65.90), Meituan (HK$171.50), One 97 Communications (Rs707.00), Pinduoduo Inc. ($68.19), Rianlon (Rmb59.50), Richful (Rmb104.68), SBI Life (Rs1,317.25), SK Hynix Inc. (W90,400), SK Innovation (W189,500), Samsung Electronics (W55,600), Samsung SDI Co. (W571,000), Sangfor (Rmb106.13), Sea Ltd. ($59.36), Shenzhen Envicool Technology (Rmb31.15), Shenzhen Inovance Technology Co. (Rmb58.03), Silan (Rmb40.02), Sinocera Functional Material (Rmb29.80), StarPower (Rmb420.31), Sungrow Power Supply Co. (Rmb121.39), TSMC (NT$475.00), Thundersoft (Rmb119.42), United Microelectronics Corp. (NT$39.30), Venustech (Rmb18.83), Wingtech (Rmb60.41), Yiheda Automation (Rmb58.44), Zhongsheng Group (HK$34.15) and Zomato Ltd. (Rs61.40)

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; for equity securities, market making and/or specialist role. 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 subject company, public appearances and trading securities held 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 the Global Investment Research Division 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, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, 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. **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 and Type II Financial Instruments Firms Association. 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

The Global Investment Research Division of Goldman Sachs 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.

Effective from the date of the United Kingdom's departure from the European Union and the European Economic Area ("Brexit Day") the following information with respect to distributing entities will apply:

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: GSI, authorised by the PRA and regulated by the FCA and the PRA, disseminates research in the following jurisdictions within the European Economic Area: the Grand Duchy of Luxembourg, Italy, the Kingdom of Belgium, the Kingdom of Denmark, the Kingdom of Norway, the Republic of Finland, the Republic of Cyprus and the Republic of Ireland; GS -Succursale de Paris (Paris branch) which, from Brexit Day, will be authorised by the French Autorité de contrôle prudentiel et de resolution ("ACPR") and regulated by the Autorité de contrôle prudentiel et de resolution and the Autorité des marches financiers ("AMF") disseminates research in France; GSI - Sucursal en España (Madrid branch) authorized in Spain by the Comisión Nacional del Mercado de Valores disseminates research in the Kingdom of Spain; GSI - Sweden Bankfilial (Stockholm branch) is authorized by the SFSA as a "third country branch" in accordance with Chapter 4, Section 4 of the Swedish Securities and Market Act (Sw. lag (2007:528) om värdepappersmarknaden) disseminates research in the Kingdom of Sweden; 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 in the Federal Republic of Germany and those jurisdictions within the European Economic Area where GSI is not authorised to disseminate research and additionally, GSBE, Copenhagen Branch filial af GSBE, Tyskland, supervised by the Danish Financial Authority disseminates research in the Kingdom of Denmark; GSBE - Sucursal en España (Madrid branch) subject (to a limited extent) to local supervision by the Bank of Spain disseminates research in the Kingdom of Spain; GSBE - Succursale Italia (Milan branch) to the relevant applicable extent, subject to local supervision by the Bank of Italy (Banca d'Italia) and the Italian Companies and Exchange Commission (Commissione Nazionale per le Società e la Borsa "Consob") disseminates research in Italy; GSBE - Succursale de Paris (Paris branch), supervised by the AMF and by the ACPR disseminates research in France; and GSBE - Sweden Bankfilial (Stockholm branch), to a limited extent, subject to local supervision by the Swedish Financial Supervisory Authority (Finansinpektionen) disseminates research in the Kingdom of Sweden.

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 our Global Investment Research Division. 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, and buy or sell, the securities or derivatives, if any, referred to in this research, 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.