Goldman Sachs | Portfolio Strategy Research

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Global Strategy Paper

25 Years on; Lessons from the bursting of the technology bubble

- This week marks the 25th anniversary of the technology bubble bursting. Given the correction so far in technology stocks in 2025, particularly in the US, we investigate the parallels and differences between the two periods and examine what lessons can be learned.
- The technology bubble was primarily driven by exuberance around the commercialisation of the internet, with the Nasdaq index increasing fivefold between 1995 and 2000. Within a month of the bubble bursting, in March 2000, it had lost over a third of its value.
- A critical difference between the dominant technology companies today and those of the technology bubble is that valuations are much less extreme and the fundamentals of the technology sector are much stronger.
- Most technology cycles result in a broadening out of opportunities as new competition emerges and companies 'piggyback' on the embedded infrastructure to generate new goods and services.
- We continue to believe that the technology sector is not in a bubble and that there remain attractive investment opportunities. In line with our view on broader markets, however, we see benefits from diversification within technology, and beyond, to capture multiple growth opportunities.

Peter Oppenheimer
+44(20)7552-5782 | peter.oppenheimer@gs.com
Goldman Sachs International

Sharon Bell
+44(20)7552-1341 | sharon.bell@gs.com
Goldman Sachs International

Lilia Peytavin
+33(1)4212-1716 | lilia.peytavin@gs.com
Goldman Sachs Bank Europe SE - Paris Branch

Guillaume Jaisson
+44(20)7552-3000 | guillaume.jaisson@gs.com
Goldman Sachs International

Twenty-five years ago this week, stock markets around the world collapsed as the technology bubble finally burst. Given the extraordinary rise in technology stocks in recent years, particularly in the US, and their correction so far in 2025, it is worth exploring the parallels and differences between the two periods and examining what lessons can be learned.

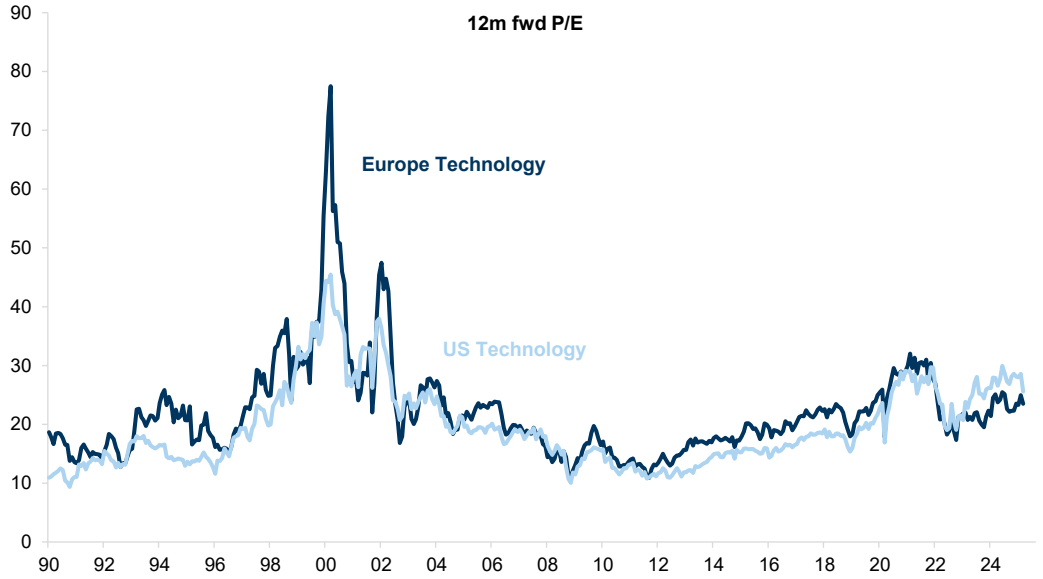
The rise in technology stocks in the late 1990s, driven by exuberance around the commercialisation of the internet, was extraordinary in magnitude and compares with some of the biggest bubbles in financial history.

- 1630s – The Tulip Mania in Holland
- 1720 – The South Sea Bubble in the UK, and the Mississippi Bubble in France
- 1790s – The Canal Mania in the UK
- 1840s – The Railway Bubble in the UK
- 1873 – The Railway Bubble in the US
- 1920s – The Stock Market Boom in the US
- 1980s – The Land and Stock Bubble in Japan
- 1990s – The Technology Bubble, Global
- 2007 – The Housing / Banking Bubble in the US (and Europe)

When the internet-based company Yahoo! made its initial public offering (IPO) in April 1996, the price of its stock rose from $13 to $33 within a single day, more than doubling the worth of the company. Growing concern about the pace and scale of speculation was expressed by policymakers. By December of that year, the then head of the Federal Reserve Alan Greenspan famously warned of 'irrational exuberance' in a speech at the American Enterprise Institute in Washington DC. Later, in February 1997, before the US Congress, he noted that "regrettably, history is strewn with visions of such 'new eras' that, in the end, have proven to be a mirage" These comments turned out to be very prescient, but also premature.

In the months that followed these warnings, shares in new '.com' companies were rising exponentially. The Nasdaq index increased fivefold between 1995 and 2000, eventually reaching a P/E valuation of 200x, significantly higher than even the 70x P/E ratio of the Nikkei during the Japanese stock market bubble. In 1999, for example, Qualcom shares rose in value by 2619%. This scale of price appreciation became commonplace (Exhibit 1). In 1999 alone, thirteen major large cap stocks all increased in value by over 1000% and another seven large cap stocks each rose by over 900%; for comparison, Nvidia rose by over 1180% from its low in 2022 to its high in 2024. Most equity markets peaked in March 2000 and by April 2000, just 1 month after peaking, the Nasdaq had lost 34% of its value, and over the next year and a half hundreds of companies saw the value of their stock drop by 80% or more. Priceline, for example, fell 94%. Eventually, by the time it had bottomed out in October 2002, the Nasdaq itself had fallen nearly 80%.

Exhibit 1: The tech bubble saw extravagant valuations in tech, especially in Europe
Monthly data. Last datapoint is as of 26 March 2025



Source: Datastream, Worldscope, Goldman Sachs Global Investment Research

Lessons from bubbles

The technology bubble was fuelled by a growing excitement around the internet. Enthusiasm around an innovation is a common characteristic around speculative bubbles in the stock market. One academic study[1] found that, in a sample of 51 major innovations introduced between 1825 and 2000, bubbles in equity prices were evident in 73% of the cases. They also found that the magnitude of these bubbles increases with the radicalness of innovations, with their potential to generate indirect network effects and with their public visibility at the time of commercialisation.

In this sense, several of the factors that drove the cycle in the late 1990s resonate with enthusiasm for AI and its related technologies today. A sea change in technology seems to be at a critical point of commercialisation, bringing the potential for higher future growth. The problem now, as then, is how to value the scale of the benefits that will accrue and identify who will be the biggest winners (and losers). Ultimately, bubbles develop as the aggregate value of companies that may be involved in the innovation exceed the future potential cash flows that it is likely to generate.

Looking at history (see *Global Strategy Paper: Why Technology is not a bubble; lessons from history*, 4 June 2018), we can make several interesting observations about how these periods evolve that help to contextualise the speed of change we are experiencing across economies and society today. Although it is difficult to generalise, some common characteristics are:

- A breakthrough in technology emerges and reaches commercial scale.

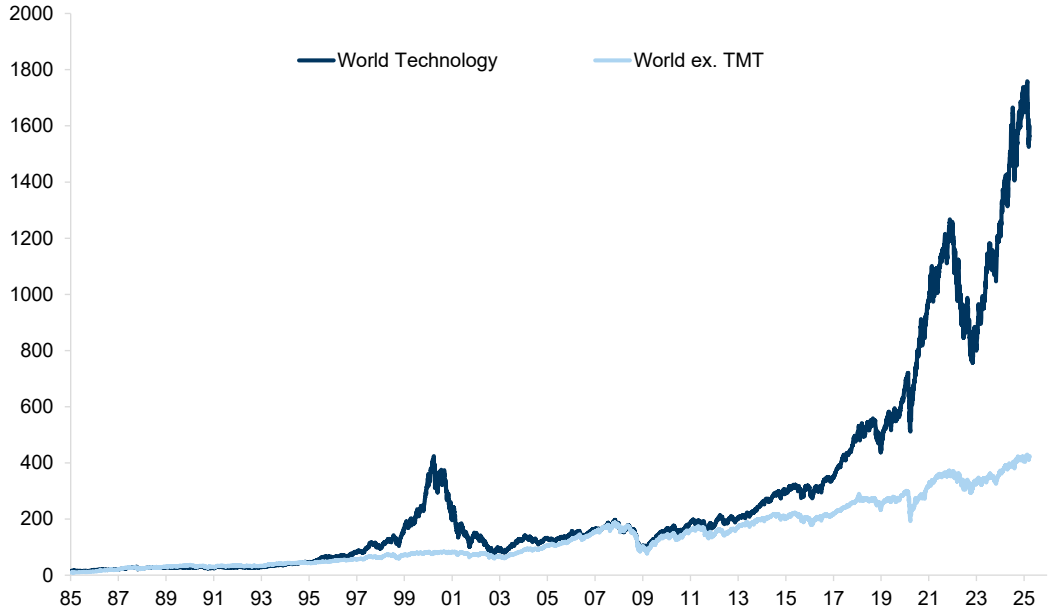
[1] See Sorescu, A., Sorescu, S. M., Armstrong, W. J., and Devoldere, B. (2018): Two centuries of innovations and stock market bubbles. Marketing Science Journal, 37(4), 507–684

- New companies and capital flood into the space.
- Speculation builds and valuations of companies rise, often resulting in a bubble.
- The bubble bursts, but the technology tends to re-emerge as a principal driver in the economy and stock market.
- The technology/industry becomes dominated by a few large players.
- Secondary innovations emerge, creating new companies and products that are enabled by the initial technology and its increased adoption.
- Other industries are disrupted by the innovations, forcing incumbents either to adapt or disappear.
- The secondary innovations create new employment opportunities and, with them, new sources of demand. Productivity tends to rise, but usually only after the full adoption of this new technology and network effects are realised.
- The speed of innovation is often associated with significant changes in broader society, seen in shifting social attitudes, consumer behaviour, government policy and business practices. These create new challenges and opportunities for companies adjusting to meet the changing demands.

Why technology today is not a bubble

A central driver of bubbles in the past has been not just strong performance (Exhibit 2) but rising valuations that reach a level that makes an unrealistic claim on future potential revenues. We have argued that while enthusiasm for technology stocks has risen sharply in recent years, this has not represented a bubble because the price appreciation has been justified by strong profit fundamentals – see *Global Strategy Paper: Why AI is not a bubble*, 5 September 2023.

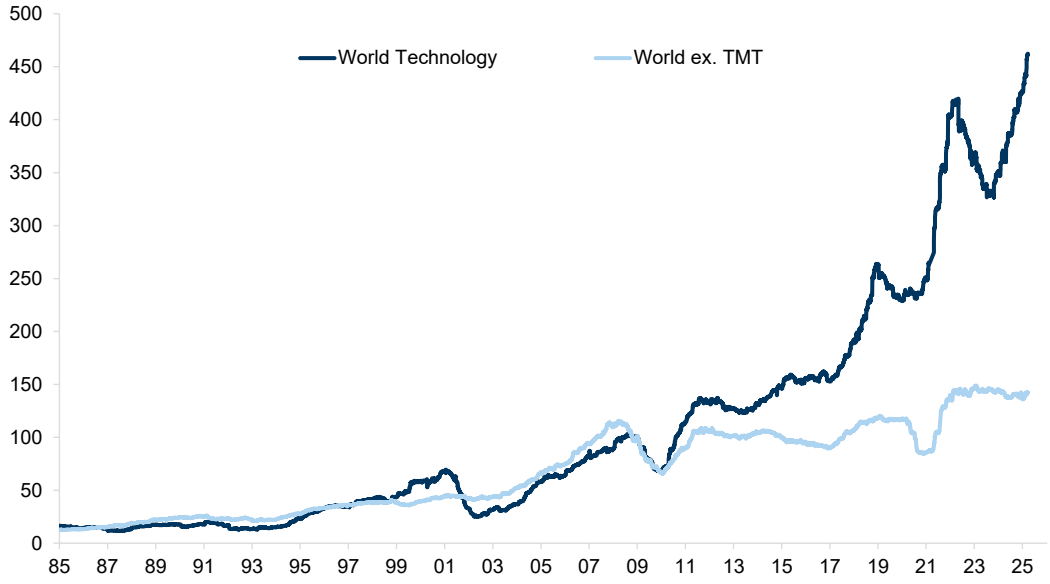
Exhibit 2: Market returns have been driven by a binary spread between technology and other sectors
Total return performance (USD). Indexed to 100 on Jan-2009



Source: Datastream, Worldscope, Goldman Sachs Global Investment Research

Exhibit 3 demonstrates the rapid growth in global technology profits (much of which has emanated from US companies) since the financial crisis, while the aggregate of non-technology companies largely stagnated for a decade.

Exhibit 3: Tech earnings have outstripped those of the global market
12m trailing EPS (USD). Indexed to 100 on Jan-2009

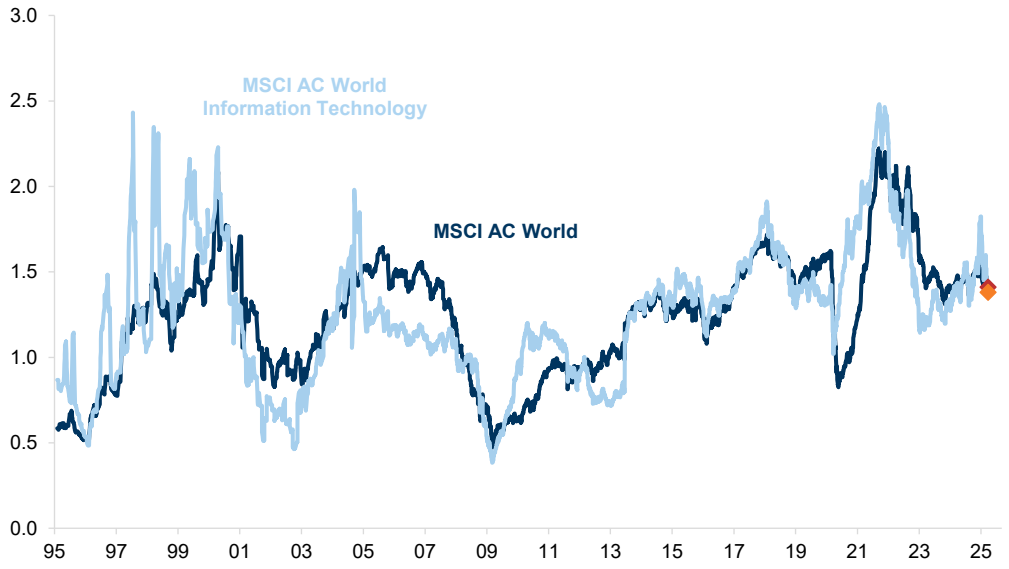


Source: Datastream, Worldscope, Goldman Sachs Global Investment Research

Consequently, the 'PEG' ratio for the sector – the valuation adjusted for expected growth – was in line with the rest of the market (Exhibit 4). Although this could also be said of the period in the late 1990s when enthusiasm for technology companies spread

into rising valuations across the whole market as it boosted future economic growth expectations, there was also a spike in relative valuations prior to the bursting of the bubble and, of course, the expected future growth rates at the time turned out to be illusory.

Exhibit 4: The PEG ratio for technology versus the world stock market has now converged
PEG ratio (12m fwd P/E divided by second 12m fwd EPS growth)



Source: Datastream, Goldman Sachs Global Investment Research

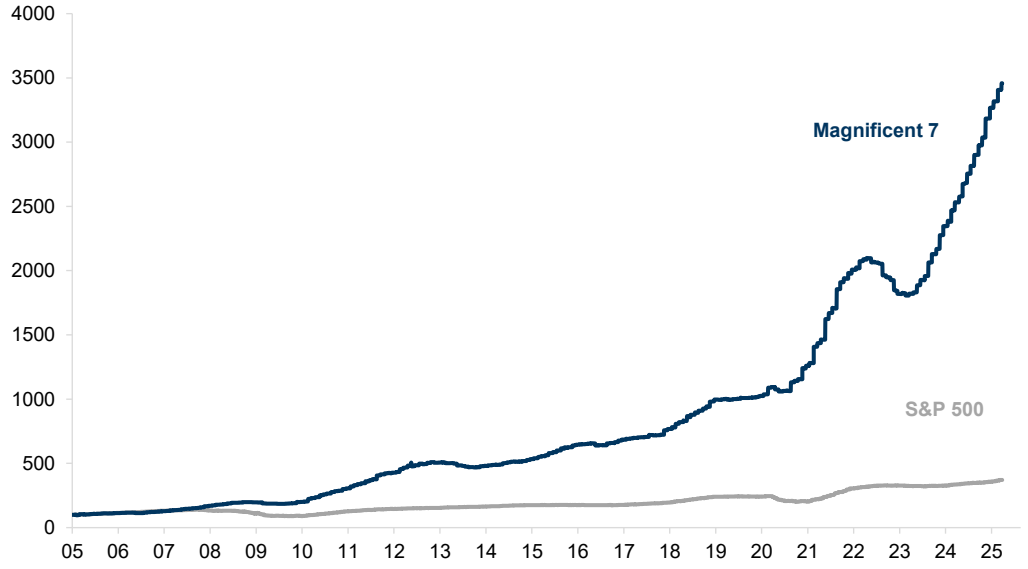
While the recent ascent of technology has been supported by fundamentals, one other phenomenon of the past decade is that technology profits have been increasingly concentrated in a small number of dominant companies. This tendency for concentration is not unique either. What tends to happen is that new technologies attract capital and new competition that results in a significant rise in new entrants – just as we saw in the technology bubble in the late 1990s. Very often, when a bubble bursts many of the competitors disappear, leaving a few dominant players. Some examples are:

- Standard Oil controlled over 90% of oil production in the US by 1900 and 85% of sales.
- By 1969 AT&T had reached 90% of US households.
- In 1981 IBM had over 60% market share in mainframe computers.
- By 2000 Microsoft had a 97% share in operating systems given its domination in the PC and laptop market.
- In internet searches Google has over 75% market share – its next biggest competitor, Microsoft Bing, has roughly 12%.

Several of the largest technology companies today are those that survived the technology bubble of 2000 and its violent shakeout. Since then, these are the successful few that have managed to scale in the waves of software development and

cloud computing that dominated in the early part of this century. Importantly, however, just as we have seen for the technology sector in aggregate, the dominant US technology companies have achieved their prominence because of extraordinary profit growth rather than speculation about future possible growth (Exhibit 5). The risk is that a new wave of technologies around AI attracts a new wave of competition, forcing down the returns of the incumbents.

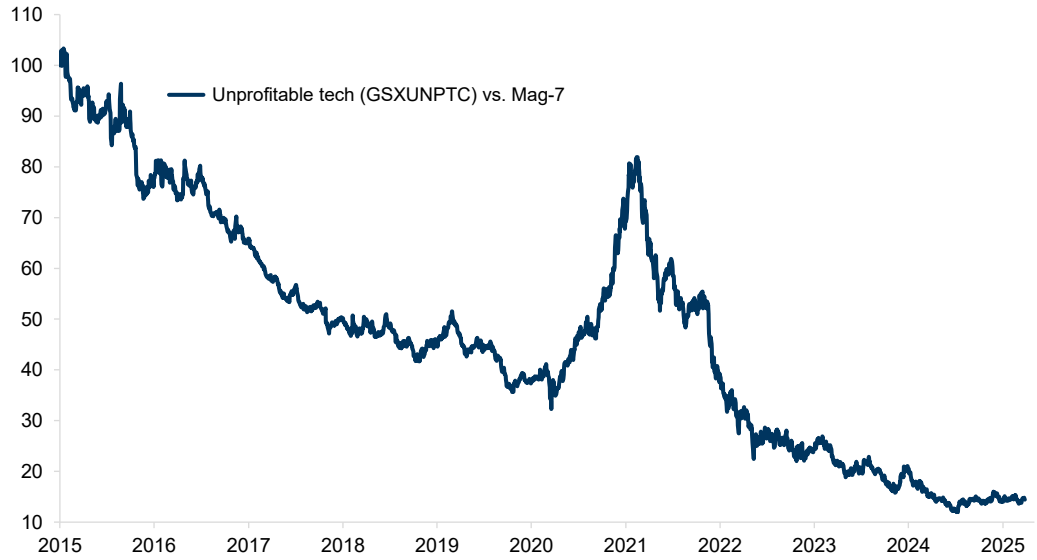
Exhibit 5: The dominance of the biggest companies in the US equity market is a function of their vastly superior earnings power over the past decade
Magnificent Seven and S&P 500, 12m trailing EPS. Indexed to 100 on Jan-2005



Source: FactSet, Goldman Sachs Global Investment Research

Nevertheless, while these dominant companies have been supported by strong profitability in recent years, we had begun to see some evidence of bubble behaviour in more speculative non-profitable growth companies in the period before the interest rate rising cycle in 2022 (Exhibit 6). When higher inflation forced policy rates to rise across the world, however, many of the longest duration speculative growth stocks collapsed in value under the weight of a higher cost of capital. The dominant technology companies managed to offset these fears given their strong balance sheets and high cash holdings.

Exhibit 6: Growth split into two parts in recent years: Unprofitable growth vs. Quality growth
Performance of the GS Unprofitable tech basket (GSXUNPTC) vs. Magnificent 7. Indexed to 100 on 01-Jan-2015



GSXUNPTC is a basket developed by GS Global Banking & Markets

Source: Bloomberg, Datastream, Goldman Sachs FICC and Equities, Goldman Sachs Global Investment Research

The current dominant technology companies do not have bubble valuations

A critical difference between the dominant technology companies today and that of other bubbles is that valuations are less extreme. As Exhibit 7 shows, the P/E for the so-called Magnificent 7 two years forward is in the low 20s with an EV/Sales of 5.1x. These are roughly half the equivalent valuations of the dominant 7 companies in the technology bubble of the late 1990s, and also compare much more favourably to the valuations of the dominant Japanese companies in the bubble of the late 1980s, or to the dominant companies in the 'Nifty fifty' period of the early 1970s.

Exhibit 7: Dominant companies today are not as expensive as those in previous 'bubble' periods in history

	Size		Valuation	
	Market weight	Market Cap ($ Bn)	*24m fwd P/E	*24m fwd EV/Sales
Magnificent 7 (2025)				
Apple	6.9%	3365	26.1	7.5
NVIDIA	6.0%	2945	20.5	11.2
Microsoft	6.0%	2938	23.3	8.5
Amazon	4.5%	2180	25.5	2.8
Alphabet	4.0%	1948	16.2	2.0
Meta Platforms	2.8%	1372	21.1	6.1
Tesla	1.9%	927	71.3	6.5
Magnificent 7 (2025) Aggregate	**32.0%**	**15673**	**23.0**	**5.1**
Tech Bubble Leaders (2000)				
Microsoft	4.5%	581	53.2	19.2
Cisco Systems	4.2%	543	101.7	17.5
Intel	3.6%	465	42.1	11.5
Oracle	1.9%	245	84.6	19.0
IBM	1.7%	218	23.5	2.3
Lucent	1.6%	206	37.9	4.1
Nortel Networks	1.5%	199	86.4	6.4
Tech Bubble Leaders (2000) Aggregate	**19.0%**	**2457**	**52.0**	**8.2**
Japan Financial Bubble (1989)				
Nippon Telegraph and Telephone	6.9%	157	100.1	
Industrial Bank Of Japan	4.6%	105	154.2	
Sumitomo Mitsui Banking	3.4%	77	49.2	
Bank of Tokyo-Mitsubishi	3.3%	75	49.8	
Fuji Bank	3.1%	71	52.8	
Dai-Ichi Kangyo Bank	2.9%	65	44.0	
Sakura Bank	2.8%	62	62.1	
Japan Financial Bubble (1989) Aggregate	**27.0%**	**613**	**67.0**	
Nifty 50 (1973)				
IBM	7.1%	48	35.5	
Eastman Kodak	3.6%	24	43.5	
Sears Roebuck	2.7%	18	29.2	
General Electric	2.0%	13	23.4	
Xerox	1.8%	12	45.8	
3M	1.4%	10	39.0	
Procter & Gamble	1.4%	9	29.8	
Nifty 50 (1973) Aggregate	**19.9%**	**135**	**34.3**	

*Actual (LTM) P/E and EV/Sales data from 02/01/1973 for Nifty 50. **LTM P/E data and EV/Sales from 27/12/1989 for Japan Financial Bubble. ***24m fwd P/E and EV/Sales data from 24/03/2000 for Tech Bubble.

Source: Datastream, Factset, Goldman Sachs Global Investment Research

Also the current crop of dominant US technology companies are much more profitable, and enjoy stronger balance sheets, than those that dominated in 2000 (Exhibit 8).

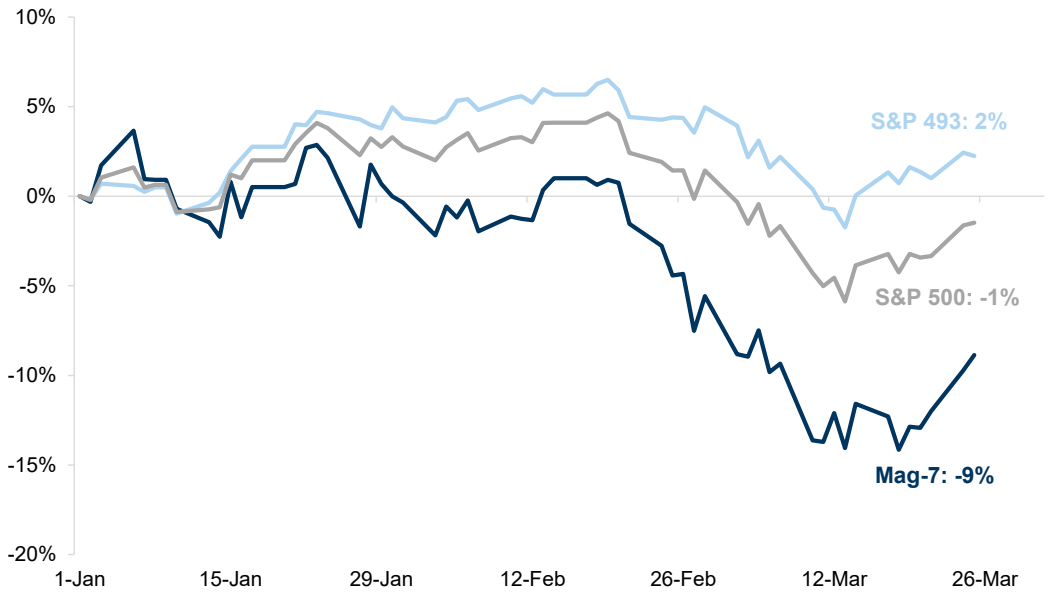
Exhibit 8: The current dominant companies are much more profitable and have stronger balance sheets than those that dominated during the tech bubble
Next 12 month estimate for Big Tech & last 12 months for Tech Bubble

	Market Weight (%)	Fundamentals			
		Cash as % of Market Cap	Net Debt to Equity	Return on Equity (%)	Net Income Margin (%)
Magnificent 7 (2025)					
Microsoft	6.0%	2.7%	-17%	26%	35%
Apple	6.9%	1.9%	-24%	129%	27%
Nvidia	6.0%	3.4%	-55%	67%	55%
Amazon	4.5%	6.9%	-13%	18%	10%
Alphabet	4.0%	2.7%	-23%	27%	28%
Meta Platforms	2.8%	4.4%	-13%	27%	34%
Tesla	1.9%	3.3%	-26%	12%	9%
Magnificent 7 (2025) Aggregate	**32.0%**	**3.6%**	**-24%**	**44%**	**28%**
Tech Bubble Leaders (2000)					
Microsoft	4.5%	3.0%	-63%	35%	39%
Cisco Systems	4.2%	0.4%	-17%	22%	17%
Intel	3.6%	2.5%	-33%	26%	25%
Oracle	1.9%	1.0%	-61%	39%	15%
IBM	1.7%	2.7%	111%	39%	9%
Lucent	1.6%	0.9%	38%	36%	9%
Nortel Networks	1.5%	1.1%	-3%	-1%	-1%
Tech Bubble Leaders (2000) Aggregate	**19.0%**	**1.7%**	**-4%**	**28%**	**16%**

Source: Datastream, Factset, Goldman Sachs Global Investment Research

Furthermore, many of the leading technology companies have underperformed and de-rated since the start of this year, partly prompted by the emergence of new competition from China, which has undermined the confidence in the strength of their competitive moats (Exhibit 9).

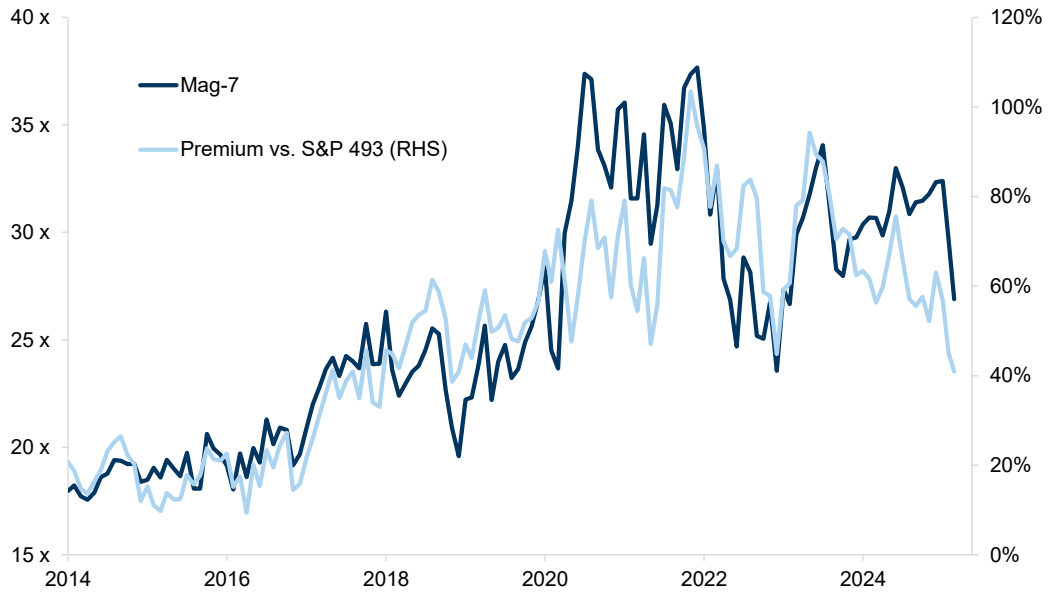
Exhibit 9: The Magnificent 7 have underperformed YTD
YTD return



Source: FactSet, Goldman Sachs Global Investment Research

Following their recent underperformance, the Magnificent 7 now collectively trade at a P/E of 27x, the lowest since early 2023 (Exhibit 10). This de-rating has occurred despite consensus expectations that the group will collectively continue to grow EPS at a faster rate than the S&P 493.

Exhibit 10: The Magnificent 7 now trade at their lowest valuation premium to the rest of the S&P 500
12m fwd P/E



Source: FactSet, Goldman Sachs Global Investment Research

The risk to incumbents

While valuations may not be in bubble territory, what lessons can we learn about the evolution of technology cycles? One of the interesting patterns from past technology cycles is that the dominant incumbents often end up underperforming as the competitive landscape evolves. The risk to the technology sector from here relates to three issues:

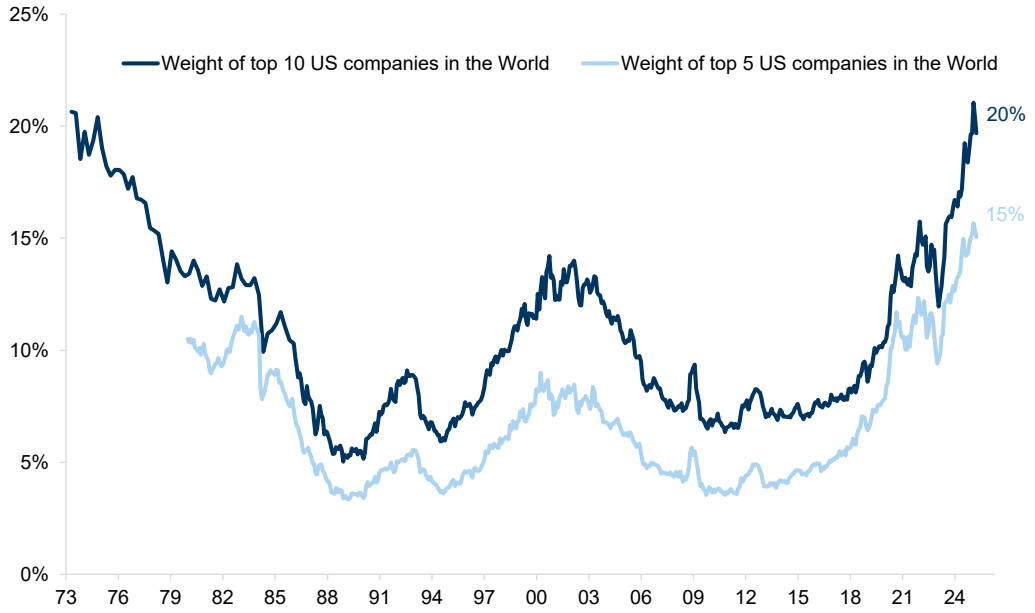
1. Concentration risk
2. Overspending on capital
3. New competition

Concentration risk

In *Global Strategy Paper: The Concentration Conundrum; What to do about market dominance*, we argued that equities had become risky because they had become more concentrated by country (as the US market increasingly dominated the global equity market), by sector and by stock. These three forms of concentration are related to each other and are connected to the growth of technology companies.

While the appreciation of the dominant technology stocks is not unprecedented, the concentration that they have in the market is (Exhibit 11).

Exhibit 11: The biggest 10 US stocks account for 20% of the entire value of the global index
Weight of biggest US companies in global market cap



Source: Datastream, Goldman Sachs Global Investment Research

The risk is that, if these companies disappoint, it would have a bigger impact on the broader equity market than we have typically seen. This is one of the key reasons why the US equity market has underperformed this year. Market concentration was also an issue last year in Europe when several of the largest companies (the GRANOLAS) had profit warnings and de-rated, pulling down the broader index.

Overspend on capex and declining returns

One of the lessons that we can draw from previous bubbles and technology cycles is that competition is often underestimated, and the returns on capital invested by the innovators are typically overstated. Companies at the epicentre of an innovation often fail to achieve the returns that their high valuations imply as the marginal cost of the technology falls and capacity increases over time, while a typical overlooked opportunity is that investors understate the returns available to new entrants in an industry that emerge after the initial investments are made that can piggyback on the capex of others. This has become a more relevant issue for the dominant incumbents in the AI space with the entrance of new competition, particularly from China.

The problem of increased competition and overspend by incumbents was evident in the early days of the internet and in the bubble that followed. While there was widespread and broad speculation in any new company that offered potential exposure to the industry, the incumbent winners were generally seen to be the telecom companies**.** They were viewed as a relatively 'safe' route to the potential fortunes that the internet may be able to generate compared to the more speculative unprofitable dot-com companies. Telecoms had the benefit of being well-established companies, in many cases former monopolies or state-run enterprises, with low volatility earnings and an existing and large-scale client base. They also had tangible assets and owned and

developed fibre optic networks, routers, wireless systems and telecoms equipment that were the underlying infrastructure of the internet. They appeared to be perfectly placed to receive a high share of the future revenues driven by the internet in e-shopping.

The problem was that investors significantly overstated the returns on the capital investment that these companies made. This was partly a consequence of new entrants and partly because of the huge scale of capital invested. Competition was stimulated by de-regulation of the industry, led by the US, which introduced the telecoms act of 1996. The act deregulated the broadcast and telecoms industry in order to provide an environment that could take advantage of the technological convergence of these trends and a surge in capital investment followed. According to the Federal Communications Commission, the amount of fibre optic cable laid in the US went from one million miles in 1996 to 10 million by 2000, much financed by debt. When Global Crossing and WorldCom collapsed, they had $25bn and $100bn of debt. A similar pattern occurred across Europe. In the UK, a spending spree occurred after the government allowed 3G spectrum auctions in April 2000 that generated £22.5bn in revenues for the government, and similar auctions in Germany raised roughly $30bn. Ultimately, however, the capex boom resulted in severe overcapacity in bandwidth for internet usage. While the fixed costs of these new networks were very high, the marginal costs of sending signals over them was very low.

Increasingly, competition forced prices down and by 2004 the cost of bandwidth had fallen by more than 90%, despite internet usage doubling every few years. As late as 2005, as much as 85% of broadband capacity in the US was still going unused. Many companies could not repay their significant debts in the US and some of the auctions for 3G licences in 1999 had to be re-run because the original companies that made the bids defaulted on their bids. When the auction was re-run, the bids were only 10% of the original $4bn raised.

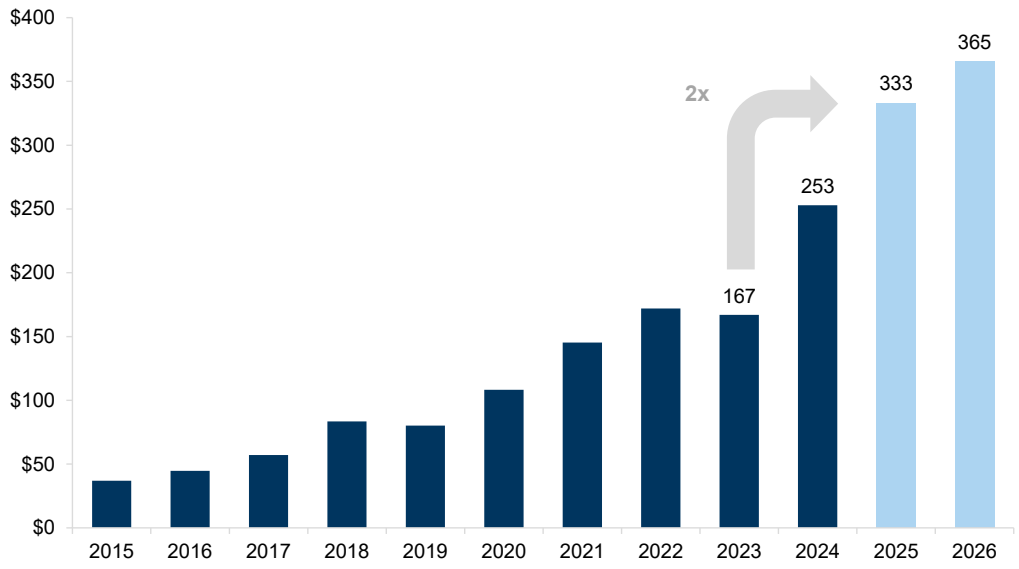
Ultimately, the valuation of these companies collapsed, alongside the broader technology bubble. Between 2000 and 2002, the Dow Jones technology index lost 86% and the wireless communications index dropped 89%, with 23 companies going bankrupt in the US alone, and the failure of WorldCom became the biggest stock market failure in history with a loss of $102bn in July 2002.

As in other examples in history, the problem was not a miscalculation of the growth potential of the technology, but rather that investors had attributed too much future value to the companies that had built the technology and infrastructure to provide it. In this case, like many others before, the ultimate winners were the companies that could 'free ride' off this spending and utilise the capacity to build business models that could leverage the technology and provide new products and services. Many of these winners did not emerge until the onset of the smart phone in 2006 and the onset of apps which then spawned a growing industry of platform companies, ride sharing, social media, and so on.

This lesson from the internet bubble of the late 1990s is interesting in the current context. The dominant technology companies today have increased their capex spending substantially, with the biggest 7 in the US doubling their capex plans since the

introduction of ChatGPT in 2022 (Exhibit 12).

Exhibit 12: Magnificent 7 will spend 2x as much on capex in 2025 compared with before ChatGPT
Magnificent 7 annual capex spend ($ billions)

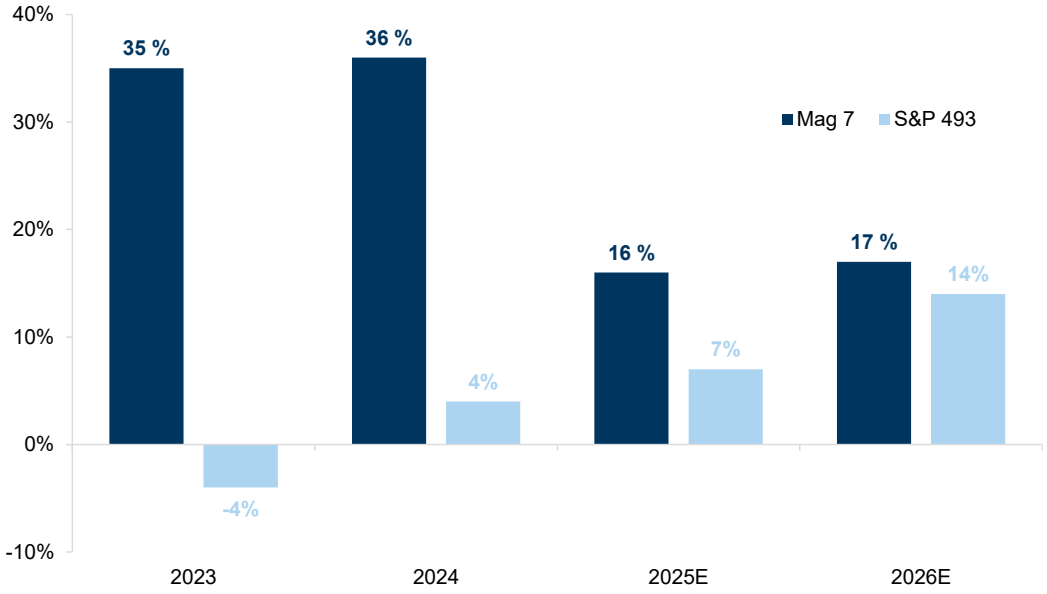


Magnificent 7 is a list of large US tech companies including: Meta, Amazon, Apple, Microsoft, Alphabet, Tesla, NVIDIA

Source: FactSet, Goldman Sachs Global Investment Research

The risk is that as capex employed rises and new competition emerges, the premium growth rates that these companies enjoy fades. Our US strategists have pointed out that this is already happening - see *2025 US Equity Outlook: The Art of the Deal,* 18 November 2024 (Exhibit 13).

Exhibit 13: Our US strategists expect the strong pace of earnings growth of the dominant technology companies to continue but also to moderate on a relative basis
Annual earnings growth

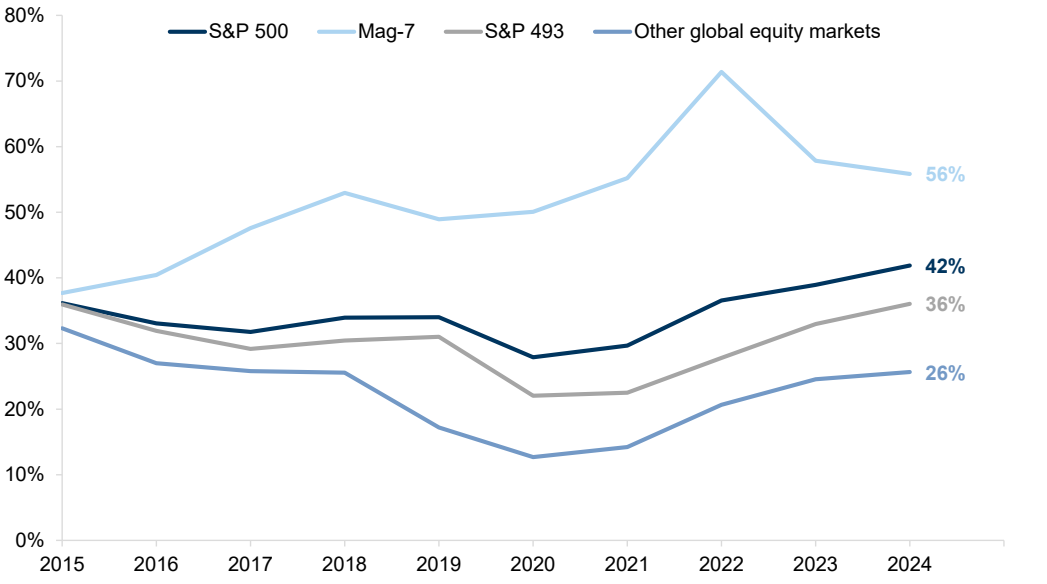


Magnificent 7 is a list of large US tech companies including: Meta, Amazon, Apple, Microsoft, Alphabet, Tesla, NVIDIA

Source: Datastream, Goldman Sachs Global Investment Research

It is also interesting that the ratio of growth capex to free cash flow is slowing from a peak in the dominant US tech companies and rising from a lower level in the rest of the market (Exhibit 14).

Exhibit 14: The ratio of growth capex to free cash flow is slowing from a peak in the dominant US tech companies
Growth Investment Ratio ([Growth capex + R&D]/ CFO)



Source: FactSet, Goldman Sachs Global Investment Research

New competition; the emergence of secondary innovations

History suggests that the original innovators are not always the ultimate winners. In 1882, *The Economist* wrote that "The electric light is very probably a great invention, and let us take it for granted that its future development will be vast. But this, unhappily, cannot be urged as a reason why the pioneer companies should be prosperous." This had been seen throughout history.

While the market for a technology innovation can become dominated by a few very large companies for a long time, the initial transformative technology becomes a conduit that kickstarts a whole range of other innovations and, with this, new companies and market opportunities.

For example, while coal and steam were the foundations of the First Industrial Revolution, a range of other developments quickly followed. Mass migration to cities and the movement away from agriculture resulted in demand for new consumer products. Mechanised looms transformed the textile industry and domestic products such as soaps began to be manufactured in factories rather than at home. This generated new markets and became the catalyst for the building of consumer brands, advertising, and marketing. During the railway boom, the steam engine spawned the development of the railways, and the network effect and connectivity then allowed other technologies to develop.

Similarly, during the Second Industrial Revolution, the harnessing of gas and oil to create electricity was one of the key driving inventions. But this, in turn, enabled the mass production of steel, the development of the internal combustion engine and the automobile. The start of the modern assembly line in factories became a further innovation, transforming the production and distribution of a range of new products. In the same way, the network impact of the railway boom and telegraph fostered a host of new market opportunities and companies.

With the computer age of the Third Industrial Revolution came the rapid acceleration of service industries. The first transistorised consumer products started to appear in 1952, opening new markets as consumers were willing and able to pay a premium for low power consumption and portability. By the mid-1950s, prototype silicon devices were developed in Northern California. Plastics and lighter materials also generated significant new growth markets, while the growth of multinational companies opened new market opportunities.

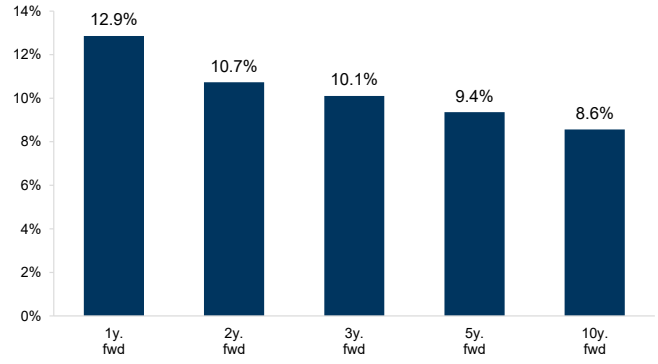
This pattern has also been evident over the past two decades. The rapid rollout and adoption of the internet and related technology has enabled the development and penetration of the smartphone. This, in turn, spawned an industry of companies based on the 'apps' used on these phones (think of the revolution in taxi and food delivery services, for example) and the 'internet of things' (a world of connected appliances and devices).

An additional lesson from previous waves of technology in the past is that competition, particularly in the US equity market, drives rapid rotation of leadership. This process sometimes accelerates or slows down but since 1980, for example, more than 35% of

S&P 500 constituents have turned over during the average 10-year period, largely reflecting innovation. Of the current top 50 companies in the US, only half were in the top 50 a decade ago, and many did not even exist before the 1990s (NVIDIA (1993), Amazon (1994), Netflix (1997), PayPal (1998), Alphabet (1998), Salesforce (1999), Tesla (2003) and Facebook (2004). More recently, Nvidia has grown at an extraordinary pace, becoming the world's biggest company from a relatively small base just a few years ago.

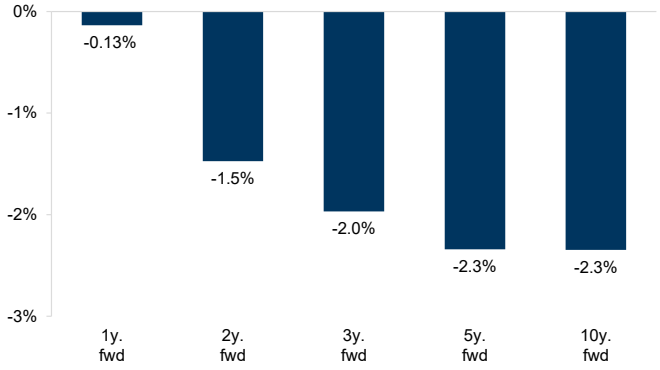
As a result of changes in leadership and, by implication, growth, history would suggest that buying dominant companies generates lower returns over time. For example, Exhibit 15 shows the total return on average since 1980 that would have been achieved by buying and holding the top 10 stocks over different time horizons (from 1 year out to 10 years), while Exhibit 16 shows the same in relative returns (compared with the S&P 500). These data suggest that, while absolute returns remain good for the dominant companies, these strong returns fade over time, and they often remain solid 'compounders'. Importantly, however, the relative returns are generally negative for dominant companies if an investor buys and holds them as other faster-growing companies come along and outperform.

Exhibit 15: Absolute returns remain good for dominant companies...
Average forward realised absolute return (US Top 10 companies). Since 1980



Source: Datastream, Goldman Sachs Global Investment Research

Exhibit 16: ...but they generally underperform (over the long run)
Average forward realised relative return (US Top 10 companies). Since 1980



Source: Datastream, Goldman Sachs Global Investment Research

Exhibit 17 shows the largest 10 companies over 5-year intervals since 1990 in the S&P500. Some of the greatest leaders have disappeared, some stay as household names, but new leaders emerge and can become dominant very quickly. There are 5 companies in the top 10 today that were in the top 10 in 2015, 3 that were in the top 10 in 2010 and just 1 that featured in the top 10 in 2005.

Exhibit 17: The 10 largest S&P companies through time
By market cap on 31 December

1985		1990		1995		2000	
IBM		IBM	2.9%	General Electric	2.6%	General Electric	4.1%
Exxon Mobil		Exxon Mobil	2.9%	AT&T	2.2%	Exxon Mobil	2.6%
General Electric		General Electric	2.3%	Exxon Mobil	2.2%	Pfizer	2.5%
Philip Morris		Philip Morris	2.2%	Coca-Cola	2.0%	Cisco Systems	2.4%
General Motors		Royal Dutch Shell	1.9%	Merck & Co	1.8%	Citigroup	2.2%
Amoco		Bristo-Myers Squibb	1.6%	Philip Morris	1.7%	Walmart	2.0%
Royal Duch Shell		Merck & Co	1.6%	Royal Dutch Shell	1.6%	Microsoft	2.0%
Du Pont		Walmart	1.6%	Procter & Gamble	1.2%	American Internation	2.0%
AT&T		AT&T	1.5%	Johnson & Johnson	1.2%	Merck & Co	1.8%
Chevron		Coca-Cola	1.4%	IBM	1.1%	Intel	1.7%

2005		2010		2015		2024	
General Electric	3.3%	Exxon Mobil	3.2%	Apple	3.3%	Apple	7.0%
Exxon Mobil	3.1%	Apple	2.6%	Alphabet	2.5%	Nvidia	6.4%
Citigroup	2.2%	Microsoft	1.8%	Microsoft	2.5%	Microsoft	6.4%
Microsoft	2.1%	General Electric	1.7%	Exxon Mobil	1.8%	Alphabet	6.2%
Procter & Gamble	1.7%	Chevron	1.6%	General Electric	1.6%	Amazon.com	3.8%
Bank of America	1.6%	IBM	1.6%	Johnson & Johnson	1.6%	Meta Platforms A	2.4%
Johnson & Johnson	1.6%	Procter & Gamble	1.6%	Amazon.com	1.5%	Eli Lilly	1.8%
American Internation	1.6%	AT&T	1.5%	Wells Fargo	1.4%	Broadcom	1.6%
Pfizer	1.5%	Johnson & Johnson	1.5%	Berkshire Hathaway	1.4%	Tesla	1.4%
Philip Morris	1.4%	JPMorgan Chase	1.5%	JPMorgan Chase	1.4%	JPMorgan Chase	1.2%

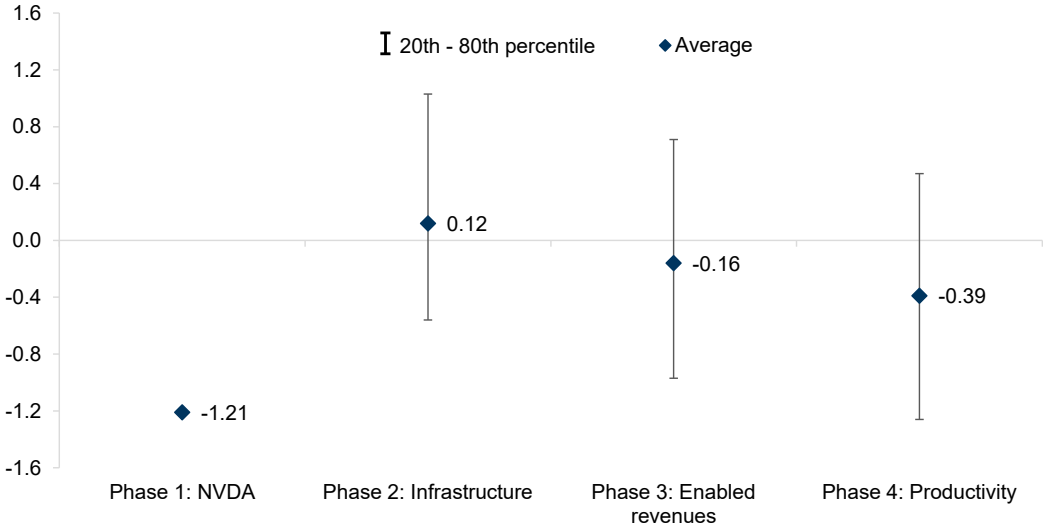
Source: American Enterprise Institute, Datastream, Data compiled by Goldman Sachs Global Investment Research

Diversify to Amplify

While the leading tech companies of the 2020s will most likely remain dominant in their respective markets, rapid innovation, particularly around machine learning and AI, will likely create a new wave of tech superstars and possibly products and services that are not yet imagined. It is probable that AI and robotics will not only create innovative leading companies but will also raise the prospect of major restructuring gains in non-technology sectors.

This is why our US strategists have talked about diversifying into later-stage winners. Focus will likely transition from AI infrastructure to broader AI Phase 3 application rollout and monetization (see *US Equity Views: AI and US Equities: Refreshing our list of AI Phase 3 stocks and identifying early adopters in AI Phase 4*, 6 March 2025). While AI capex among the hyperscalers has been revised higher, the growth rate of AI capex is slowing. In addition, our investor conversations continue to suggest major uncertainty about the return on investment among the hyperscalers. Instead, as the cost of AI continues to decline, we expect investors will begin to seek companies with AI-enabled revenues. Even after the sell-off, the relative valuation of AI Phase 2 stocks is still slightly above its historical average, while AI Phase 3 stocks trade slightly inexpensive vs. history.

Exhibit 18: The relative valuation of AI Phase 2 stocks is still slightly above its historical average, while AI Phase 3 stocks trade slightly inexpensive vs. history
Distribution of company P/E vs. SPW relative to past 10 years (z-score)



Source: FactSet, Goldman Sachs Global Investment Research

Finally, it is worthwhile recognising that there is a growing symbiotic relationship between the future growth rates of the technology sector and those of other industries required to roll out the infrastructure, which also add to the potential for sector diversification. Increasingly, the ambitions of large cap tech companies are dependent on greater electricity generation and infrastructure. Many of the companies that stand to benefit from this trend are in the 'old economy' and have much lower valuations, having stagnated and disappointed for many years. AI could continue to boost returns in the technology space, but for these companies to fulfil their potential, they will need huge increases in electrical power (and, with it, demand for infrastructure spend and copper). Our equity analysts estimate that data centre power demand is poised to grow 160% by the end of the decade, which should drive a significant acceleration to a level of electricity growth in the US and Europe not seen in a generation (see *GS Sustain: AI/data centers' global power surge and the Sustainability impact*, 28 April 2024).

Disclosure Appendix

Reg AC

We, Peter Oppenheimer, Sharon Bell, Lilia Peytavin and Guillaume Jaisson, 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.

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