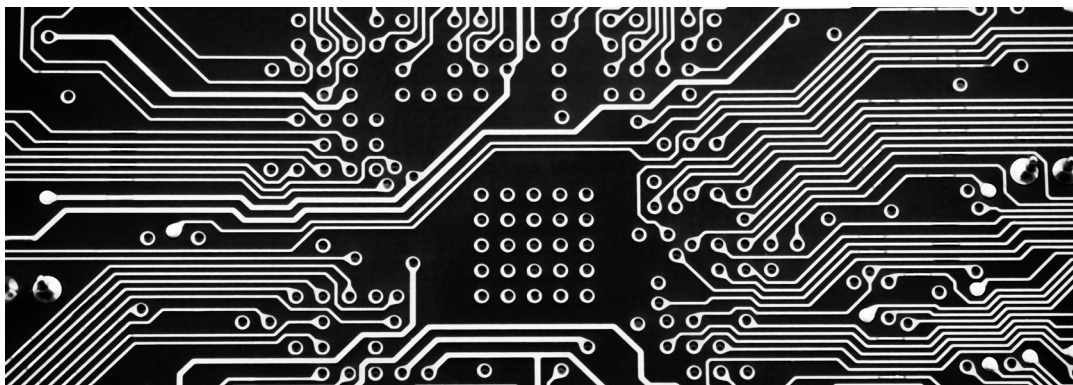


# Industry Top Trends 2022

## Technology

### Technology Sector's Strength Will Continue Into 2022



*This report does not constitute a ratings action*

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#### What's changed?

**Ratings expectations.** S&P Global Ratings' rating actions in 2021 were heavily biased to the upside with positive actions outweighing negative by a roughly 5:2 ratio. Based on our favorable IT spending outlook, we expect this to continue in 2022 albeit at a more balanced pace.

#### What are the key assumptions for 2022?

**IT forecast.** After expanding by more than 10% in 2021, we expect global IT spending to grow at a more modest 6% area in 2022. This betters our global GDP forecast of 4.3% and represents increasing demand for cloud services, acceleration of enterprise spending, and adoption of new technologies.

**Semiconductor shortage.** Strong demand will cause the global semiconductor shortage to persist into 2022, but conditions may loosen by the end of the year in certain markets as supply begins to come online.

**New technologies.** We believe emerging technologies will enter the steeper part of the adoption curve in 2022 as their capabilities and benefits feed off one another, providing another boost to both enterprise and consumer tech demand.

#### What are the key risks around the baseline?

**Inflation.** It is a low risk for the technology industry as companies can mostly pass on higher input cost in a tight supply environment. However, higher rates arising from inflation could hurt low-rated borrowers over the longer term.

**Financial policy.** Based on our forecast for strong cash flow generation, tech companies are likely to shift priorities to M&A and share repurchases now that liquidity hoarding and balance sheet management are in the rear view.

**Supply chain.** Investments to accelerate supply chain diversification outside of China present a low risk for now given strong profitability but labor management and infrastructure at new locations represent long-term risks.

# Ratings trends and outlook

## Global Technology

Chart 1

Ratings distribution

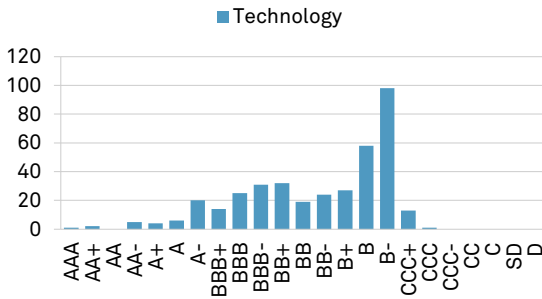


Chart 2

Ratings distribution by region

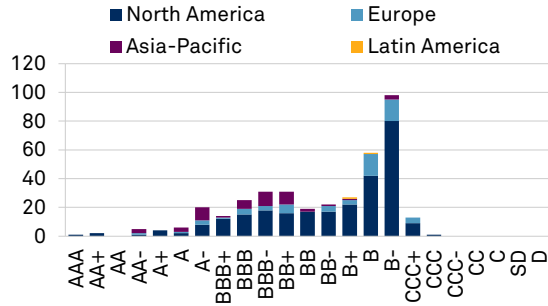


Chart 3

Ratings outlooks

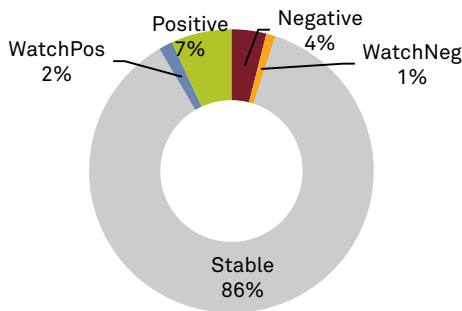


Chart 4

Ratings outlooks by region

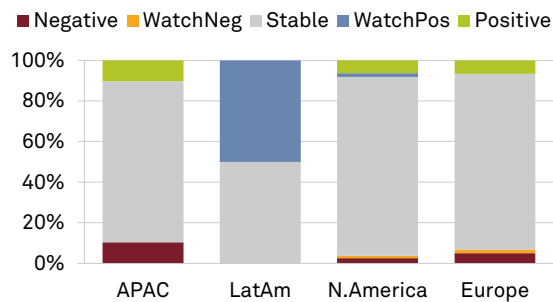


Chart 5

Ratings outlook net bias

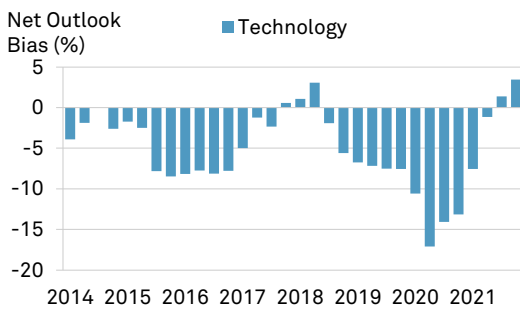
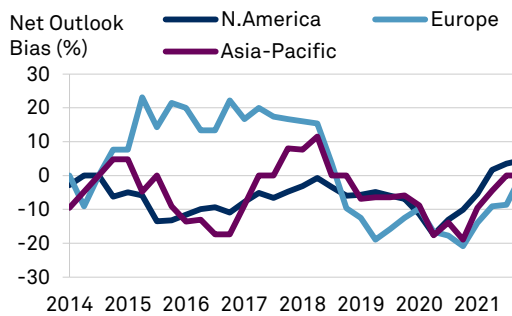


Chart 6

Ratings net outlook bias by region



Source: S&P Global Ratings. Ratings data measured at quarter end.

# Technology

## Ratings trends and outlook

2021 was an active year for technology ratings. After a volatile 2020, marked by significant negative rating actions in the first half and gradual improvement through the second half, 2021 generated positive rating actions throughout the year as technology companies continued to benefit from accelerating digital transformation which led to rising purchases of software, hardware, and services. We expect continued expansion of global IT spending in 2022 underpinned by accelerating growth in the cloud, improved enterprise spending, and continued ramp of 5G smartphones and related infrastructure. Macro risks, such as inflation, rising borrowing costs, and the pace of pandemic recovery bear monitoring, but we believe ratings will continue to have an upward bias throughout 2022, albeit a more moderate trend compared to 2021.

## Main assumptions about 2022 and beyond

### 1. IT spending will continue to outpace GDP growth in 2022

After expanding by more than 10% in 2021, we expect global IT spending to still grow, albeit at a more modest 6.3%, in 2022. This betters our global GDP forecast of 4.3% and represents increasing demand for cloud services, acceleration of enterprise spending, and adoption of new technologies.

### 2. Semiconductor shortage to persist through 2022

Semiconductor markets have spent 2021 in one of the largest and most pervasive supply shortages in history as low inventory and capacity constraints constrained firms' ability to respond to rapidly rebounding demand in 2021. Moderately slowing demand growth, incremental capacity, and new ordering practices should mitigate some of the disruption by the end of the year.

### 3. Broadening use cases in IoT and 5G in 2022

We believe these emerging technologies will enter the steeper part of the adoption curve in 2022 as their capabilities and benefits feed off one another. The early success of these emerging technologies to increase factory automation and improve productivity in the industrial end market should entice broader adoption in other end markets, providing another boost to both enterprise and consumer tech.

## IT spending will continue to outpace GDP growth in 2022

2021 was a year to remember for the technology industry as COVID-19 accelerated digital transformation across enterprises and demand for remote work-related hardware and services led to strong growth for tech companies. Data center spending, especially by hyperscale cloud providers, jumped as enterprise customers accelerated their move to the cloud to create more flexible and resilient remote work environments. Semiconductor shortages made headlines all year as chip manufacturers could not keep pace with the sudden surge of demand across most end markets. Software sales proved sticky through all economic cycles and IT services recovered from 2020. We estimate that 2021 global IT spending grew near 10% as a result (see table 1).

Our 2022 IT spending outlook remains generally favorable despite the everchanging macro environment and slowing demand for pandemic-related purchases such as the PC. Global economic recovery will continue to be driven by the prevalence of COVID-19 cases and resulting supply chain impact across the globe, but we believe technology spending

will remain a safe harbor in an otherwise uncertain macro environment. Further, we believe technology spending will continue to outpace that of global GDP and account for a larger percentage of the global GDP spending over the coming decade as enterprises continue to invest to meet evolving demand for the next wave of technology innovations in areas such as Internet of Things, artificial intelligence (AI), machine learning, and autonomous driving, which all require greater connectivity, storage, and processing power. Against this backdrop, we forecast that global IT spending will expand 6.3% in 2022 on a constant currency basis, exceeding our current global GDP growth forecast of 4.3%.

Table 1

**Global IT Growth Forecasts**

	2020	2021e	2022e
<b>Macro</b>			
Global GDP Growth	(3.3%)	5.7%	4.2%
--U.S. GDP Growth	(3.4%)	5.5%	3.9%
--Eurozone GDP Growth	(6.5%)	5.1%	4.4%
--China GDP Growth	2.3%	8.0%	4.9%
<b>Global IT Spending</b>	<b>3.0%</b>	<b>10.5%</b>	<b>6.3%</b>
<b>Revenues</b>			
IT Services	2%	8%	7%
Software	9%	13%	11%
Semiconductors	7%	26%	9%
Network Equipment	(3%)	2%	5%
Mobile Telecom Equip	5%	12%	3%
External Storage	(4%)	6%	5%
<b>Shipments</b>			
PC	13%	15%	2%
Smartphone	(7%)	4%	1%
Server	3%	6%	5%
Printer	0%	(5%)	3%

e—Estimate. Source: S&P Global Ratings.

We believe IT spending growth will outpace global GDP growth in 2022 as supply chain constraints have pushed some demand into the current year; this tailwind should last through at least the midyear. Enterprise spending should accelerate in 2022 as companies continue to prioritize digital transformation, move workloads to public and hybrid clouds, and invest in growth-oriented IT projects that have longer payback periods after a profitable 2021. We expect cloud providers to accelerate their capital spending in 2022 to meet the growing demand for its services, although we note that some subsectors, such as software and semiconductors, will benefit more than traditional hardware vendors. PC shipments will only grow modestly in 2022 after nearly two years of hyper-demand, but we believe the industry can sustain shipments near current high levels for next several years. Smartphone shipment growth will slow in 2022 but 5G phones will continue to proliferate and represent a higher proportion of sales, which will lift overall industry revenues. Software sales, the most resilient through the pandemic, will continue to grow near double digits with pure SaaS providers exceeding this growth. We do not view inflation as a meaningful risk for the technology sector as we believe most companies are able to pass on higher cost to customers in a supply constrained environment.

Below we discuss the outlooks for key technology products.

## Software

We expect the software market to grow about 11% in 2022, a modest deceleration from about 13% in 2021 but still above the high-single-digit pace we typically see in this segment. Enterprises are leaning into their digital transformation plans, which the COVID-19 pandemic accelerated through increasing complexity and security requirements of remote working arrangements, among many other behaviors that we believe are beneficial to the tech industry. Input constraints on raw materials and labor and remote working policies have increased pressure on companies to find efficiencies and become more flexible, and they are looking to software solutions to deliver these outcomes. A continued strong demand environment will provide funds for a healthy pace of business investment, which will benefit software companies over a multi-year horizon.

Software-as-a-service (SaaS), which represents nearly 45% of the total software market according to IDC, has proven to be one of the best performing subsectors through COVID-19 and should continue to take market share from on-premises software. While SaaS should grow in the high-teens percent area over the next few years, on-premises software should grow in the low-single digits. This is down from the mid-single digits in 2017 and 2018, which demonstrates how the impact of SaaS has accelerated in recent years. The SaaS model provides lower total ownership costs because the SaaS provider can more efficiently manage hardware and maintenance and significantly reduce the customer's hardware and IT services spending. Customers also find lower upfront costs and less-complex implementations, making the purchase decisions easier for customers. In addition, customers can more easily scale applications across their enterprises, get quicker access to the latest updates, and have more predictable software expenditures as they shift the spending to operating expense budgets from capital expenditure budgets. Software providers continue to focus on enabling on-premises customers to quickly and reliably transition to the SaaS versions of their applications.

## Services

We expect the IT services industry to experience an above global-GDP growth rate, at about 7% revenue growth, in 2022, following an estimated 8% rise in 2021 that saw a sharp uptick in activity as businesses continue to learn how to operate in a COVID-19 disrupted world. Significant backlog is present as supply of skilled labor is tight onshore and offshore.

Large projects, such as enterprise resource planning (ERP), software implementations, and consulting engagements, returned in 2021 after being delayed the year prior. We saw large IT services vendors such as Accenture, Cognizant, and IBM experience double-digit revenue growth in these areas. As the pandemic changed the way we work, businesses realized the importance of the hybrid work environment and relied even more on IT services vendors for help to accelerate their shift to a private and public cloud infrastructure, as well as need for digital transformation, application modernization, and automation. We view these needs to be a secular trend as demand for these capabilities continue, and the implementation periods tend to be long and involve the development or modernization of both front-end application and back-end platforms and infrastructure across areas such as customer engagement, cloud, artificial intelligence, big data, analytics, and cybersecurity. As businesses continue to embed more technology in their operating environment, IT services vendors will have an ever-larger role to play as trusted business partners, favoring those with the most digital expertise but also superior customer service.

The biggest risk exposures to IT service vendors in 2022 will be their ability to navigate labor supply challenges in an environment where utilization rates, attrition rates, and wage inflation are high. Companies with the ability to attract and retain their skilled workers and that possess pricing power with customers will be the most effective in offsetting margin headwinds the industry will likely face.

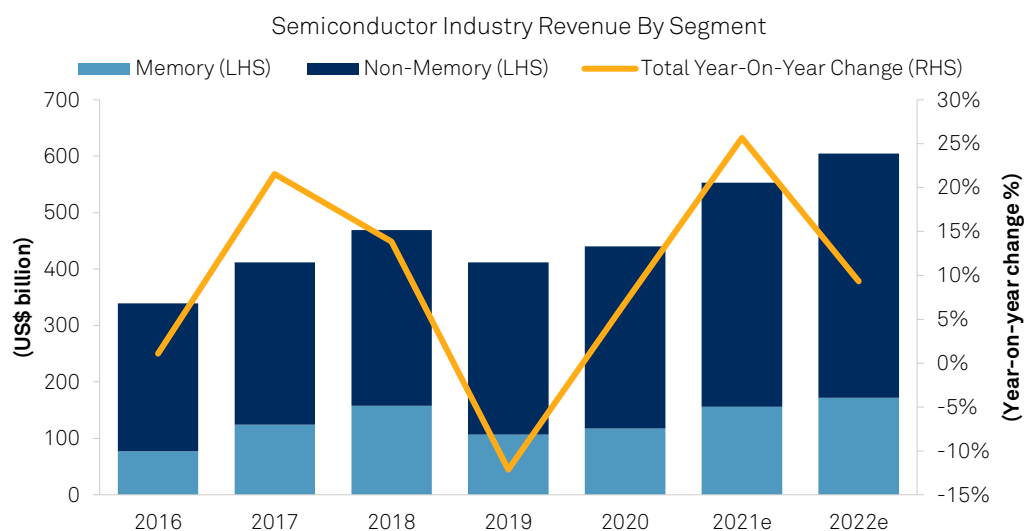
## Semiconductors

The semiconductor industry had a banner 2021, with an estimated overall revenue growth of about 26% to around \$550 billion. Demand drivers were plentiful, with an improving global economic backdrop accelerating demand across most end markets and causing the well-documented chip shortage which continues into 2022. Semiconductor cycles are becoming less pronounced as end markets broaden but we believe the industry will still undergo periods of demand contraction, especially in the commodity-like memory segment which accounts for nearly 30% of the market. Nevertheless, we believe the industry should continue to outpace the overall IT spending and global GDP growth for the next decade due to growing silicon demand across most industries.

Demand trends remain favorable as we enter 2022 and we forecast the industry will expand by about 9% for the year (see chart 7). The economic outlook, while uncertain, remains positive and supply continues to be hampered by chip shortages which we believe will last through 2022 for some products (see detailed discussion on page 10). Industry participants, especially those on the leading edge requiring high-capital intensity (Intel Corp, Samsung Electronics Co. Ltd, Taiwan Semiconductor Manufacturing Corp., and Micron Technology Inc.) are investing aggressively to meet demand, benefitting wafer fab equipment manufacturers (Applied Materials, Lam Research, and KLA Corp), but we do not expect meaningful supply to come online until at least 2023, which should keep inventory levels lean across customers and distributors. We believe this should continue to support firm pricing and stable to expanding margins for most of the companies we rate.

Chart 7

### Semiconductor Industry Is Set To Grow Again



e—Estimate. Sources: SIA, S&P Global Ratings.

We expect non-memory segments (analog, logic, microcontrollers, etc.) to grow near 9% as most hardware segments generate revenue growth in line or better than the global GDP. We expect good growth for companies exposed to smartphones as 5G phone shipments should jump from over 500 million units in 2021 to more than 700 million units in 2022. 5G base station growth should also accelerate in 2022. Data center spend should continue to benefit from hyperscale providers, whose capex should exceed 2021's estimated 20% growth as enterprises continue to prioritize cloud investments. Auto demand remains strong due to content growth and as auto production accelerates through 2022 from a supply-constrained 2021.

Memory sales are estimated to have grown nearly 33% in 2022 as demand rose across hyperscale data centers, 5G smartphones, PCs, and auto/industrial end markets while supply remained disciplined across both DRAM and NAND segments. Despite the tough comps, we expect memory sales to grow in excess of global GDP at about 10% in 2022 as 5G phones require greater memory content, server demand from cloud providers remain solid, and SSD sales continues to gain traction. PC demand should remain stable but higher mix of enterprise demand should help ASPs.

### Smartphones

We expect smartphone unit shipments to grow about 1% in 2022, following growth of about 4% in 2021. The strong momentum in global smartphone sales in early 2021 has waned, partly offset by good performance in China (approximately 25% of global smartphone sales), with smartphone shipments growing 15% year-over-year in the first 11 months of 2021. We estimate China's smartphone shipment growth could be flat or grow in the low-single-digit percentage area in 2022, reflecting supply chain issues during the first half of 2022, relatively high penetration of 5G smartphone and a slowing economy.

The semiconductor shortage is affecting all industries as the surge in demand following COVID-19-induced disruptions led to outstrip supply. Our view on 2022 smartphone unit growth is predicated on supply constraints continuing at least through the first half of 2022 and that it will remain pervasive across regions and affect the largest smartphone OEMs such as Samsung Electronics and Apple. Despite the slowing momentum, we believe average selling prices will rise in the low-single-digit percent area year-over-year as 5G smartphones will continue to represent a growing proportion of overall unit shipments.

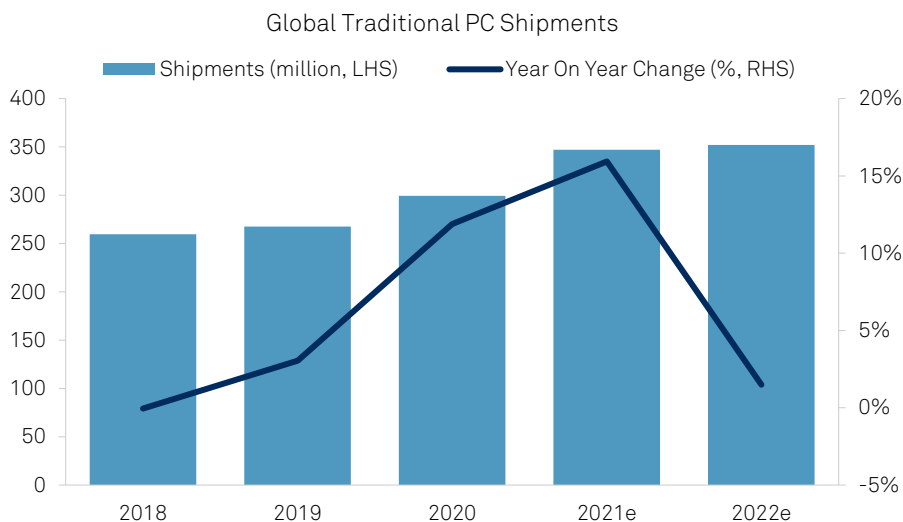
Apple gained global smartphone market share in 2021 and we expect that to continue in 2022, as it benefits from customers upgrading to 5G phones and better-than-expected reception of its iPhone 13. Competition among OEMs in the Android camp, particularly Chinese brands, could intensify in 2022 as Honor (mid-end phone brand spun off by Huawei) re-enters the smartphone market. Additionally, the merger between domestic smartphone makers OPPO and OnePlus could strengthen the competition against Xiaomi as well.

### PCs

The pandemic accelerated investments in digital transformation and reinvented the way people learn, work, and collaborate. Despite supply chain woes, the PC market saw an outsized benefit as demand over the past two years has been stronger than forecasters had predicted. The continued penetration of less represented markets like education drove global units to about 348 million in 2021—the highest levels in over a decade—growing about 15% in 2021 after 12% growth in 2020. While this level of growth is unsustainable, we do note that it does set up the industry for a more frequent and higher level of refreshes going forward. We expect global units are likely to increase again in 2022 but at a subdued level near 2%, keeping units around the 350 million level (see chart 8). While emerging risks from COVID-19 variants could derail unit availability and cause growth revisions, we expect demand from underpenetrated markets and emerging countries as well as continued enterprise demand to sustain growth for another year. Desktops which represent about a quarter of units (excluding tablets), have seen a resurgence after many years of displacement. A more entrenched hybrid workforce is driving renewed demand for desktops that have been in decline as mobile laptop devices replace them. **Dell Technologies** and **Lenovo** may benefit more from commercial demand and their ability to navigate supply chain woes. This is evident in diverging growth rates—although still strong—among the three largest vendors (Dell, HP, Lenovo).

Chart 8

**PC Demand Should Stabilize In 2022**



e—Estimate. Sources: IDC, S&P Global Ratings.

**Servers**

We expect server shipments to grow near 6% in 2021 primarily due to higher demand for computing power by hyperscale cloud providers as they continue to ramp up capital spending to meet enterprise shift to the public cloud and to accommodate growing work-from-home and e-commerce activities. We expect these trends to continue in 2022 with improving enterprise demand against a favorable economic backdrop. Overall, we forecast server unit growth near 5% in 2022. The adoption of cloud, edge computing, software-defined infrastructure (SDI), and data analytics will continue to drive server shipment growth as companies shift toward a more operationally agile and resilient business model. The market growth may come at the expense of legacy hardware providers as large cloud providers continue to design their own servers through original design manufacturers (ODMs). Nevertheless, we expect branded original equipment manufacturers (OEMs) like Dell Technologies and HP Enterprise (combined market share near 33%) to grow server shipments in 2022 by mid-single-digit growth in part due to the 5G rollout in the U.S. that will provide a tailwind for cloud and edge deployment.

**Storage**

We expect external storage systems revenue will grow about 5% in 2022 following 6% growth in 2021. This above trend growth came as enterprise customers gradually ramped up storage spending in 2021 after delays in 2020 when they curtailed investments in response to COVID-19. Growth in 2022 should remain above the long-term trend because we see enterprise demand accelerating as recovery in economic activity continues following the rollout of vaccines and we do not see the Omicron surge derailing technology spending. We believe that beyond 2022, growth should moderate to flat to low single digits since enterprises are increasingly meeting their storage needs using cloud services rather than on-premises hardware.

Within the external storage market, we expect all-flash arrays to continue taking share from hybrid and hard disk drive (HDD)-only systems, as NAND chip price declines narrow the cost of flash memory relative to HDDs. We are seeing that large cloud providers prefer to leverage their scale to custom-build storage infrastructure instead of purchasing it from major branded OEMs such as Dell, HP, and NetApp, so the adoption of the hybrid cloud approach--whereby some workloads remain on premises as others shift to the cloud--is critical for the viability of the external storage systems market. Meanwhile, we



expect enterprise customers, who have traditionally been major purchasers of external storage systems and have growing storage needs, will leverage software to optimize their storage capacity.

### **Networking equipment**

We expect the networking equipment market to grow roughly 5% in 2022, an improvement from an estimated 2021 growth of roughly 2%, due to positive investment cycles across enterprise, hyperscale cloud providers, and service providers. Networking providers such as Cisco Systems Inc. and Juniper Networks have seen significant order improvements and large backlogs entering 2022, albeit partly due to supply chain challenges and potential double ordering. Revenues have largely lagged orders as a result. Their ability to pass on higher expenses to customers will also determine the margin profile although increasing software content continues to dampen potential volatility. Hyperscale spending should increase meaningfully as they accelerate overall investments, benefitting 200G/400G switching upgrades in particular. Service providers should also improve their capital spending as they deploy the new mid-band spectrum and increased fiber densification with 5G. However, we are cautious of historically uneven carrier spending patterns among service providers. Despite the Omnicron threat, enterprise spending should expand as companies continue to invest in hybrid work environment and infrastructure to support digital transformation.

### **Mobile telecommunications equipment**

We expect the mobile telecommunications equipment market to grow in 2022, albeit at a lower pace than in 2020 and in 2021. The main growth driver remains the gradual roll-out of 5G networks, given 5G technology is still at an early stage. The number of 5G subscriptions only represented about 8% of total mobile subscriptions at the end of 2021, and global 5G population coverage was only about 25%. That said, 5G investments grew rapidly in 2020 and 2021, mainly in China which accounts for 70% of total 5G subscriptions and where 5G coverage is among the highest in the world. Another driver supporting the global take-off of 5G investments has been the growing affordability and availability of 5G smartphones (about one-third of smartphones sold were 5G-enabled in 2021 and should increase to about one-half in 2022).

Mobile equipment market will continue to expand in 2022 and beyond but growth will be uneven between years and regions. We expect 5G investments will continue to gain traction, more than offsetting the gradual decline in network spending on older technologies. Key drivers will be consumer demand, including demand for fixed wireless access, and enterprises for advanced use cases, including Internet of Things (IoT) and specific applications such as autonomous driving, mining, and manufacturing automation. East Asia (including China and South Korea) and North America have invested most in 5G so far but we expect other regions, in particular Western Europe, to catch up gradually.

Some factors could delay growth in the near term. Supply chain constraints, for instance access to chips, could delay the production of telecom equipment such as base stations, or the production of smartphones, in turn delaying 5G investments. Telecom equipment vendors faced supply chain challenges in the second half of 2021, which, if prolonged, could affect their revenues or margins. Furthermore, after a few European countries banned Chinese vendors due to security concerns, European vendors have lost market share in China during tenders that took place in 2021. However, we expect these factors will only have a limited impact and will not constrain long-term growth.

### **Printers**

The resurgence of COVID-19 cases dashed hopes for steady recovery in print demand from a broader return to office that failed to gain momentum in 2021. According to IDC Corp. worldwide hardcopy unit shipments showed a significant decline of negative 20.4% in third quarter of 2021 after strong growth in the first half of 2021 (13.4% in second

quarter and 19.2% in first quarter). The print industry is concurrently battling overwhelmed supply chains and component shortages that are constraining unit growth, though that may help equipment prices over the next year because of the supply demand imbalance. In 2022, units may experience modest growth because of severe declines in the prior year and some pent-up demand amid the shortage in the near term, though we acknowledge that forecasting will be difficult because of lumpy sales historically and the uncertain pace of return to office.

We forecast printer units to grow 3% in 2022 but this is still down about 4%-5% relative to five-year average units. This general decline is consistent with the erosion seen in paper producing industries. S&P Global Ratings expects the structural erosion in uncoated free sheet demand to continue declining in the low-single-digit area in 2022. While the printer industry can likely grow somewhat above historical trends over the next year, our long-term view on digital substitution and trends such as electronic records and digitalizing business processes continue to cannibalize paper consumption. Significant investments in digital workflows to support hybrid workforce will continue to affect print pages volume as office activity is far from recovering to pre-pandemic levels as indicated by less than 50% of time spent working in the office according to an IDC Corp. survey (August 2021) compared to 70%-80% prior to the pandemic. This may challenge companies dependent on office activity like Canon, Ricoh, and Xerox.

### Semiconductor shortage to persist through 2022

The semiconductor industry faced one of the largest and most pervasive supply shortages in the history of the industry in 2021, as low inventory levels and tight capacity constraints at fabs constrained companies' ability to respond to rapidly rebounding demand, particularly for durable goods. We expect conditions to remain tight across the industry as the semiconductor industry posts another strong year of growth in 2022, but moderately slowing demand, incremental capacity growth, and new ordering practices should mitigate some of the disruption by the end of the year. Our forecast of semiconductor sales growth of 9.3% for 2022, while a meaningful deceleration from 26% in 2021 and 15% in 2020, still represents an industry in overdrive to meet strong demand until new capacity investments come on-line. While capacity growth in the semiconductor space often involves three year or longer lead times, wafer fabrication equipment spending was strong in 2021 despite the pandemic and we expect some incremental capacity to ease supply conditions at the margin by the end of 2022, particularly in leading edge logic nodes that have drawn the majority of recent spending. Shortage-driven changes to customer ordering behavior may also help mitigate the risk of double-ordering and a potential oversupply situation even without a complete resolution of supply and demand concerns, as the industry has moved increasingly toward longer-term, noncancellable ordering practices that can help better align supplier capital investment with customer demand.

Notwithstanding this forecast for a moderate easing of conditions, we expect a little slack in the supply chain will persist, and the industry's ability to rapidly accommodate unexpected shocks, such as greater-than-expected demand growth or supply disruption from a geopolitical conflict remains extremely limited. These tight supply conditions will continue to benefit companies with sufficient scale to benefit from needed capacity allocations at fabs, including Broadcom, Qualcomm, Nvidia, and AMD, which is emerging as one of the largest users of TSMC's 7nm process node in our estimate. We expect analog supply to remain tighter than logic or memory into 2023 given limited foundry capex at the trailing process nodes used for analog chips, and an expectation that demand from electric vehicles, industrial automation, and 5G will persist longer than pandemic-driven spending on consumer tech and PCs. In this context, analog companies with stronger in-house manufacturing capabilities such as **Texas Instruments** will likely be able to meet demand more readily than those more dependent on foundries. We expect wafer fab equipment spending will only grow from 2021 levels as companies

across the industry work to bring new capacity online, a trend that will benefit all players in the capital equipment supply chain. We think that changes to ordering practices will mitigate some oversupply risk, but we see some potential for supply to overshoot demand in some markets, particularly PC components, if demand slows in 2023.

### **Broadening use cases in IoT and 5G in 2022**

Emerging technologies such as 5G, IoT, artificial intelligence/machine learning, and big data analytics have been much talked about for years and we believe these technologies are entering the steeper part of the adoption curve in 2022 as their capabilities and benefit feed off one another. According to IDC, the global IoT infrastructure revenue is expected to grow from approximately \$17 billion in 2020 to about \$34 billion by 2025 (approximately 15% CAGR). This includes networking devices and access, computing platforms such as gateways and servers, software operating systems, and data and storage platforms.

We believe enterprise IoT will strongly benefit from the increasing use cases (edge network) enabled by continued deployment of 5G networks in 2022. The low latency and low power capabilities offered by 5G (over 4G and wi-fi) will be key to the wider adoption. The industrial end market is one of the first to adopt these capabilities and companies such as Honeywell, Siemens, ABB, Schneider Electric, Rockwell Automation, and Eaton have invested heavily in factory automation over the years as they foresaw the benefits of productivity improvements and tangible returns on investments that IoT can bring. Today, 5G networks and IoT capabilities have infiltrated the factory floors, enabling industrial companies the ability to run highly reliable, largely automated operations, such as assembly lines, robots and tools, with low latency. The networked IoT devices also allow for the collection of massive amounts of data for predictive analytics, i.e., artificial intelligence/machine learning and big data analytics software, on machinery and the management of supply, inventory, waste, delivery times, etc. Other end markets that have joined the foray include health care, oil and gas, automotive, life sciences, and utilities-- and there will certainly be more to come.

Beneficiaries in the technology sector include companies ranging from cloud service providers (such as Amazon's Amazon Web Services, Microsoft's Azure, Alphabet's Google Cloud), enterprise server and storage vendors (such as Dell, Hewlett Packard Enterprise, Lenovo, IBM), networking equipment and service providers (such as Cisco, Juniper, Hewlett Packard Enterprise) and semiconductor companies (Intel, Qualcomm, Skyworks, Broadcom, Texas Instruments, and Arm).

Consumer IoT use cases such as smartphones, wearables, and smart home devices were already fairly popular even prior to 5G-enabled capabilities. We anticipate the arrival of the metaverse and AR/VR devices in the mass market will provide another boost to consumer IoT spending in 2022 and beyond.

### **Credit metrics and financial policy**

Investment-grade companies' balance sheets have remained mostly consistent over the past few years. By and large, most technology companies have refrained from overextending their balance sheets following U.S. tax reform in 2017, with a few exceptions. Notably, we downgraded Oracle Corp. by several notches from 'AA-' before tax reform to 'BBB+' today due to increased share buybacks, and IBM Corp. due to its acquisition of RedHat Inc. We also downgraded Qualcomm Inc. in 2018 due to a large share repurchase following the termination of its deal for NXP, but we recently upgraded the company to 'A' as performance improved significantly driven by adoption of 5G smartphones as well as growth in adjacent product areas such as radio-frequency front-end, IoT, and auto, coupled with a share repurchases program that is commensurate with its free operating cash flow generation. However, companies with significant balance sheet capacity such as Cisco Systems Inc., Microsoft, and Apple Inc. have executed

sizable share repurchases utilizing their excess liquidity, and therefore our ratings on them are unchanged. Following tax reform, Apple stated its intention to reach a roughly net cash neutral position over time, although it has been moving toward it slowly and is roughly two-thirds toward its goal after four years. Perhaps the most noteworthy technology rating action of 2021 was the upgrade of Dell Technologies Inc. to 'BBB' from 'BB+' upon its spinoff of VMWare and significant debt repayments.

Companies in the tech sector are acquisitive, particularly those in the semiconductor and software segments. The semiconductor space has been consolidating since 2015 as companies seek to enhance their product portfolios, strengthen their competitive positions, gain leverage with customers and suppliers, and capture cost efficiencies. Software companies seek to acquire targets that will provide cross-selling opportunities and to gain exposure to fast-growing segments that allow for shortened time-to-market or add capabilities difficult to build organically. Targets often have very high valuations with little profit or cash flow contribution, such as Intuit Inc.'s acquisition of Mailchimp. Still, we have not downgraded many companies due to acquisitions. Some can fund acquisitions with balance sheet cash and cash flows such as Microsoft Corp.'s pending acquisition of Nuance Communications Inc. and recently announced acquisition of Activision Blizzard Inc. An exception to this theme is Oracle which recently announced the acquisition of Cerner Corp. in an all-cash transaction; Our 'BBB+' on Oracle rating remains on CreditWatch with negative implications pending more details about its balance sheet management plan. Finally, for companies that are known to use their balance sheets to finance acquisitive growth strategies, such as **Broadcom**, we have included cushion within their ratings to accommodate their appetite.

In the speculative-grade space, financing remains available for new issuers sponsored by private equity companies. Among these deals, capital structures are as aggressive (if not more) as they were before the pandemic, with high debt-to-EBITDA ratios and very modest cash flow, aided by low interest rates. Most are rated 'B-', which indicates that we believe these capital structures are sustainable despite weak credit metrics, often because of solidified competitive positions, unique intellectual property, high recurring revenue, or low capital intensity. We expect companies to be able to manage gradually increasing interest rates as the Federal Reserve seeks to tame inflation, but those in the lower end of the ratings spectrum ('B' and below) do not have much cushion to absorb execution missteps given limited free cash flow generation after debt service. We currently expect leveraged loan markets to be accommodative to more highly leveraged technology buyouts into 2022.

## Key risks or opportunities around the baseline

### 1. Inflation risk low for tech but rising rates could hurt

Technology companies have mostly been able to pass on higher cost to customers given strong demand for their products. Technology products can also be deflationary through productivity gains that save cost for the purchasers. However, rising borrowing cost arising from Fed's fight against inflation could weaken credit metrics for speculative-grade issuers.

### 2. Ripe for more M&A and buybacks in 2022

We expect investment-grade companies' excess liquidity and healthy profits and cash flow generation are likely to drive additional shareholder returns and acquisitions in 2022 including the occasional large-scale transactions. Nevertheless, we expect balanced and telegraphed financial policies and healthy balance sheets. Conversely, high yield credits, especially 'B-' names, may face higher execution risk as favorable market conditions are accommodative of transactions pushing leverage to higher levels.

### 3. Supply chain diversification will accelerate

Tech companies are taking advantage of global capacity shortage and strengthening profitability to diversify their production footprint. They could better manage rising geopolitical risk and improve their long-term competitiveness if material diversification is built. However, China will remain the largest production hub given its huge pool of highly skilled labor and well-developed infrastructure, as well as its large domestic market.

## Inflation risk low for tech but rising rates could hurt

The technology sector has not been immune to ongoing supply constraints and labor shortages affecting the economy. We believe pent-up demand for technology products and services has so far outweighed the effects of increasing costs, with many able to pass through higher prices and maintain profit margins. At the same time, the Federal Reserve's response to inflation could weaken credit profiles at the lower end of the ratings spectrum should they find their borrowing costs rising over time.

We see indications that technology companies have thus far been able to mostly manage the inflation risk. Demand remains high for technology products and companies such as Cisco Systems Inc. have been able to implement price hikes with limited pushback from customers. While its own cost increases could pressure gross margin over the near term, we believe the company should be able to mostly maintain its margin profile over the longer term. The average selling price for PCs was up roughly 10% year-over-year in 2021, according to Gartner Inc., largely due to rising input cost such as microprocessors and memory, but it has yet to dent robust PC demand as enterprises and consumers continue to refresh their laptops. Dell Technologies Inc. reported record PC operating income in its most recent third quarter. Software companies are also able to raise prices with little impact to its profitability. Companies that provide software as a service (SaaS), such as Salesforce.com., should continue to see strong double-digit top line growth and margin expansion in over the next several years as they are able to scale efficiently while adding new customers.

We believe that technology investments can be used as a deflationary force to offset rising costs by its customers. Businesses can absorb higher input cost by enhancing productivity through technology. Robots can replace humans at an auto assembly line and self-service checkouts at grocery stores can reduce labor cost in a tight labor market. We believe large enterprises will continue to invest in software and hardware to automate their manufacturing footprint.

We see potential for rising long-term credit risk in the 'B' ratings category which is largely comprised of private equity-owned software companies with leverage near, and some in excess, of 10x. In an inflation-driven rising rate environment we believe credit investors may also demand higher returns over time which could raise financing costs, particularly for borrowers in the lower end of the ratings scale. Over the past decade, sponsors have purchased software companies at very high valuations and have pushed leverage to record levels as investors chased higher yield. Technology companies rated 'B-', the lowest, now outnumber those rated 'B' by roughly 5 to 2, a reversal from a decade ago, indicating deterioration in overall sponsor-owned credit profile. While many companies have been able to refinance their debt and push out the maturity wall over the past two years, we believe those who have yet to refinance their debt could see their cash flow after debt service weaken. Considering nominal level of cash flow generated by a typical 'B-' rated issuer, this could result in more rating downgrades to the 'CCC' category.

### **Ripe for more M&A and buybacks in 2022**

While supply chain disruption is constraining growth and causing temporary inflationary pressures within the technology industry, which we expect to last until at least late 2022, profits and free cash flow are at multiyear highs for many technology companies. Many of them, like HP Inc. and NXP Inc., are benefiting from cost pass-throughs and better pricing amid strong demand. As our economists continue to expect good global economic growth despite COVID-19 variants emerging, we believe many companies are well positioned with excess cash and investment balances to invest in the business and look for opportunistic M&As, such as the recently announced Microsoft's acquisition of Activision Blizzard Inc. Tech companies have fared relatively well while navigating two years of challenges related to the pandemic. This business confidence and the active balance sheet management over the past two years that largely addressed a substantial amount of near to medium term debt maturities, we believe, will lead to release of excess liquidity that was deemed important earlier on.

We expect management to also focus on other capital allocation priorities such as share repurchases and higher dividend payouts as well. Buybacks exceeded \$240 billion (trailing-12-months ended Sept. 30, 2021) among information technology companies in the S&P 500 index (30% of sector), with Apple, Alphabet, Oracle, and Microsoft leading the way. While frothy equity markets by historical standards —technology in particular— and a potential tax on share buybacks may influence decisions on level of repurchase activity, we expect technology companies to be more inclined to spend more on investments and shareholder returns when their balance sheets and free cash flow (FCF) growth should continue to be healthy and inflation disincentives carrying excess cash balances. Many technology companies' valuation reached multiyear highs—such as Oracle and HP Inc.—as they continue their more aggressive share buyback activity, while others like IBM and Intel have balanced growth investments and shareholder returns.

Technology industry M&A reached approximately \$360 billion transaction value in 2021 up 36% year-over-year (Source: Bloomberg) and is poised to be active once again in 2022 in our view. Given many tech companies' cash buffers and improving cash flow generation, we don't view scale as a gating item to pursue M&A as evidenced by the appetite for deals as some never cross the finished line, i.e., Atos' \$15.6 billion bid for DXC, Broadcom's bid (reportedly \$15 billion-\$20 billion) for software company SAS. However, we believe M&A transactions will continue to receive extensive regulatory review increasing risk that deals fall apart. Large deals like NVIDIA's bid for ARM Ltd. is pending regulatory approval, but the recent closings of Analog Devices/Maxim Integrated and Marvell/Inphi mergers appear to indicate that domestic deals face less risk of termination while cross-border deals have higher hurdles. Moreover, despite rising acquisition multiples, the still low interest rate environment provides ample liquidity to those pursuing large-scale M&A if debt issuance is required.

We anticipate many will focus on smaller strategic tuck-ins to enhance current product portfolios while others will pursue larger-scale targets that allow them to enter new markets while leveraging existing products and industry domain expertise. Oracle recently announced its proposed acquisition of Cerner—a health care business—for \$28 billion and last year Microsoft announced its plans to acquire natural language understanding technologies company Nuance Communications for \$14 billion. Additionally, we expect many more companies, particularly mature hardware vendors, to hunt for M&A targets with high-quality recurring revenue businesses to enhance cash flow resiliency and align strategies with tailwinds from accelerating digitalization trends and technology innovations over the next several years.

### Supply chain diversification is gaining momentum

The technology supply chain, long dominated by China, is likely to undergo gradual diversification due to the confluence of the ongoing pandemic and the resulting component and assembly capacity shortage, rising geopolitical concerns and lower cost in other regions. Such a transition could have far-reaching implications for technology companies, including increasing resiliency of their manufacturing supply chain, increasing diversification of their supplier and customer base, and potentially strengthening competitive barriers from managing an increasingly complex supply chain. However, such benefits do not come without risks as these companies face issues such as adjusting manufacturing processes to local customs and culture, incremental startup costs, and finding suitable labor supply.

We see major electronics manufacturing services (EMS) providers and component makers increasing capacity mainly in Vietnam, Thailand, Malaysia, and India driven by demand from their OEM customers. To minimize geopolitical and event risks such as from the COVID-19 pandemic, large OEMs such as Apple are encouraging Taiwanese EMS suppliers to build new capacity in southeastern Asia and India.

Increasing nationalistic sentiment are also resulting in more government policies that favor local supply chains, which could add to reasons for evaluation of supply chain diversification. India, for example, has prohibitive import taxes to encourage local production, speeding up the need for EMS companies to expand their domestic capacity in India. And many semiconductor companies, such as TSMC and Samsung, are increasing investments in U.S. and European manufacturing facilities driven by customer demand, as well as subsidies from local governments.

Still, there are many challenges faced by technology companies when diversifying their supply chain. Cultural conflicts and infrastructure constraints have emerged for companies like Hon Hai Precision Industry Co. Ltd. Inc. and Wistron Corp., which caused delays in production ramp and damage to their reputations due to labor disputes.

Moreover, building capacity outside of China can be costly given China's well-developed infrastructure and supply chain capabilities. Additionally, some countries, especially those in Southeast Asia, lack a large pool of skilled labor or have much higher labor costs, such as in the U.S. In the near term these issues may be minimized given the tightness of supply and better pricing resulting from component shortages; however, we believe these conditions are temporary. Despite the reasons explained, and our expectation for some diversification of supply chain in the tech sector, we believe China will remain the largest global manufacturing hub given its highly efficient manufacturing capabilities, well-developed infrastructure, and large domestic market.

Nonetheless, these headwinds are unlikely to deter the broad trends supporting supply chain diversification over the longer term. The recent pandemic-related surge in demand was unanticipated and caught the industry off guard. But the trends supporting supply chain diversification is not only to meet the recent surge of demand but rather based on longer-term business strategies around risk management and improving the company's competitive positioning. Surging demand and improving profitability have helped the tech

supply chain carry out its capacity expansion with limited impact to most companies' credit profiles. We expect capacity shortage and relatively strong profitability in combination with significant subsidies by hosting nations could facilitate such a transition, but any meaningful diversification will take time in our view.

## **Related Research**

- [Strong Fundamentals In U.S. Tech Allow Capital Allocation Flexibility](#), Jan. 19, 2022



# Industry forecasts

## Global Technology

Chart 9

### Revenue growth (local currency)

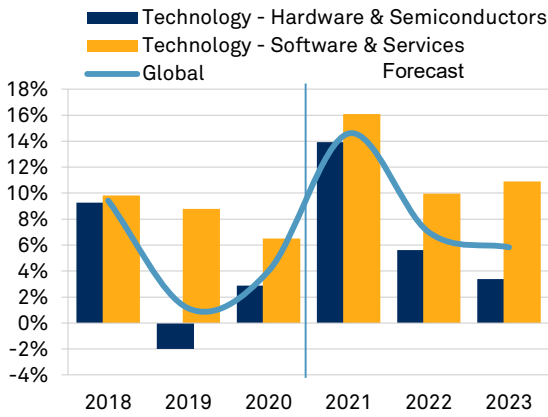


Chart 10

### EBITDA margin (adjusted)

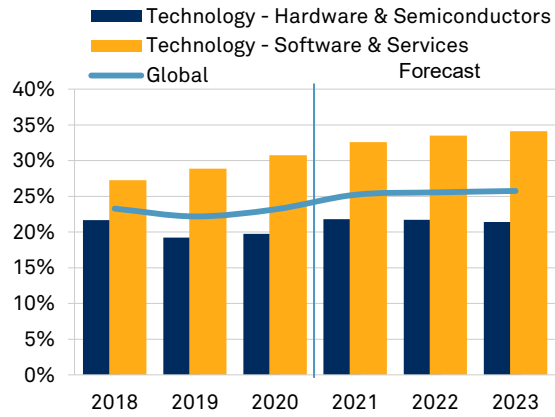


Chart 11

### Debt / EBITDA (median, adjusted)

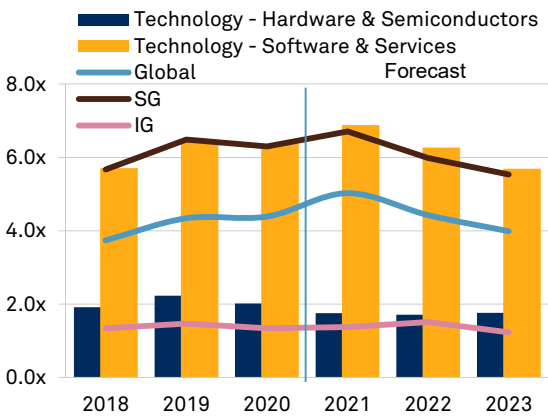
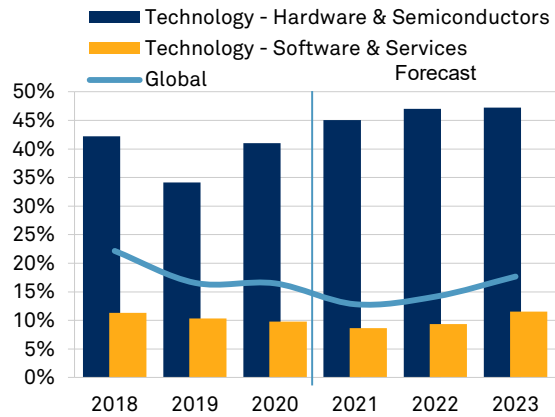


Chart 12

### FFO / Debt (median, adjusted)



Source: S&P Global Ratings. Revenue growth shows local currency growth weighted by prior-year common-currency revenue-share. All other figures are converted into U.S. Dollars using historic exchange rates. Forecasts are converted at the last financial year-end spot rate. FFO—Funds from operations.

# Cash, debt, and returns

## Global Technology

Chart 13

Cash flow and primary uses

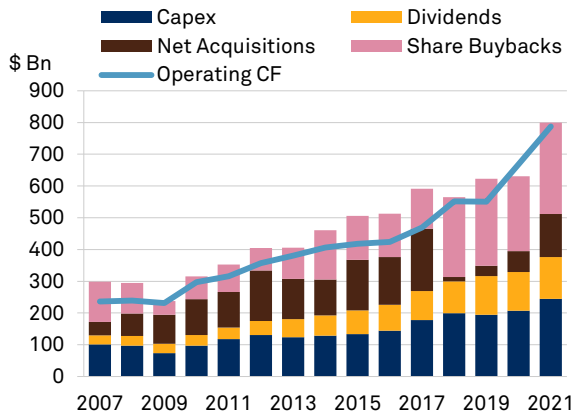


Chart 14

Return on capital employed

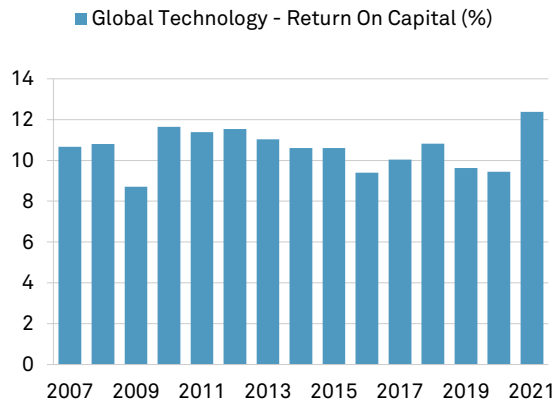


Chart 15

Fixed versus variable rate exposure

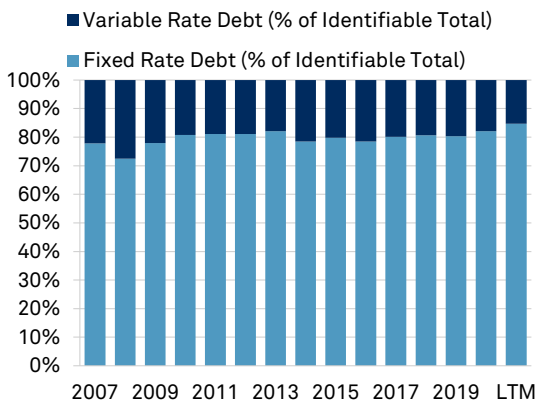


Chart 16

Long term debt term structure

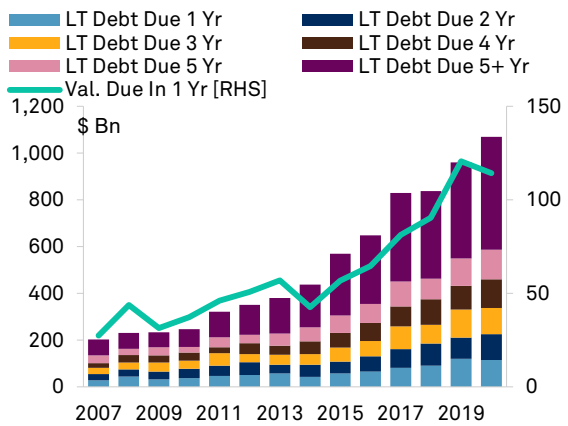


Chart 17

Cash and equivalents / Total assets

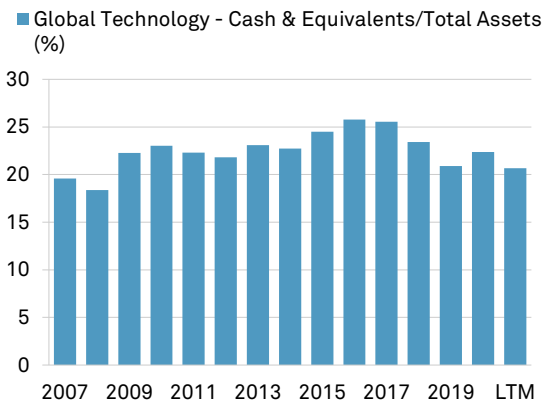
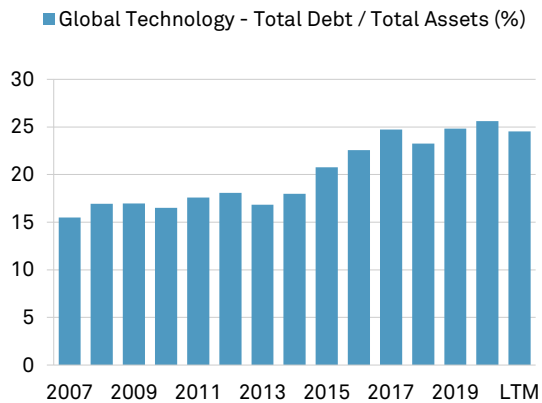


Chart 18

Total debt / Total assets



Source: S&P Global Market Intelligence, S&P Global Ratings calculations. Most recent (2021) figures are using last twelve months (LTM) data.

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