

TOP of MIND

US-CHINA: MORE DECOUPLING AHEAD?



US-China tensions have been running high for a while, but the US' recent downing of a suspected Chinese spy balloon and President Biden's plans to unveil further China investment curbs have again left these tensions—and their investment and industry implications—Top of Mind. We turn to Harvard China scholar Graham Allison to get a handle on the recent rise in tensions (which he predicted) and how relations might evolve. GS economists discuss the policy tools employed in the increasingly fraught relationship and what further policies to watch for: Biden's impending technology investment curbs, focused on semiconductors. Semiconductor industry veteran Richard Hill explains why that is, and what it means for the global semiconductor supply chain (not much). And we address the key question that companies and investors in both countries are grappling with: are growing tensions increasingly making the other country uninvestable? Bain's Jonathan Zhu and Rhodium's Daniel Rosen say no, though Rosen sees more decoupling of the two economies ahead.



When a rapidly rising power threatens to displace a major ruling power, both become increasingly hostile towards the other... this is a classic Thucydidean rivalry... So, as I wrote in 2016: expect things to get worse before they get worse.

- Graham Allison

The amount of 'coupling' two countries can engage in depends on the daylight between their economic systems... The US and China, however, have increasingly dissimilar economic systems... So, further decoupling is likely.

- Daniel Rosen

The risk-reward trade-off has become more challenging, but China is still investable.

- Jonathan Jia Zhu



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Daniel Rosen, Founding Partner, Rhodium Group

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

Macro news and views

We provide a brief snapshot on the most important economies for the global markets

US

Latest GS proprietary datapoints/major changes in views

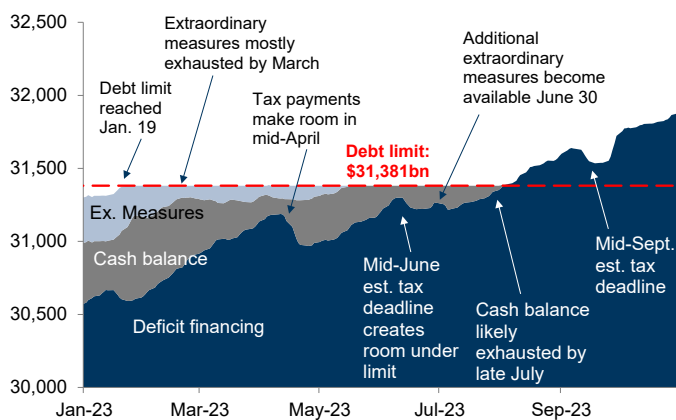
- We lowered our Fed terminal rate forecast to 5-5.25% (removed 25bp June hike) given data that showed credit conditions have tightened following bank stress and some Fed officials' hesitancy about a May hike.

Datapoints/trends we're focused on

- Growth impact of bank stress; we estimate tighter lending conditions will reduce US GDP growth by 0.4pp this year.
- US debt limit deadline; we project that Treasury will likely exhaust its cash and borrowing capacity by late July.
- Jobs-workers gap, which has shrunk substantially but painlessly and is now halfway back to pre-pandemic levels.

Treasury cash balance likely exhausted by late July

Projected public debt subject to limit, \$bn



Source: US Treasury, Goldman Sachs GIR.

Japan

Latest GS proprietary datapoints/major changes in views

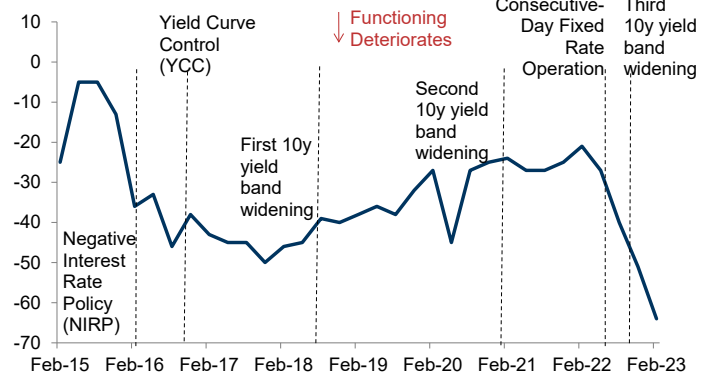
- We now expect the BoJ to shorten the target maturity of yield curve control (YCC) to five years from 10 in July (vs June previously) following increased BoJ references to the inflation outlook, which suggests it's more appropriate for the adjustment to be made alongside the Outlook Report.

Datapoints/trends we're focused on

- BoJ exit strategy; we think BoJ Gov Ueda will seek to withdraw YCC chiefly on the grounds of restoring bond market functioning, but wait until inflation reaches its 2% target before ending Negative Interest Rate Policy (NIRP).
- *Shunto* wage negotiations, which look likely to result in the highest negotiated wage hikes since the early 1990s.

JGB market functioning has been deteriorating

Bond Market Functioning Diffusion Index (BoJ Bond Market Survey), pp



Note: Diffusion Index measures pp difference between survey responses of "high" and "low" to question of the degree of bond market functioning.

Source: BoJ, Goldman Sachs GIR.

Europe

Latest GS proprietary datapoints/major changes in views

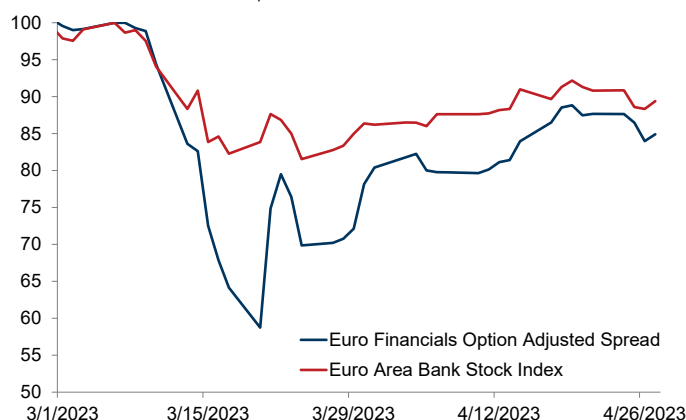
- We recently raised our ECB terminal rate forecast to 3.75% (added a 25bp July hike) given receding banking tensions, strong underlying inflation, and hawkish ECB commentary.
- We raised our BoE terminal rate forecast to 5% (added 25bp hikes in May/Jun/Aug) given stronger-than-expected activity data, strong wage growth, and firm inflation pressures.

Datapoints/trends we're focused on

- EA growth, which we expect to remain resilient at 0.7% in 2023.
- EA core inflation, which we expect to remain strong in the coming months before gradually declining to 4% by YE.

Diminishing banking risks in the Euro area

Bank stock indices and spreads, 3/6/2023 = 100



Source: Haver Analytics, Goldman Sachs GIR.

Emerging Markets (EM)

Latest GS proprietary datapoints/major changes in views

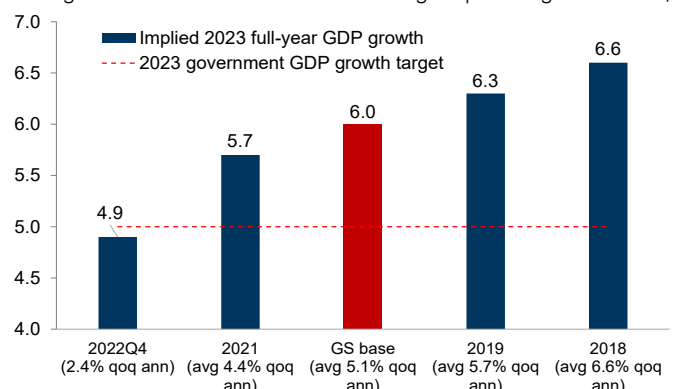
- We lowered our 2Q23 China growth forecast slightly to 4.9% (from 5.5%, qoq ann) on a more front-loaded reopening impulse and sequentially softer April high-frequency data, but continue to forecast full-year 2023 GDP growth of 6.0%.
- We lowered our 2023 China headline CPI inflation forecast to 1.8% (vs. 2.2%) following downside surprises in March data.

Datapoints/trends we're focused on

- Chinese export growth, which we view as one of the most significant headwinds to China's growth this year, surprised sharply to the upside in March.
- EM growth, which continues to be stronger than DM growth.

China's official "around 5%" growth target seems easily achievable after Q1 GDP release

FY23 growth under scenarios of Q2-Q4 avg sequential growth rates, %



Source: Haver Analytics, Goldman Sachs GIR.

US-China: more decoupling ahead?

US-China tensions have clearly been running high for some time. Indeed, we wrote about a primary manifestation of these tensions—the US-China trade war—not one, not two, but three times since trade tensions spiked in early 2017. But the US' downing of a suspected Chinese spy balloon earlier this year, increasingly hostile rhetoric between the two countries (see pg. 24), and, most recently, President Biden's plans to unveil further China investment curbs ahead of the upcoming G7 summit, have once again left these tensions—and their investment and industry implications—Top of Mind.

Given the many twists and turns in the US-China relationship since we last wrote about it, we first turn to Harvard China scholar Graham Allison to get a handle on its current state and how it might evolve. In his words, the relationship today is “very bad”—the worst it's been since Henry Kissinger and Zhou Enlai met in Beijing in 1971 to begin normalizing US-China relations after decades of hostilities. This recent rise in tensions, he argues, was entirely predictable (in fact, he *did* predict it in his 2017 book *Destined for War*), because history has shown that such hostilities inevitably occur when a rapidly rising power (China) seriously threatens to displace a major ruling power (the US). In the vast majority of historical cases, Allison finds that the outcome of such a “Thucydidean rivalry” was war. But while he expects relations to “get worse before they get worse” as China challenges the US' long-standing position as the predominant power in Asia, he doesn't believe that war between the two is inevitable—although he does warn that extraordinary efforts will be required to avoid it.

GS Asia economists Andrew Tilton and Hui Shan and GS US political economists Alec Phillips and Tim Krupa then survey the elevated tensions through the lens of the policy tools employed in the increasingly fraught relationship, and what further policy actions to watch for. All eyes, they say, are trained on President Biden's impending executive order that is expected to further restrict US outbound investments to China in certain areas of technology—first and foremost, advanced semiconductors.

Semiconductor industry veteran Richard Hill explains that semiconductors have been a key battleground for US-China tensions because US policymakers are worried that Chinese advances in semiconductor technology could put the US at a military disadvantage, concerns which Hill believes are “overblown.” But even if they aren't, he argues that the subsidies in the US CHIPS and Science Act—intended to revitalize US semiconductor manufacturing—are only a “drop in the bucket” compared to what would be required to build out a domestic industry on the scale required to meet the US' needs, with a lack of skilled, disciplined US labor another major constraint. China, he says, is also ill-equipped to become self-sufficient in semiconductors, largely because of equipment and critical materials constraints. So, he doesn't see a significant reshaping of the global semiconductor supply chain on the horizon, even if investment flows are shifting in the industry.

What about the implications of the tensions for investment flows more broadly? We speak with the Rhodium Group's

Daniel Rosen, who has done extensive work tracking and evaluating US-China investment and trade flows. He finds that US-China trade—while still rising—has tracked well below where it would have been in the absence of tensions and the related trade war. And bilateral foreign direct investment (FDI) flows, which should have increased dramatically, have instead declined as Beijing has constrained outbound FDI and sentiment among multinational CEOs towards China has become more cautious.

Whether these disconcerting trends will continue boils down to the key question companies and investors in both countries are grappling with: are growing tensions that show no sign of abating increasingly making the other country uninvestable?

Rosen, for his part, believes that the substantial amount of daylight between the economic systems of the US and China given the latter's stalled progress towards marketization—let alone the elevated geopolitical tensions—will constrain deepening engagement between American and Chinese governments and companies. So, he sees further economic and financial decoupling that entails fewer bilateral investment opportunities as likely. But, he says, such decoupling doesn't have to be maximal; many accretive opportunities for companies and investors will remain. And he argues that even the decoupling itself is not a foregone conclusion, noting that China's leaders have exhibited a greater ability to shift policy direction when warranted than they are generally given credit for. So, he believes that a policy shift that is conducive to deeper US-China engagement “could well lie ahead.”

Jonathan Zhu, Partner and Co-head of Asia Private Equity at Bain Capital, also still sees opportunity in China for US investors and companies. Although he characterizes the current investing landscape as “one of the more difficult ones” he's encountered in his nearly two decades of investing in China and concedes that the opportunity set for US investors has narrowed, he believes it's still possible to identify companies that can be expected to perform well in the future. And he sees China's distinct cyclical environment, characterized by relatively strong reopening growth and low inflation and interest rates, as more compelling than the macro backdrop in many Western economies right now. So, he says, “the risk-reward trade-off has become more challenging, but China is still investable.”

Finally, as investability also comes down to what's priced, we turn to GS Asia Pacific strategists Tim Moe and Kinger Lau to understand the extent to which China equity prices already reflect US-China tensions as gauged by their proprietary US-China Relations Barometer (GSSRUSCN). They find that tensions are already well reflected in China equity valuations, consistent with their overweight recommendation on China.

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Interview with Graham Allison

Graham Allison is Douglas Dillon Professor of Government at Harvard and Founding Dean of the Harvard Kennedy School. Allison served as Assistant Secretary of Defense in the Clinton Administration. He has extensively studied and documented the US-China relationship, including in his latest book, *Destined for War: Can America and China Escape Thucydides's Trap?* Below, he discusses the current state and potential evolution of US-China relations.

The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.



Allison Nathan: How would you describe US-China relations today?

Graham Allison: In one word, bad. In many words, very bad. Unfortunately, the relationship has deteriorated to its worst state since Henry Kissinger and Zhou Enlai began their conversations to reestablish relations between the two countries over fifty years ago.

Allison Nathan: How did we end up here?

Graham Allison: My book *Destined for War*, which was published just as President Trump entered office, predicted this rise in hostility. So, I have been jokingly accused of perpetrating a self-fulfilling prophecy. But I say: blame Thucydides. As we saw when Athens challenged Sparta in Ancient Greece and have seen repeatedly in the centuries since, when a rapidly rising power threatens to displace a major ruling power, both become increasingly hostile towards the other. The last 500 years have seen 16 cases in which a rising power threatened to displace a ruling power. In 12 of those cases, the outcome was war. Nobody can deny that China is a meteoric rising power. Who was the world's manufacturing workshop when China entered the WTO in 2001? The US. Who is it today? China. Who was everyone's main trading partner in 2000? The US. Who is it today? China. Who has the largest GDP? In 2000, China's GDP was roughly a quarter of the US' in purchasing power parity terms, and today it is slightly larger than the US'. And nobody can deny that the US is a colossal ruling power that has been the architect and protector of the international order that has given us over seven decades without great power war. So, this is a classic Thucydidean rivalry.

But this rivalry is only ~75% of the answer to why hostilities have risen. The other 25% owes to the identity of the two rivals. Americans have become so accustomed to being at the top of the pecking order for a century—what we call the “American century”—that it is now part of the American psyche. So, as we've seen in the case of other ruling powers, which I describe as the “ruling power syndrome,” Americans are shocked by the idea that China is not taking the place that the US has assigned it in the American-led international order.

On the other hand, anybody that knows anything about China knows that China's view of its role in the world is as the center of the universe. In Mandarin, the word China means Middle Kingdom, which is the connection between the earth and heaven. It is the sun around which all others revolve. From the Chinese POV, they occupied their legitimate position at the center of the universe for thousands of years until Westerners showed up with new technology and displaced them, imposing what they call the “century of humiliation.” But as China has

regained its strength, pursuing what President Xi calls the “great rejuvenation of the great Chinese people,” China is returning to what it sees as its natural place of global power. And, as China becomes more powerful, it, like other rising powers in history, has what I describe as “rising power syndrome,” demanding and gaining more say and sway in the world. These storylines that have been repeated over the course of history are now on display in the views and actions of both the US and China. So, as I wrote in 2016: expect things to get worse before they get worse.

Allison Nathan: What do the US and China most misunderstand about each other?

Graham Allison: They both seem to misunderstand the realities of domestic politics that shape policy in the other country. A vivid example was each side's lack of understanding around the balloon incident earlier this year. The Chinese could not seem to comprehend how President Biden could allow the incident to so disrupt American politics that they had to cancel Secretary of State Blinken's meeting with Xi in China, which destroyed three months of hard work by both sides to prepare for the opening of a new chapter in US-China relations. And the Americans couldn't understand how Xi could send a spy balloon to the US just before this crucial meeting was set to take place.

I tried to explain to people in Beijing and Washington that these perspectives were equally naive. The idea that Xi knew about this spy balloon is nuts. Remember what happened during the Cuban Missile Crisis. On the most dangerous day of the crisis, when President Kennedy was making decisions that he thought might lead to the deaths of 100 million people, an expert from the CIA informed him that a US U2 spy craft had strayed over the Soviet Union and was on course to fly over Soviet missile fields, which could appear to be a last-minute check on targets before a nuclear first strike. In a moment of gallows humor, JFK said: “there's always some son of a bitch who doesn't get the word.” Kennedy had no idea what that plane was doing. And I'm confident the same was true for Xi vis-à-vis the balloon. Similarly, if you put a big spy eye over the US where citizens can see it and TV cameras can track it and think that won't set off political fireworks, you have no understanding of US politics.

Allison Nathan: What have we learned from China's response to the Russia-Ukraine conflict?

Graham Allison: China's support for Russia in the war with Ukraine has revealed an uncomfortable truth that most US observers are still unwilling to recognize: Xi has built with Russia the most consequential undeclared alliance in the world. Xi's achievement is all the more impressive because these two nations have so many reasons to be adversaries. They share a long border with territorial disputes. On Chinese maps, Vladivostok, Russia's most significant naval base in the Pacific,

is labeled with its Chinese name because the Chinese view it as territory to be recovered at some later stage. China is a massive country with few natural resources, while across the border in Siberia, Russian land east of the Ural Mountains is full of natural resources but has few people. So, China and Russia are natural adversaries. But Xi has defied expectations in building a thick relationship with Putin, and China's response to the Ukraine war should be a wake-up call to the world that Xi is not walking away from him. So, the US—and the world—needs to factor in this alliance as it contemplates its statecraft.

Allison Nathan: Are US-China relations poised to deteriorate into a new Cold War?

Graham Allison: Many Americans, and even some US government officials, seem to believe China is the new Soviet Union in what will be a new Cold War. But it is important to remember that the Soviet Union was an expansive revolutionary power that was pursuing global transformation. It believed its mission was to bring Communist governments to power in every country. But China has no aspiration for other governments to be ruled by the CCP. As Kissinger noted, the Chinese have such a superiority complex that they can't imagine other societies could be good enough to imitate their form of government. Moreover, a key feature of the Cold War was an economic iron curtain that essentially cut the Soviet Union off from the global economy. Today, China is the second backbone of the global economy and, as the Trump Administration discovered, most nations refuse to choose between a US that is essential for their security and a China that is essential for their continued prosperity. So, simplistically applied, the Cold War analogy misleads more than it clarifies.

Conversely, China has made clear that it aspires to displace the US as the predominant power in Asia. It aims to achieve this not by attacking or occupying territory, but in the Chinese style that is more like the game of Go, where the strategy is to surround people until they yield because they have no good alternatives. This puts the US and Mainland China directly at odds in the South China Sea, Taiwan, and the broader Asia-Pacific. The US believes strongly in its role in the region and in its alliances with Japan, South Korea, and Australia, as well as the Quad and AUKUS security alliances. So, the US is not walking away from Asia. That said, the best way to understand the competition in the near term isn't in terms of the Cold War and the Soviet Union's global aspirations, but as a classic Thucydidean rivalry in which East Asia is today the most dangerous arena.

Allison Nathan: What about a hot war, which the Thucydidean pattern suggests is the most likely outcome?

Graham Allison: I do not believe for a moment that a hot war between the US and China is inevitable. It's true that in Thucydidean rivalries, the outcome is normally war. And if all policymakers can manage in US-China relations is diplomacy as usual, then we should expect history as usual. *Destined for War* was not written to offer a fatalistic prediction, though, but as a call for strategic imagination. Again, in four of the 16 Thucydidean rivalries in the past 500 years, extraordinary strategic imagination produced extraordinary results. Many people claimed that the inevitable outcome of the Cold War between the US and the Soviet Union would be a hot war. But it never occurred because policymakers developed a coherent

strategy and patterns of behavior that managed to contain the competition and prevent crises from escalating to real war. The US-China rivalry presents a new challenge for strategic imagination to stretch our minds beyond history as usual.

Allison Nathan: But given the negativity around the relationship today, can such extraordinary efforts prevail?

Graham Allison: The politics, populism, and nationalism in Washington and Beijing make achieving this outcome harder than was the case for Athens and Sparta. But not impossible. Biden and Xi are sane, experienced political leaders. Each understands that war between the US and China would be catastrophic for his own country. So, the question is whether Xi and Biden can find their way to a relationship that's robust enough to manage their domestic political demons. This will be an extreme, but not insurmountable, challenge for both leaders.

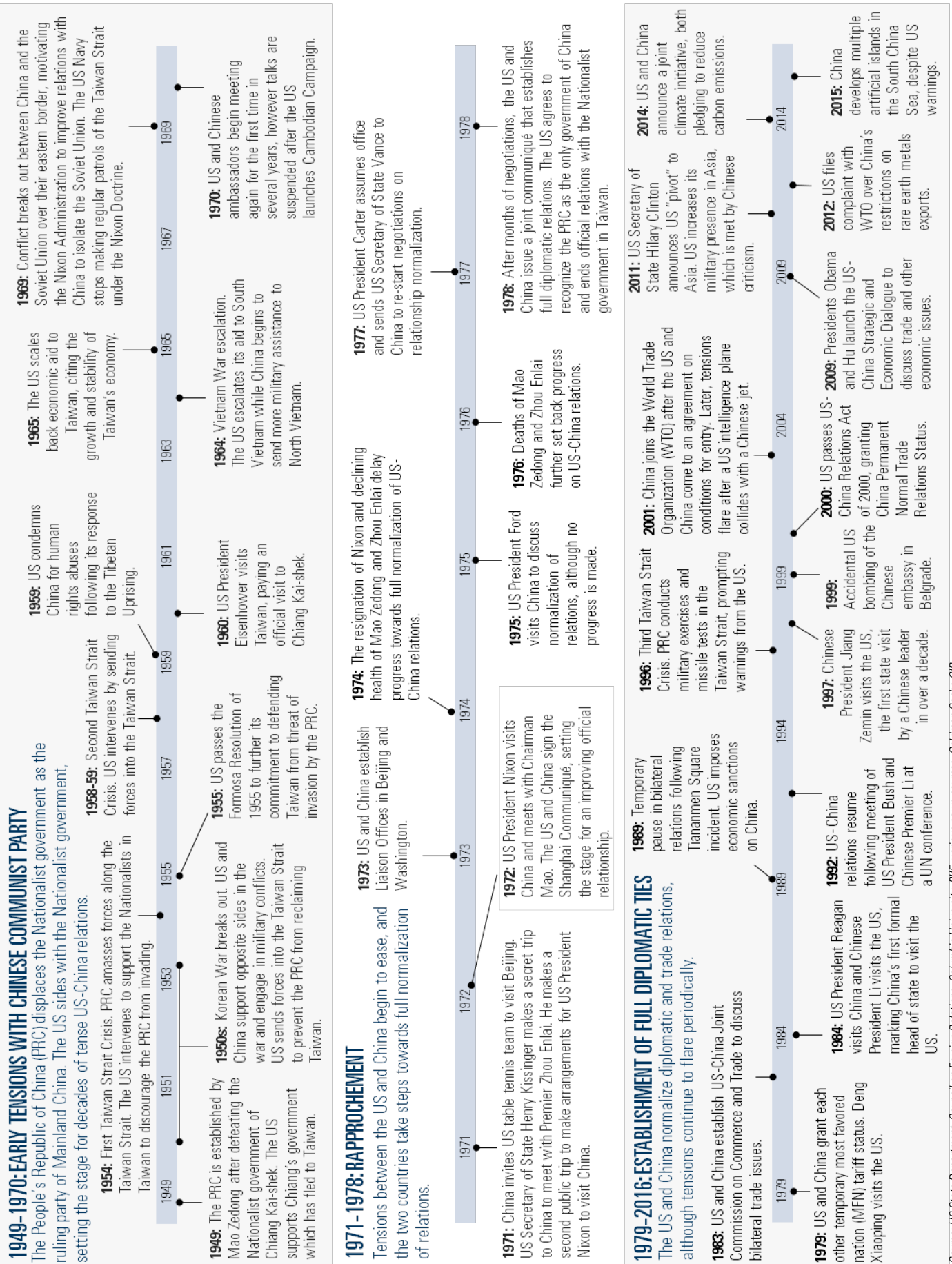
Allison Nathan: So, what's your advice for policymakers?

Graham Allison: When I speak privately to policymakers on both sides, I pose a question: Which should rational leaders in Beijing and Washington find more compelling: the incentives to compete, or the incentives to cooperate? I suggest they write down a list of each. The US and China are fiercely competing for predominance in Asia. They are competing to be the global leader in IT, AI, quantum computing, and other significant technologies. Each aspires to be an "indispensable" economy so that when others take actions they oppose, they can squeeze them, as China did when it cut off Japan from rare earth metals or the US is doing in prohibiting exports of advanced semiconductors to China. So, incentives to compete are compelling.

But incentives to cooperate are also compelling. We live in an era of nuclear "MAD:" mutual assured destruction. Both the US and China have nuclear arsenals that if used against the other would lead to retaliation and, ultimately, the destruction of both countries. Thus, as certainly as it did during the most dangerous days of the Cold War, President Reagan's insistence that "a nuclear war cannot be won and therefore must never be fought" remains a foundational truth in US-China relations. MAD also applies to climate. Greenhouse gas emissions have the potential to destroy the shared biosphere, so each country has an incentive to cooperate to constrain emissions. The global financial system creates a similar interdependence. If the financial system is so integrated that a major recession in one country could become a global depression absent cooperation on stimulus—as in 2008—the incentive to cooperate for the sake of each country's own economy is strong.

Based on these two lists, it's clear that the US and China are locked in conditions defined by two contradictory imperatives: to compete in the greatest rivalry of all time, and to cooperate for each to ensure its own survival. So, they must find their way to a strategic concept that combines competition and cooperation. One possibility is a "rivalry partnership," in which they are both fierce rivals and intense partners. This concept often occurs in business. Apple and Samsung are fierce competitors in smartphone markets, but Samsung is the biggest supplier of parts for Apple. That's an uncomfortable situation, but who said life should be comfortable? Learning how to compete in some spaces and cooperate in others is a difficult but necessary aspect of today's complex world.

Long history of US-China relations



Source: US State Department, Council on Foreign Relations, Columbia University, P/E, various news sources, Goldman Sachs G/I.

Short history of US-China relations

2017-2020: TRUMP-ERA TRADE WARS, ESCALATING TENSIONS

Trump Administration enacts Chinese tariffs, kicking off a tit-for-tat trade war that eventually ends with a Phase 1 trade deal. Political tensions continue to rise despite trade deal.

Mar 2018: The US releases an official report stating that China has conducted unfair trade practices relating to technology, intellectual property, and innovation. Trump orders 25% tariffs on steel imports and 10% on aluminum from all suppliers including China.

Jan 2018: US imposes "safeguard" tariffs on all imported washing machines and solar panels, including from China.

May 2017: US unveils an agreement with China to expand trade of products and services such as beef, poultry, and electronic payments.

Apr 2018: The US bans the sale of components to Chinese tech company ZTE. China imposes retaliatory tariffs of up to 25% on many US products including airplanes and soybeans.

Jul 2018: US imposes 25% tariff on \$3.4bn worth of Chinese goods. China retaliates with its own tariffs on \$3.4bn worth of US goods. China criticizes the US for "trade bullying."

Aug 2018: US imposes 25% tariffs on \$16bn worth of Chinese goods.

Sep 2018: US imposes 10% tariffs on \$200bn worth of Chinese goods. China imposes tariffs on \$60bn of US goods.

Oct 2018: US Vice President Pence says the US will prioritize competition over cooperation by using tariffs to combat "economic aggression."

Jan 2019: US announces financial fraud charges against Huawei CFO, Meng Wanzhou.

Jun 2019: US raises tariffs from 10% to 25% on \$200bn worth of Chinese goods.

Sep 2019: US imposes 15% tariffs on \$120bn worth of Chinese goods. China retaliates with tariffs on \$75bn worth of US goods.

Jan 2020: US and China sign Phase 1 trade deal that includes suspension of planned tariffs and a Chinese pledge to buy more US goods. US drops its designation of China as a currency manipulator.

Jul 2020: The US orders China to close its consulate in Houston, Texas, citing espionage and intellectual property theft. China retaliates by closing the US consulate in Chengdu.

Aug 2019: US labels China a currency manipulator after the yuan weakens significantly.

Nov-Dec 2020: Trump continues to crack down on China during his last few weeks in office. US adds dozens of new Chinese companies to its trade blacklist, sanctions more Chinese officials, and bans US investments into companies with ties to the People's Liberation Army.

2021-PRESENT: EXPANDED US HARD LINE ON CHINA

Biden expands Trump-era hard line on China and tensions continue to escalate. US shoots down suspected Chinese spy balloon, igniting fresh concerns about the direction of the US-China relationship.

Mar 2021: Biden Administration officials meet with Chinese officials for the first time, the meeting reflects disagreements on both sides. Biden Administration maintains Trump-era tariffs on Chinese imports and blacklists five Chinese companies, including Huawei, citing national security concerns.

Jun 2021: Biden expands Trump-era ban on US investment into Chinese firms with ties to defense or surveillance technology sectors. US Senate passes the Innovation and Competition Act of 2021 to compete with China. China passes the Anti-Foreign Sanctions Law to counter US and EU sanctions.

Nov 2021: Biden and Xi discuss "guardrails" to avoid conflict. The US and China sign a joint statement during UN climate summit agreeing to boost cooperation on combating climate change.

Feb 2022: US imposes diplomatic boycott on Beijing Olympics over the Chinese government's human rights abuses. Chinese officials say the US is trying to "provoke confrontation."

Oct 2022: US announces restrictions on exports of advanced computing chips and related equipment to China. The restrictions also apply to foreign companies that use any US-made tools and software. Chinese Foreign Ministry spokesperson says the US "will only hurt and isolate itself" with the restrictions.

Mar 2022: In a call with Xi, Biden threatens "consequences" if China provides military support to Russia.

Aug 2022: US House Speaker Pelosi visits Taiwan in a trip she says demonstrates US support for Taiwan. Mainland China retaliates by suspending climate talks with the US, cutting off military communication channels, and sanctioning Pelosi. Mainland China military conducts live-fire drills around Taiwan.

Feb 2023: US shoots down a suspected Chinese spy balloon and US Secretary of State Blinken cancels his trip to China. China condemns the US' actions, claiming the balloon was a civilian craft.

Apr 2023: Taiwan leader, Tsai Ing-wen, meets with US House Speaker McCarthy in California. Mainland China condemns the visit and launches military exercises around Taiwan.

Mar 2023: Biden Administration reportedly to propose new legislation to curb the flow of US funding to Chinese technology. China announces a cybersecurity review of US chip maker Micron Technology.

Source: US State Department, Council on Foreign Relations, various news sources, P/E, Goldman Sachs GfR.

Defining the scope of decoupling

Andrew Tilton and Hui Shan survey the state of US-China policy and what could lie ahead

US-China tensions, concentrated on trade imbalances during most of the Trump Administration, have metastasized across many aspects of the bilateral relationship in recent years. Why have relations deteriorated so rapidly, and what's next?

Many observers would argue that China's rapid economic growth and its very different political system made some degree of tension with the US inevitable eventually (see pgs. 4-5). China's economy caught up to the US in PPP terms following the 2008 financial crisis and continues to grow at a faster pace. Erosion of the US manufacturing base, emerging Chinese global competitors in key industries, and the chronic US trade deficit have all highlighted China's growing economic clout. On the geopolitical front, disputes over Chinese sovereignty flared up intermittently with various regional neighbors, with the US often showing its allegiances via displays of force (e.g. military exercises with allies or "freedom of navigation operations" in the South China Sea). But the past few years have put several new strains on the relationship:

1. The US trade war and its failure to resolve bilateral imbalances. The trade war launched by President Trump marked a sharp turn in US economic policy towards China. While tariffs reduced US imports of particular Chinese products to some extent, they failed to produce a large shift in the bilateral imbalance given large differences in saving and investment between the two nations. The conditions set by the Trump Administration for removal of the tariffs-purchase targets for US goods—were never achieved. However, Chinese policymakers appear to have been surprised and disappointed that the Biden Administration did not remove the tariffs.

2. Hong Kong protests. While the UK (and US) governments did not dispute Mainland China's sovereignty over Hong Kong following the 1997 handover, they rhetorically sided with pro-democracy protesters in 2019, angering Beijing. Chinese policymakers repeatedly blamed "foreign forces" for the protests and imposed a new national security law in Hong Kong, which was criticized by the US and allies.

3. The Covid pandemic. The biggest global pandemic in a century brought massive economic and human hardship, but 3+ years later there is no consensus about the origin of Covid. The WHO investigation remains incomplete (by its [own assessment](#)), and US policymakers have expressed dissatisfaction with China's cooperation. Each country took very different approaches to Covid control and denigrated the performance of the other: China criticized the US' failure to control the spread, the US criticized China's repeated lockdowns, and both stuck with domestically-developed vaccines. The lack of cross-border travel and meetings between US and Chinese citizens and policymakers exacerbated misunderstandings.

4. Russia's invasion of Ukraine. China and Russia proclaimed a "no-limits" partnership shortly before the latter instigated the first land war in Europe since World War II. Though Chinese policymakers have avoided that phrase since then, and likely see the war as complicating their efforts to maintain good relations with Europe, they have repeatedly emphasized strategic alignment with Russia (e.g. recent meetings between

the presidents and defense ministers), and trade with Russia has risen sharply since the war began. US policymakers drew the conclusion from Russia's surprise invasion that greater efforts at deterring Mainland China may be necessary to protect Taiwan; ongoing US weapons sales and policymaker visits to the island have sparked protests (and military exercises) from Mainland China.

As US policy shifts from tariffs to technology...

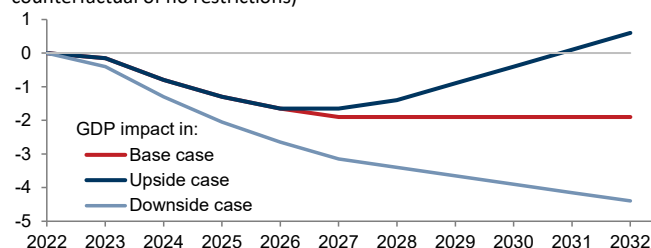
Amid the deterioration in relations, tariffs—once expected to be temporary—have stayed in place, while the newest hotspots of bilateral friction have moved to technology and investment (see pgs. 10-11). In the [words of](#) National Security Advisor Jake Sullivan, the US strategy shifted to "maintain as large a lead as possible" in critical technologies over its rivals.

In this vein, US export controls have expanded dramatically during the Biden Administration. Under President Trump, the highest-profile restrictions were on two telecommunications companies—ZTE and Huawei—initially related to their sales of equipment to Iran containing embedded US technology. In the first 1.5 years of the Biden Administration, the US Department of Commerce added a range of Chinese firms in supercomputing, surveillance technology, aerospace, drone, and other sectors to its Entity List and/or military-industrial company sanctions. The intention was to avoid supplying advanced US technology to firms that might be associated with China's military or surveillance policies (e.g. in Xinjiang).

In October 2022, the US dramatically broadened its technology sanctions regime by announcing a ban on exports of advanced semiconductor technology (including chips, equipment, and related software) to all of China—essentially giving up on trying to identify sensitive/military end-users, in part because of China's stated policy of "[civil-military fusion](#)." While US policymakers have mentioned the possibility of controls on other strategic industries—like biotech/biomanufacturing—the semiconductor controls are likely to have by far the biggest macro impact. We mapped out several potential scenarios—including a base case that could result in a cumulative hit of nearly 2% to China's GDP over the next few years if the competitiveness of certain downstream export industries were to be affected. The US has also [intensively scrutinized](#) Chinese investments in the US via the CFIUS process.

Significant potential impact of persistent technology restrictions

Impact of US semiconductor export controls on China's GDP, % (0 refers to counterfactual of no restrictions)



Source: Goldman Sachs GIR.

...China strives to maintain connectivity

As US-China tensions escalated and US restrictions on China moved from trade to technology and investment, Chinese leadership's rhetoric towards the US also hardened. At the annual "Two Sessions" in March this year, President Xi Jinping [made an unusual and explicit reference](#) to the US, stating that

“Western countries led by the US have implemented all-round containment, encirclement, and suppression” against China. In response to US tariffs and technology and investment controls, China’s policymakers are looking to dissuade other countries from joining US sanctions efforts and to [build ‘self-reliance’](#) (i.e. lessen dependence on foreign economies more generally), as highlighted by President Xi Jinping and other senior leaders.

• **China continues to devote significant government resources to developing leading edge technologies.** For example, China dominates the EV battery supply chain, with global investments in raw materials and world-leading manufacturing capacity in China itself. Semiconductor development has become an even bigger priority following US sanctions, with the government’s so-called “Big Fund” [revamped with new leadership](#). In theory, China could leverage sectors where it has the upper hand—rare earth production and refining, for example—to try to extract economic or diplomatic concessions; in practice, it has been fairly cautious in this regard with respect to the US, though that remains a possibility (notably, China [will review](#) a proposed deal for its battery maker CATL to license technology to Ford).

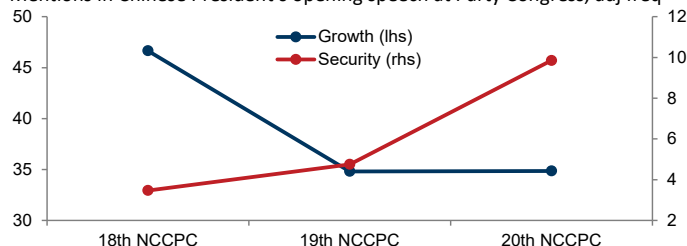
• **To assure itself of market access,** China has developed its own new trade agreements (RCEP) and applied to join existing ones (CPTPP, ironically, given it was originally proposed by the US). Xi and other senior officials set out on a flurry of meetings following the end of zero-Covid policy, and China’s diplomatic clout was on display in the [recent announcement](#) of a Saudi Arabia-Iran détente. China’s exports continue to grow rapidly in key EM markets, and to a lesser extent in Europe. Some production capacity targeted at US markets—particularly later-stage operations such as assembly—is moving to countries and regions not under tariffs (e.g. India, Southeast Asia).

• **Efforts to reduce dependence on the US Dollar—and US financial sanctions—continue.** The use of the RMB by Russian firms and in bilateral trade has increased. China also seeks to utilize its currency with other key trading partners (e.g. in the [Middle East](#) and [Brazil](#)). And large-scale testing of China’s e-CNY continues. Also, on the margin, China has shifted foreign reserves slightly towards gold in recent months.

• **Direct retaliation has been more limited,** in part to avoid discouraging desired inbound investment by foreign firms. Besides tariff retaliation (which is less-than-proportional given its relatively smaller import volumes from the US), Mainland China symbolically placed two US defense contractors on an “unreliable entities list” for arms sales to Taiwan, and more recently has investigated or penalized several foreign firms, including launching a [security review](#) of US chipmaker Micron.

China’s priorities shift from growth to security

Mentions in Chinese President’s opening speech at Party Congress, adj freq



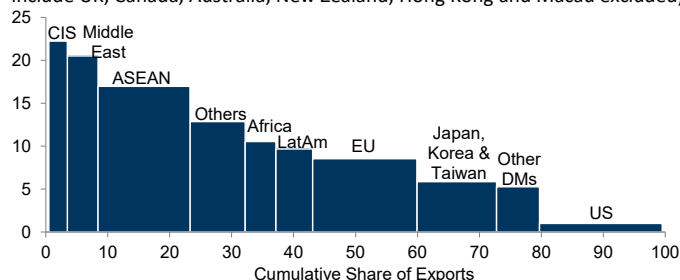
Source: Government websites, Goldman Sachs GIR.

In short, China’s strategy is to keep its addressable market (and sources of inbound investment and technology transfer) as

broad as possible, while investing heavily in the next generation of technologies. Because of the importance of maintaining China’s attractiveness of an investment destination, and the concern that a ‘bloc’ of US allies imposing sanctions could significantly constrain its economic growth and technological progress, diplomatic activity has been stepped up and overt retaliation for US sanctions has been extremely selective. The use of trade restrictions to send political messages also has been curtailed, with, for example, an easing of restrictions on Australian exports following a multi-year bilateral dispute.

Mainland China trade shifting away from the US bloc

Mainland China 2022 export growth by destination, yoy, % change (other DMs include UK, Canada, Australia, New Zealand; Hong Kong and Macau excluded)



Source: Haver Analytics, Goldman Sachs GIR.

What’s next?

In the near term, markets await the next set of US regulations, this time in the form of a White House executive order on outbound investments to China. In keeping with [media reports](#), we expect them to be fairly narrowly focused on advanced semiconductors and related technologies, paralleling last autumn’s export controls, and do not anticipate significant restrictions on secondary market portfolio investments, though there has been some discussion of a broader “notification regime.” While this “reverse CFIUS” regulation will hardly be the last word on US-China restrictions, we may see more focus on refining the existing tariff, export control, and investment regimes once basic frameworks are in place.

High-level US-China policymaker dialogue and engagement remains very limited. Discussions around an eventual trip to China by Secretary of State Blinken continue to be on hold following the overflight of a suspected Chinese spy balloon, and no specific plans for trips by Treasury Secretary Yellen and/or Commerce Secretary Raimondo have been made. US policymakers appear to want to compartmentalize issues, imposing significant restrictions on Chinese technology access while also cooperating in areas such as climate change. Chinese policymakers, for their part, tend to view US actions and comments as part of an integrated “containment” policy—even when they come from Congress rather than the Administration—and for now [appear to have decided](#) to focus their diplomatic efforts elsewhere. For now, no news may be good news for US-China relations, with business and informal bilateral contact resuming post-zero-Covid and official interactions only likely to step up further after a period of calm.

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US-China policy: new strategic focus

Alec Phillips and Tim Krupa discuss the evolution of US policy towards China and what that could imply for policy ahead

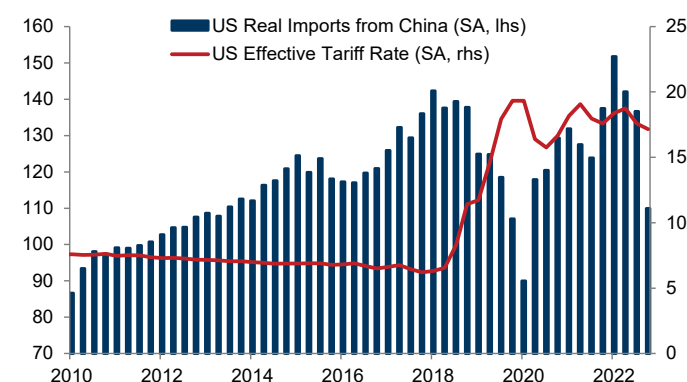
Tighter economic policy towards China enjoys strong bipartisan support in Washington. While early Trump Administration policies were primarily economic in nature, since then US policy has taken on a more strategic focus. Below, we explore how this shift has played out, and what that implies for policy ahead. With few other areas where both political parties agree, we see further restrictions on economic relations with China as likely.

Tariffs are here to stay, but are no longer in focus

At the start of the Trump Administration, the decision to impose tariffs on imports from China was made largely on economic grounds, primarily focused on narrowing the bilateral trade deficit (see pgs. 8-9). While that decision was initially controversial among both political parties, the Biden Administration has kept the tariffs in place and has defended them from challenges, including most recently in the US Court of International Trade, which upheld the Section 301 tariffs on over \$300bn worth of imports from China. While that case may be appealed to the US Court of Appeals and potentially to the US Supreme Court, we don't expect broad changes to the tariffs anytime soon. More importantly, the tariffs are now non-controversial, and removing them would likely entail greater political risk than maintaining them. And while removing tariffs would be disinflationary, the effect would be diffuse and relatively small, at around -0.2pp on core PCE.

Tariffs on China imposed during the Trump Administration are likely here to stay

\$bn/quarter (lhs), % (rhs)



Source: US Census Bureau, BLS, Goldman Sachs GIR.

Policy now has a strategic focus

Near the end of the Trump Administration and throughout the Biden Administration, US policy towards China shifted to policies with a strategic, rather than purely economic, focus. The shift regarding technology is most apparent, with the Biden Administration moving away from maintaining a "relative advantage" in key technologies over competitors to instead aiming to maintain "as large a lead as possible." This has two main consequences:

1. **Export controls have broadened and intensified.** Export controls began to ramp up during the Trump Administration (e.g., Huawei) and have intensified since.

In the fall of 2022, the Department of Commerce implemented new export controls on semiconductors—including restrictions on equipment, components, and services—and expanded the [Entity List](#), which requires US companies to apply for a license to trade with those entities "under a policy of denial" and notably now includes the Chinese semiconductor company YMTC. The Administration is also likely to continue expanding technologies subject to export controls under the "emerging and foundational technologies" export control rules, known as "Section 1758" technologies.

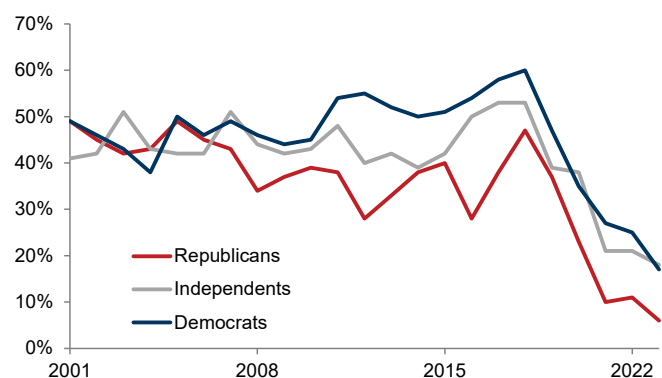
2. **New outbound investment restrictions are likely.** The Biden Administration has been developing new outbound investment [policies](#) akin to the existing inbound process under CFIUS for several months, and an executive order looks finally likely in the next few weeks. These restrictions would likely apply to US private sector investment in critical areas (e.g., semiconductors, quantum computing, AI) and would very likely include new reporting/notification requirements. However, there are likely to be important exceptions. Indeed, the aim of the policies appears to be to limit the transfer of US expertise and technology, rather than capital per se. The policies are likely to focus on active rather than portfolio investments.

Lots of talk, but limited action, in Congress

In Congress, policy developments have been more modest than hawkish rhetoric suggests. In late 2022, Congress passed a spending bill that included several China-focused amendments. Most important are the accelerated delisting of companies that do not comply with US auditing standards—they now have two years instead of three to comply—and a ban on TikTok on federal government devices, a largely symbolic measure.

US sentiment towards China has declined significantly across party identification

Overall opinion of China (% very/mostly favorable)



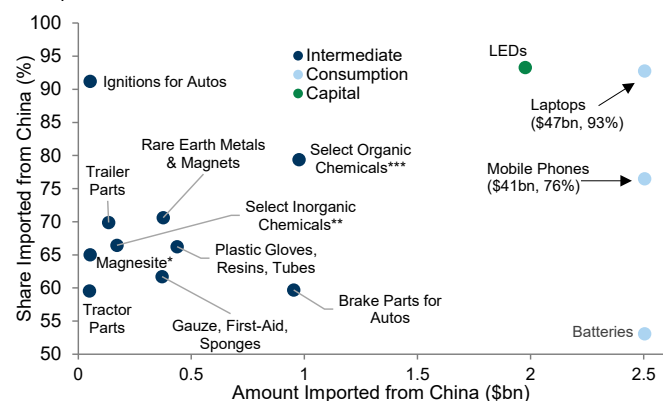
Source: Gallup, Goldman Sachs GIR.

Hawkish headlines out of Congress are likely to continue. The [opening remarks](#) by the Chairman of the new House Select Committee on China, Rep. Gallagher (R-WI), at its first hearing struck a maximalist tone, stating that "strategic competition" with China "is an existential struggle over what life will look like in the 21st century." While the committee does not have legislative authority and its initial hearings have not involved specific policy recommendations, the Chairman has [indicated](#) a

focus on US investment in China, as well as US areas of supply chain dependence on China, including rare earth minerals, pharmaceuticals, and medical goods. Sen. Schumer has signaled that Senate Democrats are likely to release a China bill later this year, possibly this summer, potentially updating the “[Strategic Competition Act](#),” which was introduced—but not passed—in 2021. This is likely to become another focal point for China-related policy in Congress.

The US imports a large share of rare earth minerals, certain chemicals, and pharmaceutical products from China

US imports from China



Note: All categories refer to specific products within, rather than categories as a whole. *Water treatment; feed stock production and fertilizers. **Calcium, antimony oxides (flame-proofing), silica gel (desiccant). ***Pesticides, ibuprofen, acetaminophen, sucralose, vitamins B/C/E, zoalene (poultry additive), potassium sorbate (food preservative), coenzyme Q10.

Source: US International Trade Commission, UN Trade Statistics, GS GIR.

What else is next?

Scrutiny of China-affiliated social media is likely to intensify.

The Chairman of the House Select Committee on China also identified banning TikTok as a priority, while Sen. Schumer (D-NY) has said a TikTok ban “should be looked at.” Legislation to restrict TikTok (and possibly other foreign social media platforms) has bipartisan support, with the [RESTRICT Act](#) being the most prominent proposal. It would authorize the Department of Commerce to “review and prohibit certain transactions” with foreign entities, such as TikTok, offering “information and communications technology products or services.” There is no clear timeline for a vote—committee consideration could come soon, though it would likely take several more months to reach the President’s desk. While there are a number of other similar competing bills with slightly different details, it seems more likely than not that some legislation along these lines will become law this year.

China-Russia relations could prompt secondary sanctions.

In February, US officials commented that China was considering providing lethal equipment to Russia and made clear there would be a response, which would likely take the form of sanctions. White House National Security Advisor Jake Sullivan [commented](#), “Beijing will have to make its own decisions about how it proceeds, whether it provides military assistance—but if it goes down that road it will come at real costs to China.” Cooperation with Russia in other areas, such as subverting the Western price cap for Russian oil, could also prompt secondary sanctions.

Multilateral solutions will pose a challenge. French President Macron recently warned that “the great risk” facing Europe is getting “caught up in crises that are not ours, which prevents [Europe] from building its strategic autonomy” and stressed not becoming “just America’s followers.” This underscored the challenges ahead to achieving Western unity in strategic competition with China, Europe’s largest trading partner. By contrast, Japan and the Netherlands—two critical producers of chip manufacturing equipment (e.g., lithography machines)—have recently followed through on restricting chip manufacturing equipment exported to China. The Dutch government, which regulates ASML, recently restricted licensing, [stating](#) “the existing export control framework” needs to be “expanded in the interests of national and international security.” Similarly, Japan [detailed](#) even stricter licensing requirements than US controls but avoided mention of China, stating “we do not have one particular country in mind with these measures.” It seems likely that US allies will join in most efforts—the Biden Administration is reportedly working on a statement in support of the outbound investment restrictions noted earlier for the G7 summit this month—but the need for multilateral agreement on many of these policies adds additional difficulty to each step the US takes.

US officials will likely attempt to deter an invasion of Taiwan by threatening sanctions but have also signaled a willingness to respond militarily.

Tensions over Taiwan rose on the heels of Taiwanese President Tsai Ing-wen’s meeting with House Speaker Kevin McCarthy (R-CA) last month. US officials are [likely preparing sanctions](#) to deter an invasion, but have also signaled that US forces could become involved if Mainland China were to invade Taiwan. In the fall of 2022, President Biden said that “yes, if in fact, there was an unprecedented attack [US forces would defend Taiwan].” This was not the first time President Biden reduced the “strategic ambiguity” surrounding Taiwan. Likewise, regarding the potential for the US to send troops to Taiwan if Mainland China invaded, the Chair of the House Foreign Affairs Committee, Rep. Michael McCaul (R-TX), said that “it would certainly be on the table and something that would be discussed by Congress and with the American people.” The more immediate focus has been on building Taiwan’s military capabilities to deter a conflict. The National Defense Authorization Act appropriated up to \$2bn annually over the next five years in grants to Taiwan’s military, in addition to smaller supports relating to training, contracting, procurement, and financing, and we see good odds that Congress passes additional support.

All told, the Biden Administration is likely to continue to tighten economic policies related to China and deepen its strategic policy focus.

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Interview with Daniel Rosen

Daniel Rosen is a founding partner of Rhodium Group and leads the firm's work on China, India, and Asia. He is also a board member of the National Committee on US-China Relations. From 2000-2001, Rosen was Senior Adviser for International Economic Policy at the White House National Economic Council and National Security Council. Below, he argues that further US-China decoupling is likely, but not inevitable.

The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.



Jenny Grimberg: Amid a recent rise in US-China tensions, what does the data suggest about how the bilateral economic relationship has evolved?

Daniel Rosen: The data shows a divergence between bilateral trade and investment dynamics. Despite all of the focus on the trade war over the

past six years, trade between the US and China has remained at extremely high levels, driven by supportive US household consumption patterns, although bilateral trade is well below the levels it would have been in the absence of the trade frictions.

On the investment side, foreign direct investment (FDI) into China by US companies—and by companies in other G7 economies—has declined sharply, which is striking, because, all else equal, global companies should be dramatically *increasing* their investments into China given the country's maturing middle income economy. It's also interesting to note that in the past three years, around 80% of total FDI flows into China have originated from 10 American—mainly technology—companies and 10 European—mainly auto and chemical—companies. So, only a handful of well-established super giants have continued to up the ante and stay in the game, in part driven by a motivation to get ahead of new US investment restrictions that may be coming down the pipe; most other firms are sitting on the sidelines, being careful about making additional direct investment outlays in China.

Outbound Chinese FDI into the US has also not returned to anywhere near the high water mark of 2015/16, owing largely to concerns about capital outflows in Beijing but increasingly to security considerations in Washington. Both have put a low ceiling on US-China engagement through the FDI channel, which should otherwise have been one of the most exciting areas of growth in the bilateral relationship. Finally, bilateral portfolio flows have remained at low levels and never saw the golden years that were expected to follow MSCI's inclusion of China in global indices, partly because of the pandemic, but mainly because China has yet to implement the macro financial policy reforms necessary to attract foreign capital, on top of growing geopolitical concerns that have slammed the brakes on the prospect of significant US portfolio flows into China.

Jenny Grimberg: You spend a lot of time speaking with companies on the ground in both countries. Is what you're hearing from them consistent with the trends you're observing in the data?

Daniel Rosen: For the most part. On January 1, 2022, I would say that roughly 95% of the CEOs at multinationals we speak

to were aware that engaging with China was fraught, but attributed most of the gloom to pandemic effects, and were comfortable with the fundamental China story, believing that the country would contribute as much as one-third or more of marginal global growth for many years to come. But just one year later, by January 1, 2023, a totally different attitude prevailed across the C-suites we interact with; with China missing its growth target for the first time in modern Chinese history, executives began to question whether the Chinese economy was suffering from serious long-term structural issues that would impede its global growth contribution. So, concerns around China strategies that were previously a VP for Asia or Head of Strategy problem suddenly became a CEO problem. That, along with escalating geopolitical tensions, has notably shifted CEO sentiment towards China, consistent with the data that shows many US/multinational companies tapping the brakes on capex in China.

That differs somewhat from what we hear from Chinese companies and executives; while they are also concerned about geopolitical headwinds, they remain eager to hedge against bifurcation and be a part of supply chains outside of China, and so many are attempting to shift at least some marginal capex to the US and other G7 countries when and where possible.

Jenny Grimberg: Are the new China investment curbs President Biden is proposing likely to have a material impact on investment, further slowing FDI flows?

Daniel Rosen: The curbs probably won't have as much of an impact as some people originally conceived or some vociferous hawks would like. These curbs have been long in train, and at this point seem most likely to entail firms providing notification of outbound investments with the aim of restricting investments in areas that may pose national security concerns. But those areas are likely to remain limited to a handful of very specific technologies like AI, quantum computing, etc., so the scope of these curbs is narrower than was first feared. It's also important to remember that these curbs are coming through executive action, which isn't permanent and can be moderated or reversed by a future administration if Beijing takes steps to be more collaborative with Western governments on legitimate security issues. So, while we'll have to carefully monitor how the proposed curbs are implemented and potentially expanded, at this point they themselves are unlikely to reduce US investment in China by another order of magnitude.

Jenny Grimberg: Is anything coming down the pipe in Washington that you worry could be more impactful?

Daniel Rosen: Yes. One that comes to mind is legislation introduced by several members of Congress that would strip

China of its Permanent Normal Trade Relations (PNTR) status, which would be extremely detrimental to the bilateral relationship. Although most proposed legislation never becomes law, this legislation should be taken seriously, because in the current environment in which US-China tensions are running high and a majority of Americans view China unfavorably, it would be hard for members of Congress to vote against such a proposition were it to be brought to the floor. American trade policy over the past six years has been tough on China without withdrawing PNTR status. We shouldn't start ripping out the tenets of the free trade regime that the US has benefitted from for so long without a much more serious discussion around what we're trying to achieve by doing so.

Jenny Grimberg: Even if such extreme measures aren't taken, is more economic/financial decoupling between the US and China likely ahead?

Daniel Rosen: Yes. The amount of 'coupling' two countries can engage in depends on the daylight between their economic systems. The US and Canada, for example, have similar economic systems, so few limits exist to interoperability in technology, trade, and investment between them because companies on both sides of the border can conduct the same amount of due diligence to get comfortable doing business with each other.

The US and China, however, have increasingly dissimilar economic systems given Beijing's choices in this regard. After being admitted to the WTO in 2001, China worked earnestly to adjust its economic system in a market direction, right up to and including the initial Xi Jinping years, but progress towards marketization stalled out in 2015/16, and even reversed in some areas. So long as that trend continues, Western engagement with China will be constrained, both for governments and companies—even before national security considerations are factored in. So, further decoupling is likely. But that decoupling doesn't have to be maximal; many activities will continue to be permissible and accretive to the US' and China's economic welfare. All decoupling means in this context is that smaller shares of the US' and China's economic futures will be tied up together.

“Western engagement with China will be constrained... So, further decoupling is likely.”

Jenny Grimberg: That said, how costly could such a decoupling be, and which economy is likely to bear the brunt of it?

Daniel Rosen: Relative to a baseline in which the US and China—the two largest economies in the world—freely interact and reap the full benefits of that interaction, [we estimate](#) that benefit-reduction will be in the trillions. Even a moderate amount of decoupling would be costly for both economies. That said, costs as a percentage of GDP will be higher for China, for several reasons. While the US would lose access to some growth in China, it would still be fully deployed almost everywhere else. China, by contrast, is at a more primitive stage of globalization, and thus has more to lose if that process

gets sidetracked. In addition, significant replacement investment will take place domestically in the US to diversify, and, done smartly, that would be accretive to American growth; whereas China has already front-loaded import-substitution industrial policy investment, though with mixed results. Indeed, those Chinese policies, often based on subsidies, are a major reason why market economy capitals are up in arms.

Jenny Grimberg: Should the hope of market-oriented reforms in China that could avert these losses be put to rest given the lack of progress on marketization you note over the last several years?

Daniel Rosen: No. Some outspoken China critics assert that the Chinese Communist Party is playing a hundred-year game and has never demonstrated any seriousness about liberalizing policy, especially in the economic arena. That assertion is ill-founded. The extent of structural adjustment and disruption to state-run businesses in China since the 1970s has been extraordinary. Time and again, China's leaders course-corrected and altered the direction of policy when the evidence became unmistakable that changes were needed. It happened in 1984, in 1992, in 1998, in 2013 when President Xi first came to power and put a significant program of reform on the table, and again in 2022 when China abandoned its zero-Covid policy.

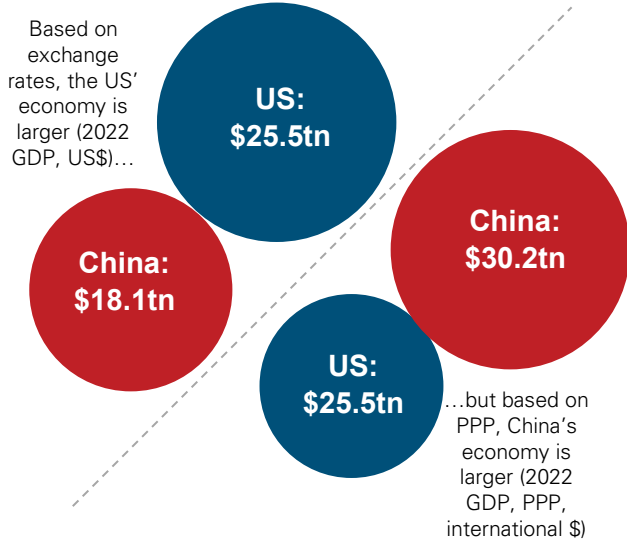
Today, China is once again facing a difficult reality; despite this year's 5% official growth target, we estimate that China will continue to face growth headwinds. Productivity is depleted, as Secretary Yellen stressed in her recent China remarks and the IMF has been pointing out. Unlike countries that faced a lost decade once they were rich (like Japan), China cannot afford to pause on economic development, with hundreds of millions of people still waiting their turn at prosperity. So, another shift in policy that is conducive to deeper US-China engagement could well lie ahead.

Jenny Grimberg: As long as we're talking about misconceptions, what are the biggest misconceptions people have about US-China tensions today?

Daniel Rosen: One of the biggest misconceptions is the one I just mentioned: that China is incapable of changing gears. A second misconception is that escalating US-China trade and geoeconomic tensions over the past decade have been an American choice; it wasn't so much an American choice as a result of China's hesitancy to continue marketization. And a third key misconception is that what's happening today is just a US-China phenomenon. It's broader; other advanced market economies have similar concerns about China, and are going through the same internal evolution in policy debate. Japan is the first G7 country that has started subsidizing its companies to leave China, for instance. So, this shouldn't be understood as a US-China fight with everyone else crowded around the schoolyard egging them on or watching to see what happens. Rather, it should be understood as the lessons of the 20th century about the effectiveness of market economic orientation competing with resurging hopes that statism can somehow prevent the hard choices that the world's market economies grapple with every day.

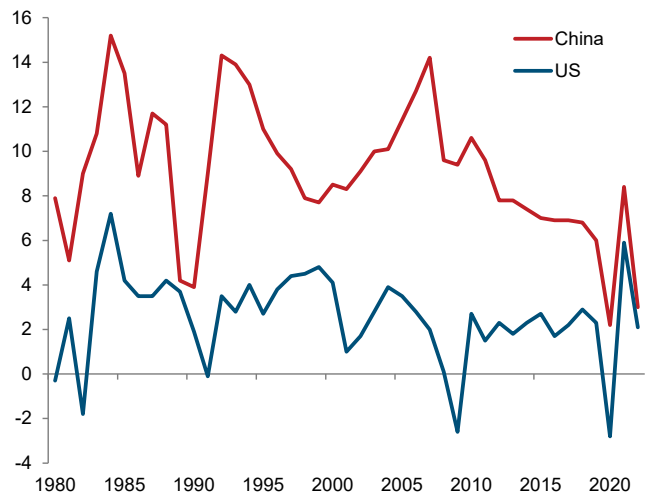
US vs. China economies in pics

The US', or China's, economy is larger, depending on measure



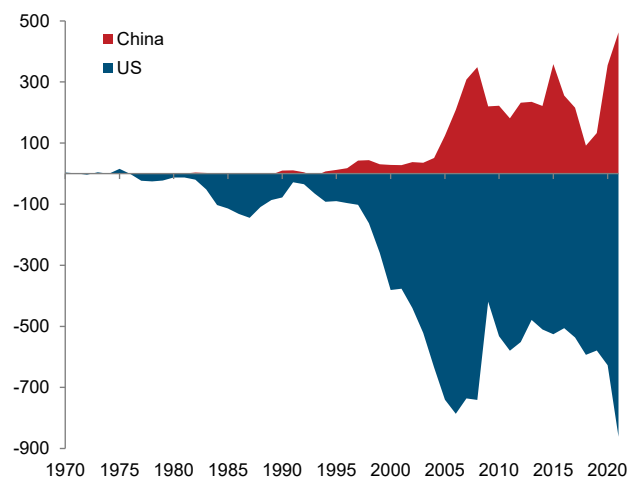
Source: IMF, Goldman Sachs GIR.

China grew faster than the US over the last several decades
Real GDP growth, annual % change (through 2022)



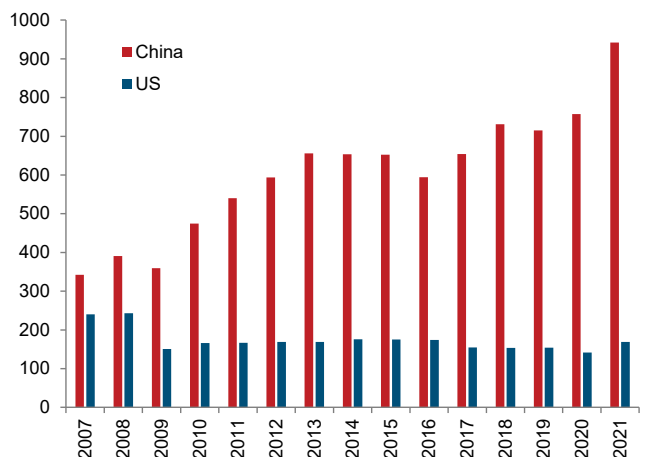
Source: IMF, Goldman Sachs GIR.

The US has long been a net importer, and China a net exporter
Trade balance (exports-imports), US\$bn (through 2021)



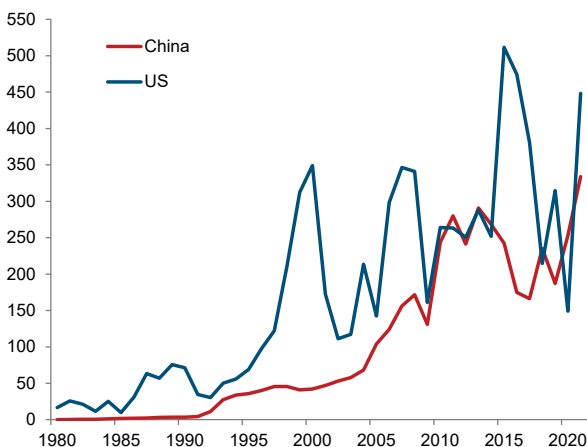
Note: Includes both goods and services trade.
Source: World Bank, Goldman Sachs GIR.

China exports significantly more high-tech products than the US
High-technology exports, US\$bn



High-tech exports are products with high R&D intensity, such as aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.
Source: World Bank, Goldman Sachs GIR.

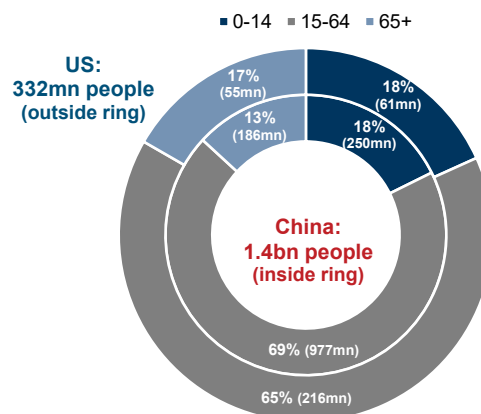
The US has generally been the larger recipient of foreign direct investment (FDI) than China, although the gap has narrowed, or even reversed, in recent years
FDI net inflows (BoP, US\$bn) (through 2021)



Source: World Bank, Goldman Sachs GIR.

The demographic breakdowns of the US and China look quite similar

Population by age group, % of total population (2021) (total population in parentheses)



Total population includes all residents regardless of legal status/citizenship.
Source: World Bank, Goldman Sachs GIR.

US-China economic linkages in pics

The US and China are one of each other's main trading partners and the value of US exports and imports to and from China has steadily risen over the last two decades

Trade in goods and services between the US and China, \$bn



Source: US Bureau of Economic Analysis, Goldman Sachs GIR.

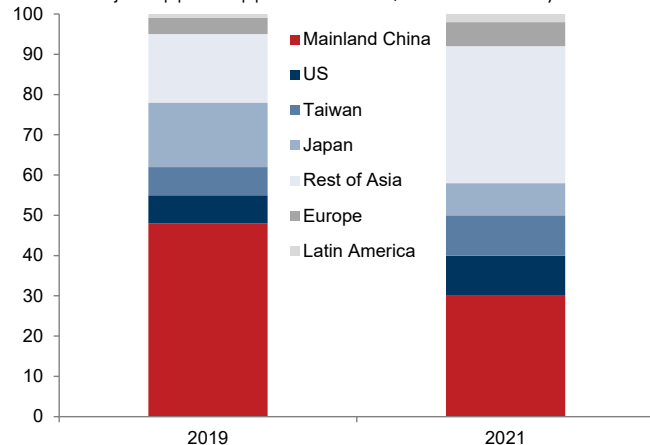
Jobs in the US and China rely on their trading partnership and expansion of US and Chinese multinational corporations



Source: US-China Business Council, International Trade Administration, Oxford Economics, Goldman Sachs GIR.

...and rely on manufacturing facilities in Mainland China, though recently some have tried to diversify their supply chain away from Mainland China given increased geopolitical tensions

No. of major Apple supplier facilities, breakdown by location



Source: Apple, Goldman Sachs GIR.

US agricultural exports to China reached a record high in 2022 and the US imported large amounts of electronic equipment and machinery from China

US exports and imports of goods to/from China in 2022

US Main Imports from China		
	\$bn	% of total trade with China
Computer and electronic products	161	23%
Manufactured commodities (incl toys, games, medical equipment)	59.5	9%
Electrical equipment, appliances, and components	55	8%
Chemicals	35	5%
Total imports from China	536.8	
US Main Exports to China		
	\$bn	% of total trade with China
Agricultural products (excluding livestock, forestry, and marine products)	30.1	4%
Chemicals	25.7	4%
Oil and gas	11	2%
Food and kindred products	3.8	1%
Minerals and ores	2.3	0%
Total exports to China	153.8	
Total trade with China	690.6	

Source: US Census Bureau Trade Data, Goldman Sachs GIR.

A large number of US companies derive a significant portion of their revenues from China...

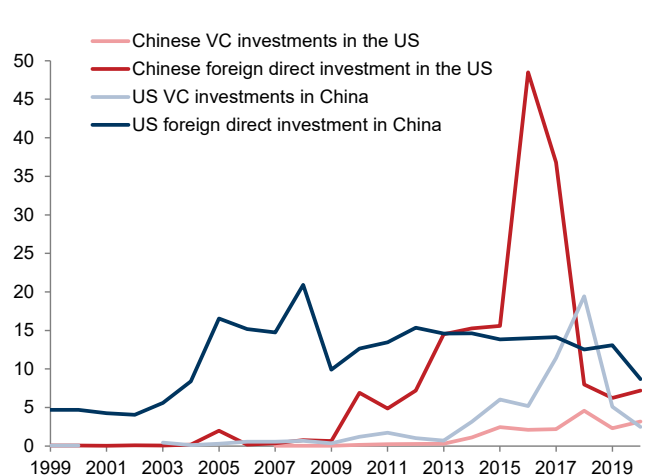
Selected US companies' revenue exposure to China in 2022

	Share of revenues from China	Revenue exposure to China (\$mn)
Qualcomm	64%	28,119
Texas Instruments	49%	9,844
Marvell Technology	42%	2,486
Broadcom	35%	11,621
Applied Materials	28%	7,254
Intel	27%	17,125
NVIDIA	26%	7,111
Tesla	22%	18,145
Apple	19%	74,200
Nike	17%	7,547

Source: Company 10k filings, Goldman Sachs GIR.

Investment flows between the US and China have decreased in recent years as bilateral tensions have escalated

US-China investment flows, \$bn



Source: Rhodium Group, Goldman Sachs GIR.

Interview with Jonathan Jia Zhu

Jonathan Jia Zhu is Partner and Co-head of Asia Private Equity at Bain Capital. Below, he argues that the risk-reward trade-off for investing in China has become more challenging amid rising geopolitical tensions between the US and China, but that China remains investable.

The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.



Allison Nathan: To what extent have rising tensions between the US and China impacted your investment strategy in China?

Jonathan Zhu: Even before the recent escalation in tensions, investing in China has always required a readiness to shift focus and strategy. China has experienced many cyclical ups and downs over the past several decades.

While it's easy to look back in amazement at China's nearly 10% average annual GDP growth since the end of the Cultural Revolution, that growth didn't happen in a straight line. Instead, it has ebbed and flowed, historically driven by two factors: the market cycle and the policy cycle. Anybody investing in China has had to closely monitor these cycles and be prepared to adjust strategy accordingly. Over the last several years and certainly continuing through today, the geopolitical tension between the US and China that you mention has become a third factor driving volatility in the investing landscape. That tension, and the resulting policies from both sides, have no doubt reduced the competitiveness or even viability of some business models, forcing us, as well as other investors, to again change strategy.

Allison Nathan: So, given this added layer of geopolitical volatility, how would you rate the current investing landscape in China relative to the past?

Jonathan Zhu: The current investing environment is one of the more difficult ones in my nearly two decades of investing in China. That owes in large part to the geopolitical tension. But the difficult investing landscape also owes to the lingering effects of China's zero-Covid policy, which had a significant impact on livelihoods, businesses, and people's willingness to commit long-term capital, as well as a tougher financing environment; private equity and venture capital firms are having a harder time accessing capital to put to work in the country.

“The current investing environment is one of the more difficult ones in my nearly two decades of investing in China. That owes in large part to the geopolitical tension.”

Allison Nathan: How have these factors impacted the investment opportunity set in China overall?

Jonathan Zhu: The market opportunity set has narrowed. Some sectors are now off-limits to US-based investors under reverse CFIUS rules that restrict investments in certain segments of the Chinese economy, including semiconductors, AI, and advanced computing. And the scope of restrictions on

not only investments in the tech space—which has historically been a particularly attractive space for investors—but in other areas as well will likely grow, further narrowing the opportunity set. Covid has also narrowed the opportunity set in the sense that, while some businesses like e-commerce did well during the pandemic, others failed. And investment opportunities have declined in sectors that the Chinese government is very focused on because it has designated them as strategically important areas, such as media and education, where domestic government policies have or could decimate return potential or government capital could crowd out private capital.

Allison Nathan: Given the growing list of trade, investment, and other restrictions between the US and China, some US investors seem to be questioning whether China is simply becoming uninvestable. Are you concerned at all that this is—or will soon be—the case?

Jonathan Zhu: The risk-reward trade-off has become more challenging, but China is still investable. It is still quite possible to identify businesses that can reasonably be expected to perform well in the future. Investors just need to be more mindful of the three drivers of business performance that we discussed—cyclical market forces, government policy, and geopolitics—and focus on investing in businesses with resiliency in today's more difficult environment.

One of these three factors—the cyclical environment—strengthens the case for investing in China today. While Western economies are still contending with high inflation and interest rates, potential banking system risks, etc., the macro environment in China is very different, partly due to US and Chinese government efforts to decouple their countries' economies and partly because Covid changed China's business cycle. Inflation and interest rates are very low in China today, and the country is experiencing a strong economic recovery and will likely be one of the major drivers of global growth this year. I must admit that I was one of the skeptics about Chinese growth prospects heading into the year, but have been especially surprised by the strength in the real estate sector, which comprises a substantial portion of the economy. For global investors like ourselves, the key is finding times and places where risk-reward is most attractive. And, currently, the risk-reward for investing in China looks reasonable relative to other geographies.

Allison Nathan: Where are investment opportunities most compelling today?

Jonathan Zhu: We see substantial value in four investment themes. One, the energy transition, which is well underway and receiving substantial government focus in China. Many companies have emerged in this space, which is quite large, involving power generation, distribution, storage, and significant investments in the electric grid, etc. Two, advanced manufacturing; in the past, China was all about labor-intensive,

low-cost manufacturing, but over the last decade or so it has become a leader in several advanced manufacturing areas like electronics, machine tools, robotics, fine chemicals, and active pharmaceutical ingredients (APIs). A large amount of higher value-added manufacturing is now occurring in China, and companies have emerged with strong competitive positions in China and globally.

Three, global supply chain realignment, driven by countries' desire to diversify their supply chains and companies' desires to build more resiliency into their supply chains and relocate manufacturing activities to lower-cost locations. This behavior is not confined to just multinational companies; Chinese companies that oftentimes require strong expertise outside their home market and significant capital to build new facilities are participating as well. And four, consumer and healthcare. When McDonald's first opened in China in 1990, per capita income was below \$400; in 2022 that figure was over \$12k. So, the scope for consumption has grown significantly, and China is now one of world's largest consumer markets. It's also the world's second-largest pharmaceutical market behind the US, and in the not-too-distant future could surpass the US' in size. So, any consumer or healthcare company needs to look seriously at the Chinese market.

“ The risk-reward trade-off has become more challenging, but China is still investable.”

Allison Nathan: Even if the addressable consumer market has grown, doesn't rising anti-American sentiment among the Chinese population make it difficult for US firms to capture a significant share of the market?

Jonathan Zhu: While it's clear that Chinese public sentiment towards the US has turned more negative just as American sentiment has turned more negative on China, I don't see that affecting consumer interest in US brands. Firms like McDonald's and KFC continue to perform well in China.

Allison Nathan: Given your decades of investing in China, where would you say the US is ahead/behind relative to China?

Jonathan Zhu: The US is clearly ahead of China in two areas: innovation and efficient capital allocation. The US is the global leader in innovation—semiconductors and the internet were invented in the US, and the US is now ahead in AI development. The US also understands how to efficiently allocate capital; China's strong economic growth has been achieved in part because it learned from the US how to allocate capital to more productive sectors of the economy, and many Chinese companies have become innovative and successful because they've been funded by US investors.

China has three important competitive advantages over the US: superior infrastructure, an exceptionally large, educated workforce, and best-in-class advanced facilities. China's infrastructure is probably the best in the world, not only from a physical standpoint—expansive high-speed rail networks, well-built airports, seaports, and roads—but also from an efficiency-of-operation standpoint—everything gets built at hyper-speed.

China also has a very large and educated workforce, which allows it to excel at scale manufacturing. It's no accident that Apple manufactures most of its products in China. The country turns out around six million STEM graduates annually—close to 10x the US—who are well-equipped to manage factory floors and production lines. That's not a competitive advantage that can be easily replicated, even in India, despite its very large labor force. And China has invested a great deal in industrial manufacturing infrastructure. Oftentimes when multinational companies are asked where their best factory is, the answer is China, because of all the money China has spent on plants, equipment, industrial robots, etc. over the last few decades.

Allison Nathan: What are the biggest misconceptions Americans/Westerners have about China in the context of US-China economic competition?

Jonathan Zhu: The biggest misconception is that China is a monolith. When I read the Western press and speak to people, I am struck by the perception that everything in China happens top down. It's important to remember that a country of China's size and complexity boasts significant regional, industry, public-private sector, etc. differences. As a result, policymaking in China, like that in other countries, involves constant adjustments and accommodations. While it is certainly true that decision-making in China is more centralized, the reality is oftentimes much more complicated and nuanced.

“ The Chinese companies that have become successful both at home and on the global stage have done so because they're strong businesses.”

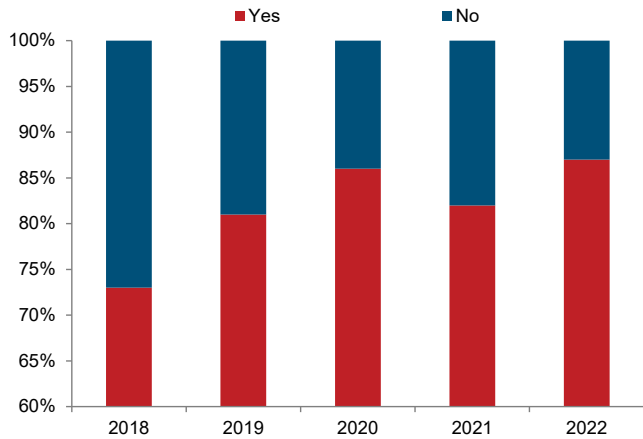
Some Westerners also seem to believe that the reason why Chinese businesses are competitive is because of government support. That's a gross oversimplification of the on-the-ground reality. Many Chinese businesses have become competitive because they've invested in the right technologies, developed a strong business strategy, and executed on that strategy well. Ironically, Huawei, which many people view as the epitome of a government-subsidized company, is a case in point. I've had a lot of exposure to the company in my career and, contrary to many people's perceptions, it actually chose to operate overseas precisely because it *did not* receive much government support and struggled to compete in China against other telecom equipment companies that did.

More broadly, many companies, like those in the internet sector, have not only not benefitted from government support, but also have had to contend with complicated regulatory issues, yet have still managed to succeed. So, while instances certainly exist of companies gaining a competitive advantage from government support, that's far from uniformly true. And companies that have gained market share because of government support generally haven't done well once that support has been scaled back or withdrawn. The Chinese companies that have become successful both at home and on the global stage have done so because they're strong businesses.

Shifting US business relations with China

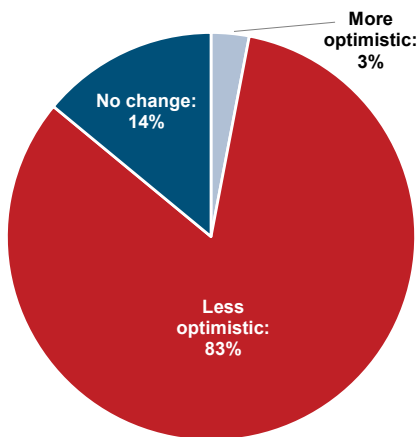
US companies doing business in China are increasingly affected by US-China tensions...

% of member companies that responded yes/no to the question "has your company's business with China been affected by US-China tensions?"



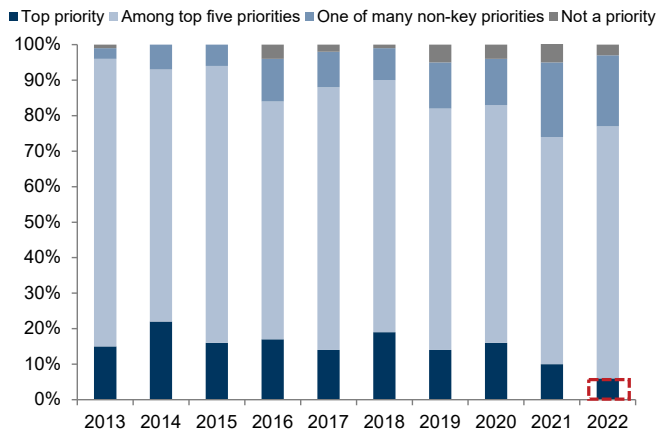
US companies' views on the business climate in China have deteriorated...

% of member companies on their "view of current business climate in China compared to three years ago"



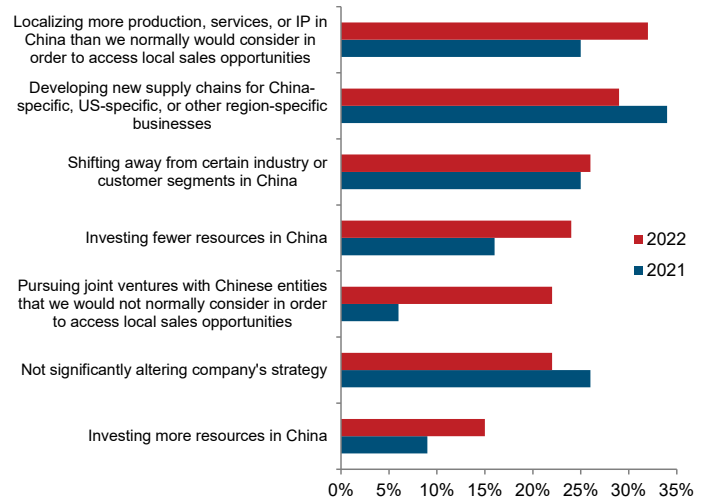
China remains a priority for many US companies, though its prominence in company strategies has declined...

% of member companies on how "China's prominence in overall company strategy" has evolved



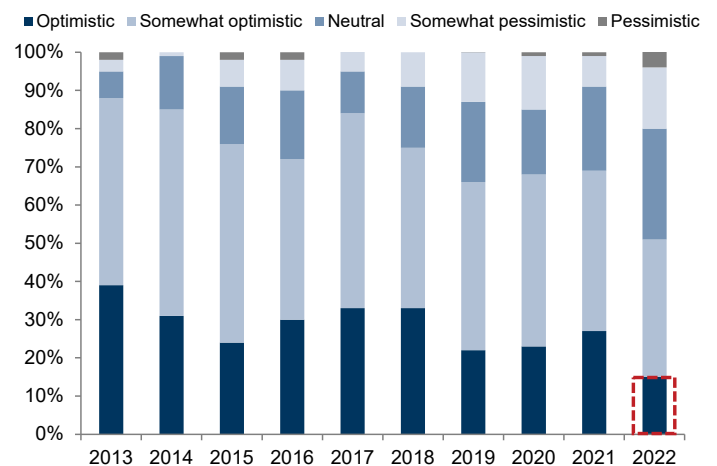
Source for all exhibits: *US-China Business Council's 2022 Member Survey conducted in June 2022*; survey responses come from 117 member companies; most respondents are large, US-headquartered multinational companies that have operated in China for more than 20 years.

...and many have responded by altering their business strategies
% of member companies that reported taking each action "due to the impact of tensions"



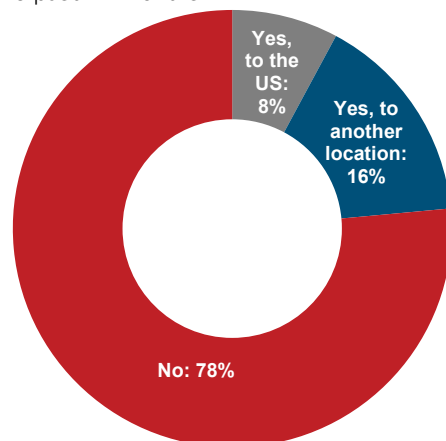
...as well as their views on the outlook for business in China

% of member companies on their view of the "five-year outlook for business in China"



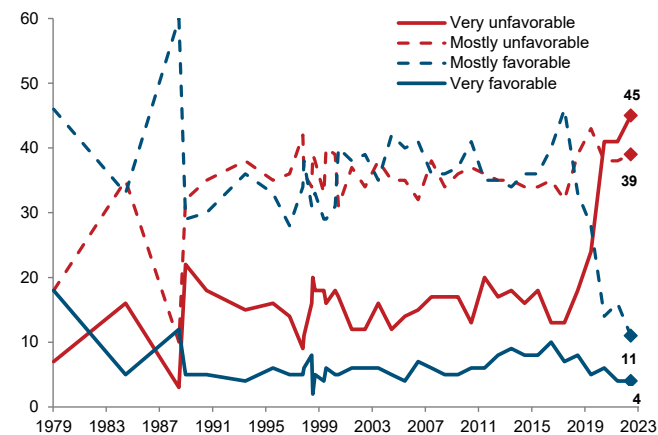
...but China remains prominent in US company supply chains

% of member companies that responded yes/no to the question "has your company moved any segments of its supply chain out of China in the past 12 months"



US-China sentiment at a glance

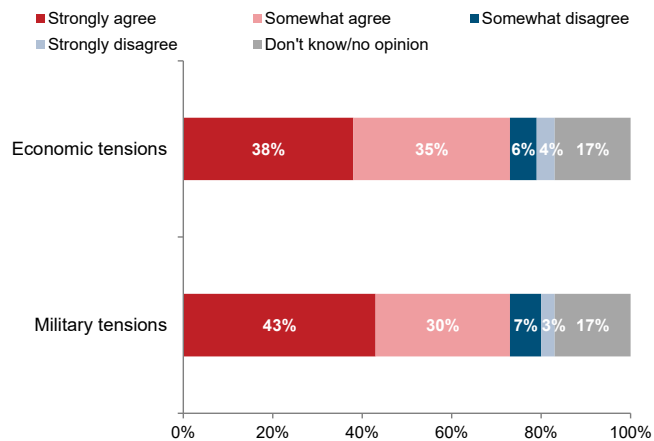
A large majority of Americans view China unfavorably...
 % of US respondents that gave each answer to the question "is your overall opinion of China very favorable, mostly favorable, mostly unfavorable, or very unfavorable"



Source: [Gallup](#) (latest data from Feb 1-23 annual World Affairs poll), GS GIR.

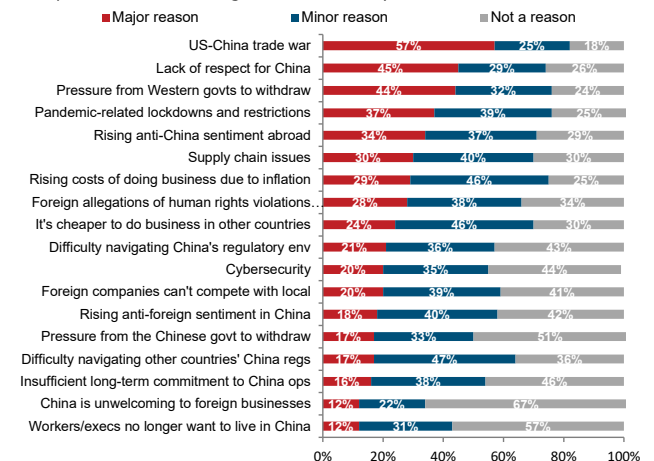
A majority of Americans believe the US and China should work together to reduce bilateral tensions...

US share reporting whether the US and China should work together to reduce economic/military tensions (survey conducted 11/2-11/3/22)



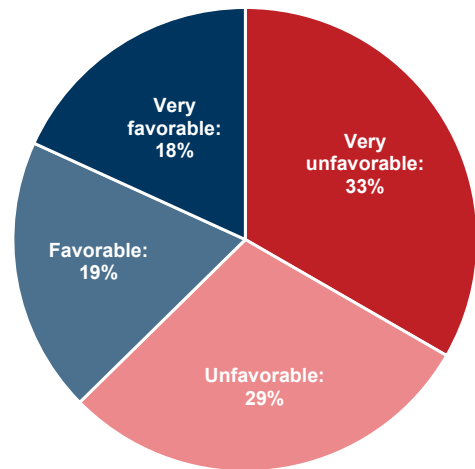
Chinese consumers view foreign companies' decisions to exit China as being primarily driven by geopolitical considerations...

China internet-using share reporting why they believe foreign companies are exiting China (survey conducted 6/1-6/6/22)



Source for charts 3-6: [Morning Consult survey](#) on the state of US-China relations (survey among representative samples of roughly 1k adults in each country), GS GIR.

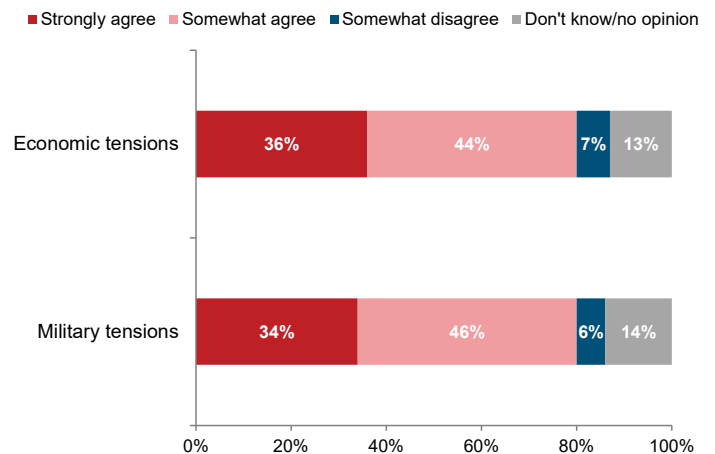
...and a majority of Chinese view the US unfavorably
 % of China respondents that gave each answer to the question "what is your view of the US" (survey fielded in Sept 2021)



Source: [The Carter Center in partnership with Rovi](#) (survey results are random and representative of the Chinese internet-using population; n = 3,391), GS GIR.

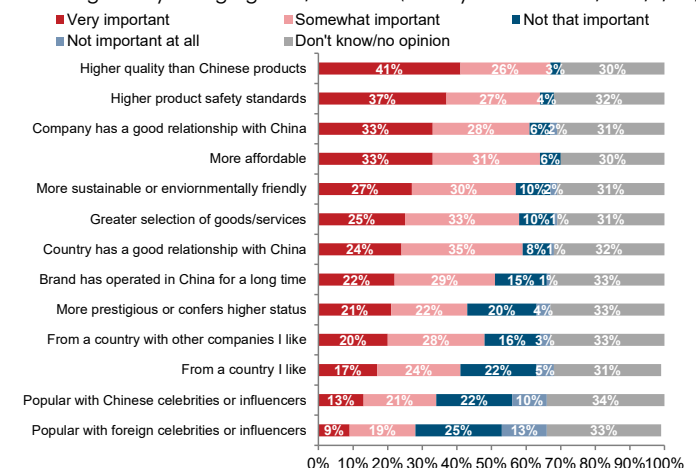
...as do a majority of Chinese

China internet-using share reporting whether the US and China should work together to reduce economic/military tensions (survey conducted 11/2-11/6/22)



...yet other factors trump geopolitical considerations as the main drivers of Chinese demand for foreign goods and services

China internet-using share reporting the importance of each when choosing to buy foreign goods/services (survey conducted 6/30-7/6/22)



Interview with Richard Hill

Richard Hill is Chairman of the Board at Marvell Technology, a US-based semiconductor company, and sits on the Board of Directors for Cabot Microelectronics Corporation. He is the former CEO and Chairman of Novellus Systems. Below, he argues that US/Chinese efforts to become more self-sufficient in semiconductor manufacturing aren't feasible, and that a significant reshaping of the global semiconductor supply chain likely isn't on the horizon.

The views stated herein are those of the interviewee and do not necessarily reflect those of Goldman Sachs.



Allison Nathan: Semiconductors seem to be a main battleground for US-China tensions. Why is that?

Richard Hill: In a nutshell, it likely owes to the US government's dismay that China now has access to technology that the US, in hindsight, wishes China didn't have. The seminal moment in US-China relations relative

to semiconductors occurred in 2010, when Intel opened a chip manufacturing factory in Dalian, China so the company could sell its 386 processors into China. As a result, we now find ourselves in a world in which China has semiconductor technology, and the US government is worried that could put the US at a military disadvantage to China if China's technology is equal or superior to the US'.

“The seminal moment in US-China relations relative to semiconductors occurred in 2010, when Intel opened a chip manufacturing factory in Dalian, China... As a result, we now find ourselves in a world in which China has semiconductor technology.”

Allison Nathan: Are such concerns over the national security aspects of semiconductors warranted?

Richard Hill: They're overblown. Semiconductors are critical to military hardware to a certain extent. But existing semiconductor technology that's produced in volume today is more than sufficient to produce military grade technology; the latest and greatest semiconductor technology isn't critical to the military industry, which today is mainly driven by developments in telecommunications. Advanced semiconductors—those with node sizes ranging from 5 to 14 nanometers (nm)—are largely designed for consumer applications. I don't see a military application for those geometries, and don't believe they'll be leveraged by the Chinese military, or the US military for that matter.

Allison Nathan: Even if national security concerns are overblown, US policymakers are focused on revitalizing US semiconductor manufacturing through the CHIPS and Science Act. Is it feasible for the US to develop a domestic semiconductor industry on the scale required to meet its needs?

Richard Hill: I don't think so. Remember, semiconductor production originated in the US and Europe—for a long time,

Intel had an unassailable lead in semiconductor process technology. But Asia, starting with Japan, did a great job of replicating those processes. I was working at Motorola when the Japanese came through the factory with their cameras, and I remember asking a supervisor if he thought that it was a good idea to let them take photos, to which he responded that they would never learn anything useful from them. Well, we know how that turned out—Japan came to dominate the memory market in the late 1980s/early 1990s.

And then, around 30 years ago, Morris Chang out of Texas Instruments decided he was going to help Taiwan break into the semiconductor industry in a big and unique way. I spoke with Chang's TSMC at that time because I was running a tech development company and they were raising money. I recall thinking that the idea of locating all sorts of semiconductor production companies in the same physical area would never work for such a competitive industry, because nothing would stop employees from quitting one company to work at another one across the street. What I underestimated was the efficiency gains from centrally locating the infrastructure required to operate a semiconductor plant. That was the brilliance of Morris Chang's idea. Today, TSMC dominates the semiconductor manufacturing industry, both from a technological and an efficiency-of-production standpoint. And I don't think it's possible for the US to get that back.

Allison Nathan: How would you rank order the constraints to returning semiconductor production to the US?

Richard Hill: The primary constraint is the lack of an educated, disciplined workforce. Semiconductor manufacturing is not a physical prowess business, it's an intellectual business. I've always told my employees, if you can make it in the semiconductor industry, you can make it in any industry, because this industry requires a tremendous amount of discipline, hard work, and skill. Those traits have long since atrophied among the US population. TSMC's WaferTech's plans to build out several factories in Camas, Washington failed partly because the company couldn't find enough people with the necessary skills to properly staff the factory. And that's a challenge every company trying to open a semiconductor factory in the US will face. Other constraints include a lack of critical materials, many of which are sourced from China, and equipment, which used to be developed mostly in the US but is now developed all over the world. More broadly, returning semiconductor manufacturing to the US requires going whole horse behind the effort, like Taiwan did with Morris Chang and his vision. I don't see that happening in the US, CHIPS Act notwithstanding.

Allison Nathan: Won't subsidies and other support in the CHIPS Act help overcome at least some of these constraints?

Richard Hill: The subsidies in the CHIPS Act are a drop in the bucket compared to the amount of investment it would take to build the infrastructure and engage and develop the right type and amount of labor to create an advanced process with a reasonable yield—the yield being the percent of chips on a wafer that perform properly, so essentially a measure of chip quality. I'd say developing a 5nm process with reasonable yields would cost *one* company \$250-300bn; the *entire* CHIPS Act is around a fifth of that. And while such advanced semiconductors are valuable due to their ability to increase a device's processing power, lower its power consumption, etc., they're not economical to produce unless they're manufactured in extremely high volumes. This is a challenge because the demand isn't high enough in most end-industries. So, I don't understand how any company thinks a 5nm process will ever turn a profit. What application has the volume and the average selling price to generate a return on \$250-300bn? I'm hard-pressed to think of any; not even the automotive industry could provide enough demand for the economics to work.

“The subsidies in the CHIPS Act are a drop in the bucket compared to the amount of investment it would take to build the infrastructure and engage and develop the right type and amount of labor to create an advanced process with a reasonable yield.”

Allison Nathan: Despite those economics, several companies have announced plans to build factories in the US. What do you make of those announcements, and do you expect more companies to follow?

Richard Hill: Companies are announcing plans because they can receive money by announcing them, and if they were considering building a factory, why not have someone else pay for some part of it? But again, the economics of the CHIPS Act just don't make sense. And a lot is being required of companies to receive the subsidies. Recipients are barred from investing and building certain facilities in China, which would severely curb their ability to sell semiconductors in China. China has a population of nearly 1.5bn; why would any company choose to ignore such an enormous market? So, I don't expect more companies to announce plans to build in the US; what we saw was just a flurry around the CHIPS Act.

Allison Nathan: If China chose to respond to the CHIPS Act, and US export controls more broadly, by strengthening its own semiconductor industry, is it in any better position than the US to do so?

Richard Hill: No. China is nowhere in the semiconductor equipment businesses, despite 25 years of trying. Creating

equipment requires partnering with a semiconductor manufacturer; it's a very iterative process, and equipment companies must be able to work with manufacturers all over the world. The US and Europe have successfully developed those relationships over many years, but China has failed to do so, partly for fear that China would just find a way to replicate the technology they gain access to in such partnerships, and then move on. That lack of a historical relationship will make it difficult for China to develop an equipment business. Beyond equipment constraints, China would also face critical materials constraints; Japan dominates the photoresist market critical to semiconductor manufacturing and Europe largely supplies the gases used throughout the production process.

Allison Nathan: So, you don't believe a significant reshaping of the global semiconductor supply chain is on the horizon?

Richard Hill: No; it's just not feasible for the US, China, or any place else for that matter to become self-sufficient in semiconductors.

“It's just not feasible for the US, China, or any place else for that matter to become self-sufficient in semiconductors.”

Allison Nathan: Consumers have enjoyed cheaper and better tech products over the last several decades, but do the recent developments suggest that will no longer be the case going forward?

Richard Hill: It's very possible. The US and other countries' efforts to become less reliant on other places for their technological food, so to speak, will raise costs for consumers. These efforts aren't about becoming more efficient, but about creating redundant sets of producers in each country. The math behind that just doesn't work, especially given the critical shortage of workers in the US. The only group that may benefit from this redundancy in the near term is equipment manufacturers that would provide the infrastructure to create the excess capacity.

Beyond that, consumers will also have to contend with the implications of Moore's Law—Intel co-founder Gordon Moore's prediction that the number of transistors on a chip would double every 18-24 months—bumping up against the laws of physics. Packing more transistors onto a microchip has been achieved up to now by making them smaller, but the size of a transistor is now so small that it can't be made much smaller and still function properly, as far as we know. The material science appears to be reaching its physical limits. Moore's Law has been the driving force behind tech products becoming cheaper and better over the last several decades. So, the potential end of it, if no innovation comes along to replace its benefits, combined with some countries' inefficient efforts to reconfigure the global semiconductor supply chain, could presage a new, and less beneficial, era for consumers.

Semiconductors, at a glance

What are semiconductors, and who makes them?

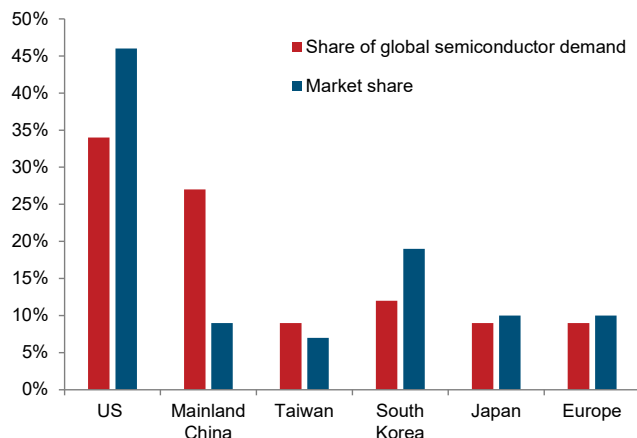
Semiconductors are also known as **microchips**. A microchip is a set of electronic circuits layered on a thin wafer of semiconductor material, typically silicon. Transistors located on the chip act as miniature electrical switches that can turn a current on or off. The more transistors that are located on a chip, the more the chip can do. The size of a microchip and the number of transistors on it varies; a microchip the size of a human fingernail can contain billions of transistors.

There are three main types of microchip companies: **Integrated Device Manufacturers** (Intel, Samsung), who design and manufacture chips in-house, **Fabless companies** (Qualcomm, AMD), who design chips in-house but outsource manufacturing, and **Foundries** (TSMC, GlobalFoundries), who manufacture chips for fabless companies, as well as **IDMs** who don't have sufficient in-house capacity.

What do microchips do?

Microchips are the building blocks of technology, and are central inputs in many everyday devices, including cars, computers, smartphones, medical devices, and even pets (a lost pet's microchip can be scanned for their owner's contact info). There are three main types of microchips: **logic chips**, **memory chips**, and **Discrete, Analog, and Other (DAO) chips**. Logic chips are the 'brains' of electronics. They process information in order to complete tasks. Central processing units (CPUs) are built for general functionality, graphics processing units (GPUs) are optimized for visual displays, and neural processing units (NPUs) are designed for machine learning applications. Memory chips store information. DRAM chips save data when a device is turned on, while NAND chips save data after a device is turned off. DAO chips transmit, receive, and transform information dealing with continuous parameters, like temperature.

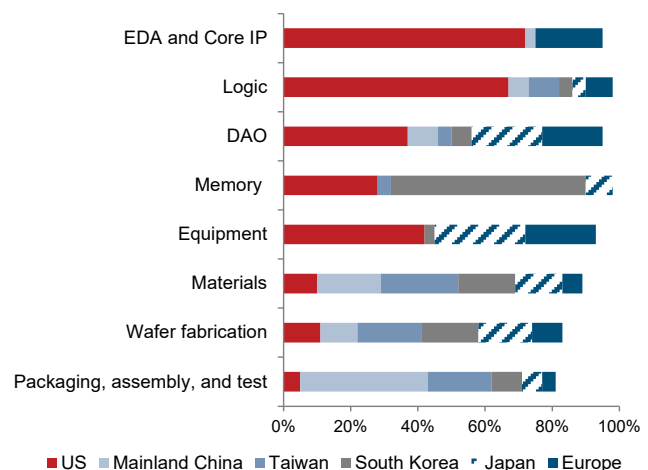
Where are microchips needed, and who sells them?



Note: Market share is based on revenues and the region in which headquarters is located for the company responsible for the final sale of finished semiconductors. It includes fabless and IDM revenues, with foundry revenues excluded to avoid double-counting; semiconductor demand is by region of original equipment manufacturer headquarters.

What parts of the value chain does each region specialize in?

Semiconductor industry value added by activity and region, %



Note: EDA is electronic design automation, software tools used for chip design.

What are governments doing to bolster their economies' positions within the global semiconductor supply chain?

United States	The CHIPS and Science Act , signed into law in August 2022, aims to boost US semiconductor research, development, and production through \$53bn in chip manufacturing incentives and research investments, as well as an investment tax credit.
EU	First announced in Feb 2022, the European Chips Act is a €43bn+ investment package aimed at boosting Europe's competitiveness and resilience in semiconductors.
South Korea	South Korea unveiled its " K-Semiconductor Belt Strategy " in May 2021, aimed at building the world's biggest semiconductor supply chain by 2030.
Japan	In 2021, the government approved \$7.7bn in funding to support domestic semiconductor manufacturing. In 2022 an additional \$8bn in funding was proposed, aimed at bringing production hubs for advanced chips to Japan, securing materials for manufacturing, and research.
Taiwan	In 2023, lawmakers passed new rules allowing local chip firms to turn 25% of their annual R&D expenses into tax credits as part of efforts to encourage domestic production.

Note: Table presents a brief/non-exhaustive overview of initiatives.

Is there enough skilled labor to execute such plans?

"To meet the capacity needs for only the critical semiconductor applications, the **US** would need to add 70-90,000 total fab jobs"
Source: Eightfold AI

"**Japan's** eight major chipmakers will have to hire about 35,000 engineers over the next ten years to keep pace with investment"
Source: Time.News citing The Japan Electronics and Information Technology Industry Association

"Over the next 10 years, **South Korea's** semiconductor industry is expected to face a shortage of at least 30,000 workers"
Source: The Korea Economic Daily, citing Korea Semiconductor Industry Association

"[Mainland] **China's** biggest obstacle to achieving self-sufficiency in semiconductors is a chronic shortage of talent"
Source: SMIC Founder Richard Chang Rugin, quoted in SCMP

"The talent shortage is the biggest challenge to semiconductor industry growth in **Europe** and globally"
Source: X-FAB Group's Henryk Schoder, quoted in SEMI

"The total number of vacancies for chip industry positions [in **Taiwan**] was 34,000 in December [2021]"
Source: Nikkei Asia, citing a survey by 104 Job Bank, Taiwan's largest local recruitment platform

Sources for all exhibits: Semiconductor Industry Association, government websites, various news sources, Goldman Sachs GIR.

US-China tensions: what's priced?

Tim Moe and Kinger Lau find that US-China tensions are at historically elevated levels, but quite well reflected in China equity valuations

US-China tensions have been a key driver of returns for Chinese assets since the trade war between the two nations first came to the forefront in 2018. Since then, the scope of tensions has continued to evolve, extending to other strategic domains spanning technology transfer bans, specific company sanctions, delisting concerns revolving around Chinese ADRs, portfolio flows restrictions, and geopolitical tensions centering on Mainland China's stance towards the war in Ukraine and issues around Taiwan. Currently, \$550bn of Chinese exports to the US are subject to import tariffs, more than 1200 Chinese companies—mainly in the defense and TMT sectors—are included on various US restriction lists, the PCAOB must regularly inspect the audit papers of Chinese ADRs for them to maintain their listings in the US, and advanced US semiconductor technology is prohibited for export to China.

Given the likely consequential ramifications of these frictions and policies on Chinese equities, in 2020 we developed an equity market indicator—our US-China Relations Barometer (GSSRUSCN)—to quantify the extent to which US-China tensions are discounted in equity prices, which enables us to assess market risk/reward through the lens of US-China dynamics. This indicator suggests that US-China tensions are well-reflected in China equity valuations today.

US-China tensions: well-reflected in valuations

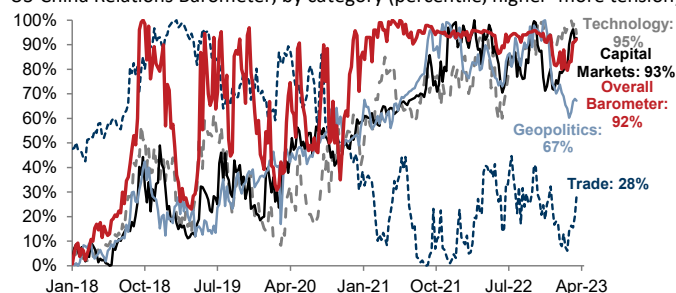
Our US-China Relations Barometer groups bilateral tensions into four strategic categories—Trade, Technology, Capital Markets, and Geopolitics—and identifies corresponding equity proxies in each category to estimate to what extent these specific concerns are priced in equity valuations. The barometer has historically tracked the US-China news flow fairly closely, and has exhibited reasonably high correlations (~30%) with market returns since 2018.

The barometer currently stands at 92 (on a scale of 0-100), suggesting that the bilateral tensions/market-implied concerns are at historically elevated levels. Looking specifically into the four thematic components of the barometer, we find that Technology and Capital Markets are the main drivers of the recent intensification of bilateral tensions. In contrast, concerns regarding Trade have remained low, and, somewhat contrary to market perception, concerns regarding Geopolitics have moderated in recent months, consistent with the relatively muted market reaction to Taiwanese President Tsai's visit to the US on April 5 and the subsequent Chinese military drills around Taiwan.

MSCI China is now trading at a 10.3x forward P/E, versus 12.5x if the barometer were at zero, suggesting the bilateral tensions seem to be quite well reflected in equity valuations. Consistent with that, we remain overweight China with a 12m MXCN target of 85.

Implied US-China tensions are currently at elevated levels, driven largely by concerns around Technology and Capital Markets

US-China Relations Barometer, by category (percentile, higher=more tension)



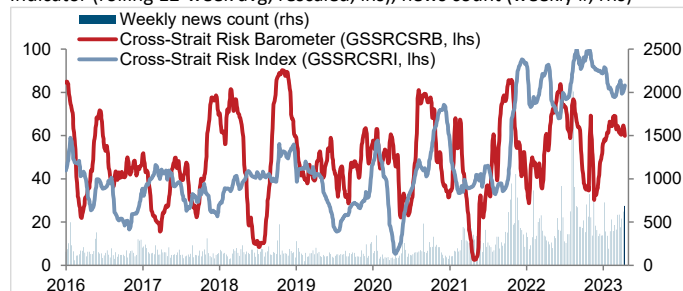
Source: Wind, FactSet, Bloomberg, Goldman Sachs GIR.

Cross-strait tensions: better discounted

We've also developed geopolitical risk indicators for the Taiwan equity market to quantify the extent to which Mainland China-Taiwan tensions are discounted in equity prices. Cross-strait tension is a long-standing feature of the Taiwan equity market; our Cross-Strait Risk Index (GSSRCSRI) gauges the intensity of this tension by measuring the news count incidence of cross-strait tensions, and our Cross-Strait Risk Barometer (GSSRCSRB) measures the extent to which tensions are reflected in share prices (using a similar approach as our US-China Relations Barometer). Differences between the two can indicate the extent to which the market is pricing/mispricing geopolitical risk.

In May 2022, a wide gap existed between these indicators: the Cross-Strait Risk Index was rising rapidly but the Cross-Strait Risk Barometer was pricing a much more benign equity market outlook. That, along with a deteriorating outlook for the heavyweight technology sector, prompted us to downgrade our long-standing overweight view on Taiwan by two notches to underweight. For 2022 as a whole, Taiwan was the worst-performing regional equity market, declining over 30% in USD terms. In late January of this year, we upgraded Taiwan to market weight, partly because the gap between our Cross-Strait Risk Index and Risk Barometer had narrowed significantly, suggesting geopolitical risks were more fairly priced. Taiwan turned out to be the best-performing regional equity market in 1Q23, rising 15% in USD terms.

The gap between cross-strait risk and the equity market's pricing of such risk has narrowed over the last several months, indicating that geopolitical concerns have become better discounted



Source: FactSet, Factiva, Goldman Sachs GIR.

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US-China relations in quotes

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"I've made clear with President Xi that we seek competition, not conflict... I'm committed to work with China where we can advance American interests and benefit the world... Make no mistake: as we made clear last week, if China threatens our sovereignty, we will act to protect our country. And we did."

- *President Biden, February 2023*

"We seek competition, but not conflict or confrontation... Everything that has happened in the last week and a half is, we believe, very consistent with our stated approach."

- *Kamala Harris, US Vice President, February 2023 on Chinese balloon incident*

"One of my greatest worries about the future is that we fall behind Communist China. The fact of the matter is—the danger posed by our dependence on China is dire."

- *Kevin McCarthy, US House Speaker, January 2023*

"We don't seek to block China from its role as a major power, nor to stop China—or any other country, for that matter—from growing their economy or advancing the interests of their people. But we will defend and strengthen the international law, agreements, principles, and institutions that maintain peace and security, protect the rights of individuals and sovereign nations, and make it possible for all countries—including the United States and China—to coexist and cooperate."

- *Antony Blinken, US Secretary of State, May 2022*

"The National Defense Strategy is clear-eyed about our main competitors. And that starts with the People's Republic of China... the PRC is the only country with both the will and, increasingly, the power to reshape its region and the international order to suit its authoritarian preferences. So let me be clear: we will not let that happen."

- *Lloyd Austin III, US Secretary of Defense, December 2022*

"Western countries, led by the U.S., have implemented all-round containment, encirclement and suppression against us, bringing unprecedentedly severe challenges to our country's development... In the face of fierce international competition, we must carve out new tracks for development, create new momentum and develop new strengths."

- *President Xi, March 2023*

"The Chinese and American economies have benefited from each other's development... China and the United States can and should cooperate, and there is great potential for Sino-US cooperation."

- *Li Qiang, Premier of China, March 2023*

"In this case the United States' perception and views of China are seriously distorted. It regards China as its primary rival and the most consequential geopolitical challenge... This is like the first button in a shirt being put wrong and the result is that the US-China policy has entirely deviated from the rational and sound track."

- *Qin Gang, Foreign Minister of China, March 2023*

"China will work with the US to find a way of promoting peaceful co-existence and mutually beneficial cooperation. We hope the US side will embrace a more open and inclusive approach when viewing China's development, work with us to manage differences in a spirit of equality and mutual respect, and adhere to the principles of coordination, cooperation and stability in bilateral ties."

- *Wang Yi, Director of the Office of the Central Foreign Affairs Commission, February 2023*

"China does not shy away from or fear competition, but we oppose using competition to define the entire China-US relationship."

- *Mao Ning, spokesperson for China's Foreign Ministry, February 2023*

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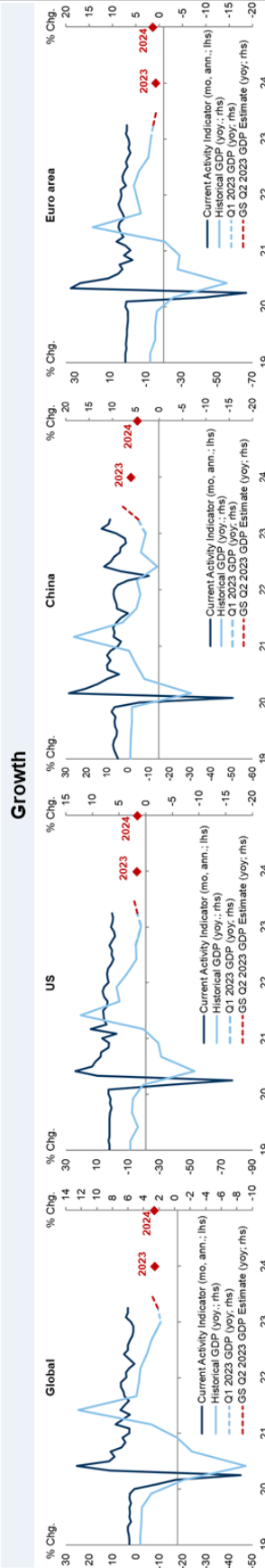
Source: The White House, South China Morning Post, various news sources, Goldman Sachs GIR.

Summary of our key forecasts

Watching

- **Globally**, we expect annual average GDP growth to slow to 2.5% in 2023, reflecting ongoing policy tightening and banking stresses in the US and Europe. While we expect inflation to remain firm in Europe over the near term and expect a moderate boost to headline inflation from China's reopening recovery, we think the combination of a moderation in demand growth, improvements in goods supply, and tighter monetary policy will be sufficient to bring inflation back toward DM central banks' targets over the next two years.
- **In the US**, we expect GDP growth to slow to 1.1% in Q4 2023, reflecting a negative impulse from tighter financial conditions and additional drags from a pullback in bank lending following banking stress. We see a 35% probability of entering a recession over the next year, reflecting increased uncertainty around the economic effects of bank stress, although we continue to think the US is headed for a soft landing. We expect core PCE inflation to decline to 3.4% by Dec 2023 reflecting continued supply chain recovery, a decline in shelter inflation, and slower wage growth. We expect the unemployment rate to remain at 3.6% through 2026.
- **We expect the Fed** to deliver a final 25bp hike in May for a peak funds rate of 5.5-5.25%, as we think the federal funds rate is near the sufficiently restrictive level that the Fed believes is necessary to bring down inflation. Beyond May, we expect the Fed to hold rates steady for the rest of the year, though much will depend on how severely banking stress affects the economy.
- **In the Euro area**, we expect GDP growth to slow to an above-consensus 0.7% in 2023, reflecting historically elevated energy prices driven by the war in Ukraine and tighter bank lending standards following banking stresses. We expect core inflation to decline gradually to 4.0% by the end of 2023, reflecting indirect pass-through from falling energy and food prices.
- **We expect the ECB** to deliver 25bp hikes in May, June, and July for a terminal rate of 3.75%, reflecting continued firm underlying inflation pressure, receding banking sector risks, and recent hawkish ECB commentary that points to a clear tightening bias. On balance sheet policy, we expect the ECB to stop reinvestments completely after the capped APP run-off of €15bn/month ends in June, implying an acceleration in balance sheet shrinkage to around €20bn/month.
- **In China**, we expect real GDP growth to accelerate to 6.0% yoy in 2023 on the back of China's ongoing post-reopening recovery and policymakers' continued focus on growth, although we think the easy part of the recovery is behind us and uncertainties remain around the shape of the property sector recovery, the extent of the export slowdown, and the pace of further consumption recovery this year.
- **WATCH CREDIT CONDITIONS AND US DEBT LIMIT.** Following banking sector stress in the US and Europe, we expect a moderate but manageable growth drag from tighter lending conditions, but risks are skewed to the downside, particularly if bank funding costs increase by more than expected. In the US, we believe that raising the debt limit this year could rival the disruptive 2011 debt limit episode, but that Congress will ultimately raise the debt limit before Treasury is forced to delay scheduled repayments, which we would expect by late July.

Goldman Sachs Global Investment Research.



Source: Haver Analytics and Goldman Sachs Global Investment Research. Note: GS CAI is a measure of current growth. For more information on the methodology of the CAI please see "Improving Our Within-Month CAI Forecasts," Global Economics Comment, Mar. 06, 2023.

Forecasts

Economics	2023				2024				Markets				Equities												
	GS (Q4/Q4) (C/F)	GS (C/F)	Cons. (C/F)	GS (C/F)	GS (C/F)	Cons. (C/F)	GS (C/F)	Cons. (C/F)	Last	E2023	E2024	FX	12m	S&P 500	E2023	E2024	12m	YTD	E2023	PIE					
GDP (growth %)	2.4	2.5	2.5	2.6	2.7	2.7	2.7	2.7	3.44	3.90	3.75	EUR/US	1.10	1.05	1.10	Price	4,000	-	-	S&P500	-	4	9	19.4x	
US	1.1	1.6	1.2	1.5	0.8	0.8	0.8	0.8	2.32	2.75	2.25	GBP/US	1.26	1.18	1.25	EPS	\$224	\$220	\$237	II/XAPJ	\$246	19	2	13.8x	
China	6.0	6.0	5.5	4.6	5.0	5.0	5.0	5.0	0.39	0.75	0.70	\$/JPY	136	132	125	Growth	1%	0%	5%	Topix	6	10	14.2x		
Euro area	0.6	0.7	0.6	1.3	1.0	1.0	1.0	1.0	3.62	4.00	3.75	\$/CNY	6.89	6.80	6.50	Credit (bp)	6.89	6.80	6.50	STOXX 600	2	10	13.2x		
Policy rates (%)	5.13	4.40	3.41	3.50	2.99	2.99	2.99	2.99	80	89	100	USD	IG	136	117	115	US	4.2	3.6	2.8	3.6	5.3	-	-	
Euro area	3.75	3.52	3.52	3.50	2.99	2.99	2.99	2.99	2.41	3.30	3.00	HY	452	400	390	Euro area	5.4	6.8	2.5	6.7	-	-	-	-	
China	2.00	2.03	2.03	2.00	2.27	2.27	2.27	2.27	8,577	9,500	11,000	EUR	IG	176	150	145	China	1.8	-	2.8	-	-	-	-	-
Japan	-0.10	0.01	0.01	-0.10	0.07	0.07	0.07	0.07	1,963	2,050	2,050	HY	472	415	405	Japan	2.8	-	2.8	-	-	-	-	-	-
Commodities																									
Interest rates 10Yr (%)																									
Wage Tracker 2023 (%)																									
Unemp. Rate (%)																									

Source: Bloomberg, Goldman Sachs Global Investment Research. For important disclosures, see the Disclosure Appendix or go to www.gs.com/research/hedge.html. Market pricing as of April 28, 2023.

Glossary of GS proprietary indices

Current Activity Indicator (CAI)

GS CAIs measure the growth signal in a broad range of weekly and monthly indicators, offering an alternative to Gross Domestic Product (GDP). GDP is an imperfect guide to current activity: In most countries, it is only available quarterly and is released with a substantial delay, and its initial estimates are often heavily revised. GDP also ignores important measures of real activity, such as employment and the purchasing managers' indexes (PMIs). All of these problems reduce the effectiveness of GDP for investment and policy decisions. Our CAIs aim to address GDP's shortcomings and provide a timelier read on the pace of growth.

For more, see our CAI page and Global Economics Analyst: Trackin' All Over the World – Our New Global CAI, 25 February 2017.

Dynamic Equilibrium Exchange Rates (DEER)

The GSDEER framework establishes an equilibrium (or "fair") value of the real exchange rate based on relative productivity and terms-of-trade differentials.

For more, see our GSDEER page, Global Economics Paper No. 227: Finding Fair Value in EM FX, 26 January 2016, and Global Markets Analyst: A Look at Valuation Across G10 FX, 29 June 2017.

Financial Conditions Index (FCI)

GS FCIs gauge the "looseness" or "tightness" of financial conditions across the world's major economies, incorporating variables that directly affect spending on domestically produced goods and services. FCIs can provide valuable information about the economic growth outlook and the direct and indirect effects of monetary policy on real economic activity.

FCIs for the G10 economies are calculated as a weighted average of a policy rate, a long-term risk-free bond yield, a corporate credit spread, an equity price variable, and a trade-weighted exchange rate; the Euro area FCI also includes a sovereign credit spread. The weights mirror the effects of the financial variables on real GDP growth in our models over a one-year horizon. FCIs for emerging markets are calculated as a weighted average of a short-term interest rate, a long-term swap rate, a CDS spread, an equity price variable, a trade-weighted exchange rate, and—in economies with large foreign-currency-denominated debt stocks—a debt-weighted exchange rate index.

For more, see our FCI page, Global Economics Analyst: Our New G10 Financial Conditions Indices, 20 April 2017, and Global Economics Analyst: Tracking EM Financial Conditions – Our New FCIs, 6 October 2017.

Goldman Sachs Analyst Index (GSAI)

The US GSAI is based on a monthly survey of GS equity analysts to obtain their assessments of business conditions in the industries they follow. The results provide timely "bottom-up" information about US economic activity to supplement and cross-check our analysis of "top-down" data. Based on analysts' responses, we create a diffusion index for economic activity comparable to the ISM's indexes for activity in the manufacturing and nonmanufacturing sectors.

Macro-Data Assessment Platform (MAP)

GS MAP scores facilitate rapid interpretation of new data releases for economic indicators worldwide. MAP summarizes the importance of a specific data release (i.e., its historical correlation with GDP) and the degree of surprise relative to the consensus forecast. The sign on the degree of surprise characterizes underperformance with a negative number and outperformance with a positive number. Each of these two components is ranked on a scale from 0 to 5, with the MAP score being the product of the two, i.e., from -25 to +25. For example, a MAP score of +20 (5;+4) would indicate that the data has a very high correlation to GDP (5) and that it came out well above consensus expectations (+4), for a total MAP value of +20.

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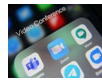
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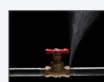
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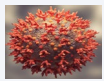
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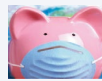
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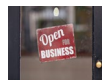
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Reg AC

We, Allison Nathan, Jenny Grimberg, Ashley Rhodes, Tim Krupa, Kinger Lau, CFA, Timothy Moe, CFA, Alec Phillips, Hui Shan, and Andrew Tilton 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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