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Zen on Tech Newsletter

19th June 2023

Summary

Amid rapid technological advances, escalating power competition, and shifting alliances, the global geopolitical landscape is in flux. For investors, understanding these shifts is crucial to identify opportunities and risks. One significant trend is the macro increase in defence spending, particularly within the NATO-AUKUS-Chip4 alliance, including the US, Taiwan, Japan, and South Korea. This spending surge reflects a shift towards collaborative military enhancement, with the potential to significantly impact the defence industry and innovation, thereby benefiting the nations within the alliance.

The United States, along with its allies, is strategically leveraging technology, specifically semiconductors, as a strategic asset to contain China's burgeoning influence. In this complex geopolitical matrix, second-tier nations such as Australia play a crucial role, countering China's economic might and strategically reinforcing the US-led containment strategy. The AUKUS pact is emblematic of this approach, not merely a means to equip Australia with nuclear-powered submarines, but also a potential catalyst for a technological boom with far-reaching economic implications.

The AUKUS agreement is set to foster a wave of high-tech advancements, potentially reshaping multiple civilian sectors and presenting a plethora of investment opportunities. This tripartite alliance creates a formidable force in the geo-tech arena, effectively responding to the growing complexities of contemporary warfare and generating a new strategic dimension to counter China's influence.

Despite China's significant strides in industrialising science, progress remains nascent, particularly in the crucial semiconductor industry. Hindered by issues such as intellectual property theft and a closed market, China's potential to emerge as a global leader in this field is severely constrained. Furthermore, the US-led alliance's strategic countermeasures, including potential incapacitation of China's chip yield via embedded kill switches, could significantly impact China's technological progress.

As the worlds of China's low-cost production model and the US-led high-tech sphere collide, smaller nations face significant decisions about their strategic alignments. The choices they make will not only shape their geopolitical future but also drastically influence the global investment landscape. By shedding light on these dynamics, this analysis equips readers with a clearer understanding of the evolving geopolitical environment, thereby enabling them to navigate the associated opportunities and challenges more effectively.

Contents

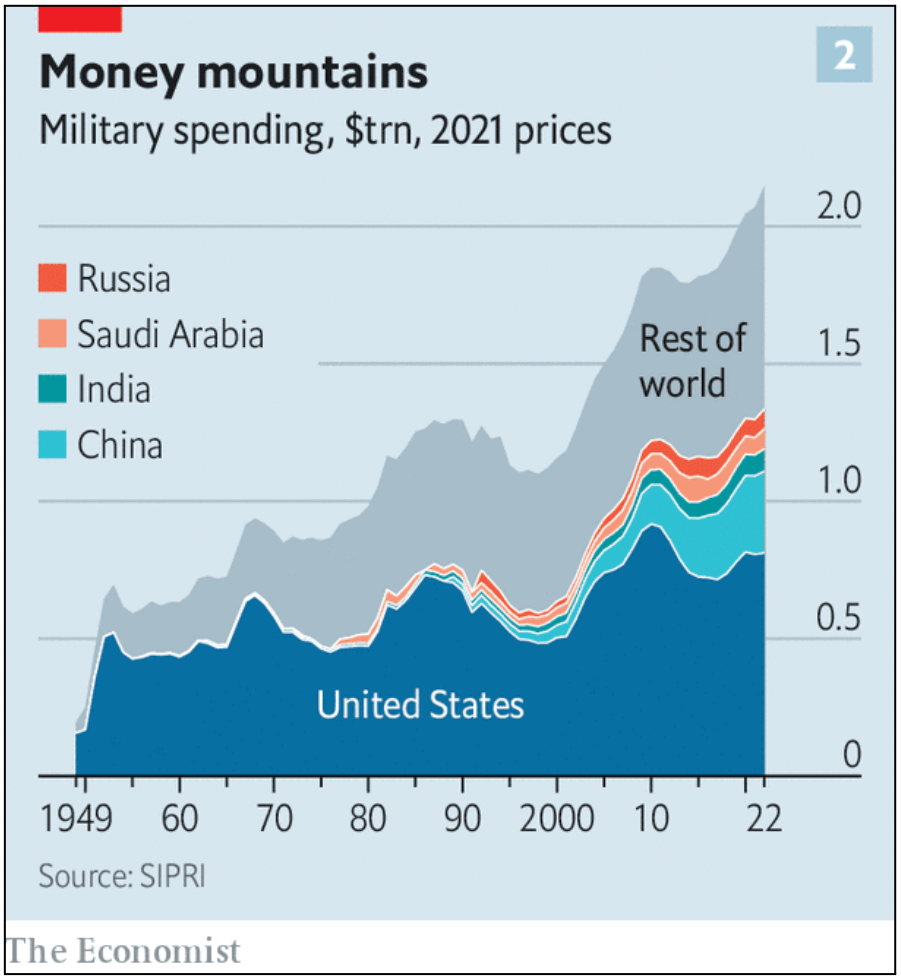
1. Riding the Wave of Defence Spending

[The cost of the global arms race]

The surge in defence spending is a trend that will persist into the foreseeable future. This expenditure will not only be a significant macroeconomic driver propelling technology evolution, as nations strive to outstrip their adversaries through the procurement of innovative weaponry and systems, but will also boost GDP by and stimulate the economy. While it is natural to correlate defence spending with raw materials like steel, aluminium, and explosives—essentially, the hard assets of war—we focus on the underlying emphasis on research & development (R&D) and the potential ripple effects on the civilian sector.

"Preparation for war and deterrence is extraordinarily expensive, but it's not as expensive as fighting a war,"
General Mark Milley, United States Chairman of the Joint Chiefs of Staff

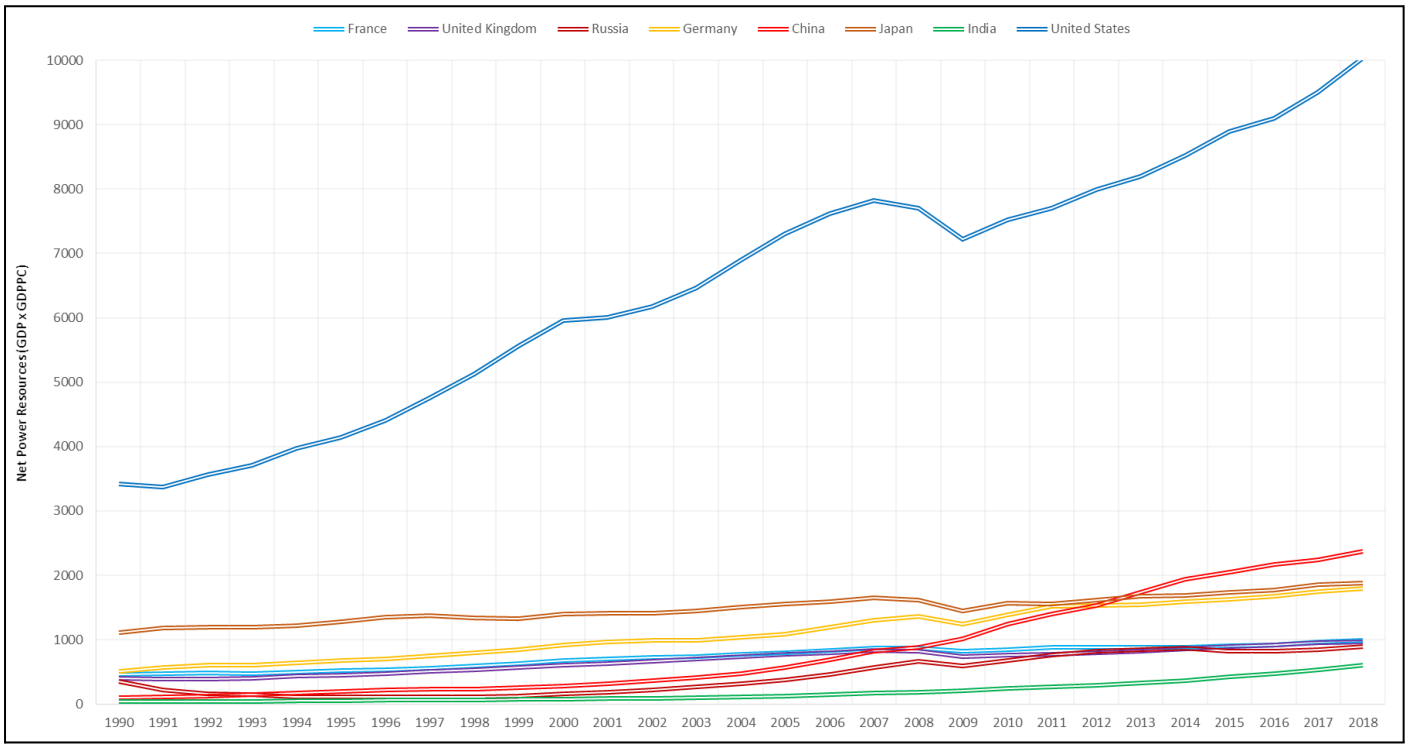
The statistics supporting the rise in defence spending globally are clear. In 2022, worldwide military expenditure stood at $2.1 trillion, marking a rise from $1.9 trillion in the previous year. This represents the highest yearly increase in military spending since 1988. The United States leads in defence spending, allocating a staggering $778 billion, while China trails behind as the second-largest spender, with an allocation of $252 billion.



Comparing What Counts: Power Assessment

[The Topography of Geopolitics: Net Resources and the Past, Present, and Future of American Power]
[Lowy Institute Asia Power Index]

Defence spending alone is a blunt instrument for measuring a country's power. In 2018, Professor Michael Beckley from Tufts University suggested a new approach to measuring a nation's power, taking into account its "net power resources". Unlike the Comprehensive Index of National Capability (CINC) score and Gross Domestic Product (GDP) that give a gross perspective, Beckley's method accounts for a country's internal costs. This net power concept represents the residual power a nation possesses after internal costs deduction. Beckley builds on economic historian Paul Bairoch's assertion that the power of a nation can be assessed through a formula that combines per capita and total GDP (GDP x GDPPC). The GDP component signifies a nation's total economic and demographic resources, while GDPPC reflects national efficiency, rewarding nations with efficient, productive populations and penalising those with larger, inefficient ones. This method, though simplistic, provides a significant advantage by using readily available data, allowing the calculation of net power for numerous countries over several centuries.

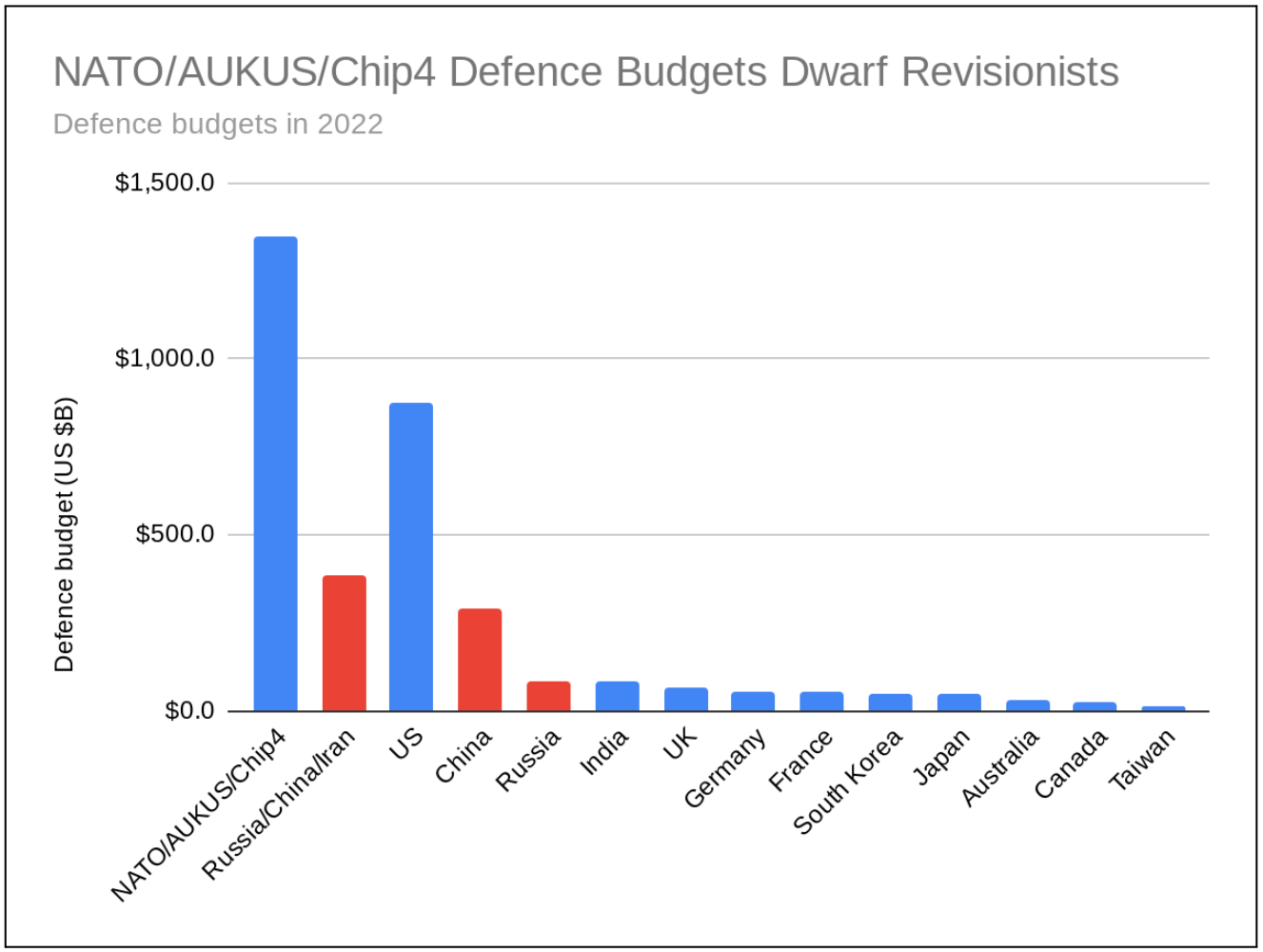


Net Power Resources of Select Great Powers (GDP * GDPPC, 1990-2018. (Chris Shaw /Maddison Project Database 2020)

Taking a multifaceted approach, the Lowy Institute has introduced a 'Comprehensive Power' metric that assesses a country's standing across eight dimensions of power. These dimensions encompass economic capabilities, military capabilities, resilience, future resources, economic relationships, defence networks, diplomatic influence, and cultural influence. The measure assigns weighted averages to each nation based on these factors. According to this assessment, the US scores an impressive 80.7, closely followed by China with a score of 72.5. Interestingly, when democratically aligned Pacific nations, namely the US, Japan, Australia, New Zealand, South Korea, and Taiwan, are taken into account as a coalition, their combined score skyrockets to **210**, offering a nuanced view of global power dynamics.

In the context of rising defence spending, an important trend is the increasing need for international collaborations to maintain it due to the phenomenon of military inflation. As military platforms and equipment become progressively expensive, this trend necessitates shared programmes between nations such as the F-35, Type 31 / Hunter Class frigate, Tempest programme, and underpins the growing demand for arrangements like AUKUS. Therefore, military procurement is not just about equipment, but is also influencing strategic alignments and shaping military alliances. This dynamic further favours the NATO-AUKUS-Chip4 (Taiwan, Japan, Korea, US) coalition, as their shared military platforms can provide additional strength and resource pooling, giving these alliances a competitive advantage going forward. Contrastingly, China struggles to form substantial security alliances.

Moreover, the current scenario in Ukraine could significantly impact Russia's substantial defense export base. Russia's military equipment has shown glaring failures in the conflict, and sanctions, inability to import foreign tech like chips and optics, along with demand for spare parts and replacements are making its exported capabilities less desirable. Given that Russia comprises approximately 20% of global weapons sales, this situation presents a significant opportunity for other players in the market. In light of the challenges facing traditional defense industries in Germany and the UK, South Korean equipment is gaining popularity, with substantial procurement projects in Australia and Poland. Further, Japan's revised defense policy could also boost their competitiveness in the global defense market, reshaping the landscape of the defence industry.



Trends in World Military Expenditure, 2022

Civilian Benefits of Defense R&D

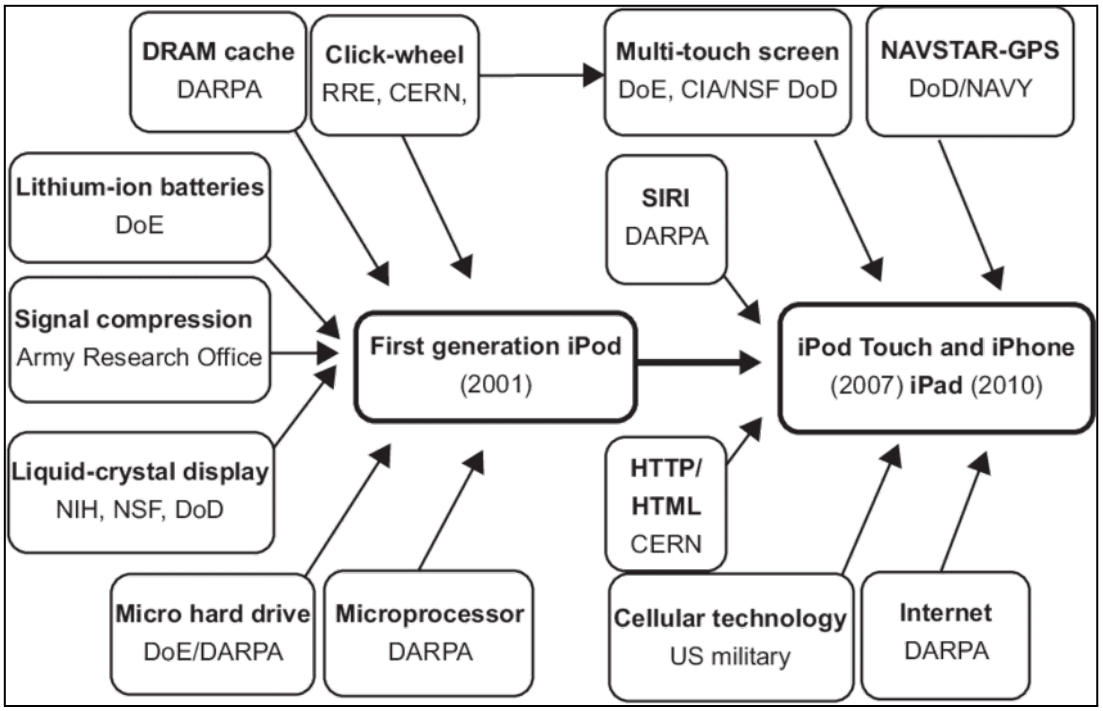
The Pentagon's Brain: An Uncensored History of DARPA, America's Top-Secret Military Research Agency
The Imagineers of War: The Untold Story of DARPA: Weinberger, Sharon
The Entrepreneurial State: Debunking Public vs. Private Sector Myths: Mazzucato, Mariana
Freedom's Forge: How American Business Produced Victory in World War II : Herman, Arthur

Some of the civilian benefits arising from defence R&D, as described in Annie Jacobsen's book, The Pentagon's Brain: An Uncensored History of DARPA:

- **GPS**: Initially developed by the U.S. military for navigational and targeting purposes, GPS has found numerous civilian applications, such as in transportation, mapping, and agriculture.
- **The internet**: Originating as a military tool for communication and research, the internet has become an essential part of billions of people's lives, enabling everything from communication to commerce.
- **Computers**: Initially designed for military use, including codebreaking and targeting, computers have been adopted by civilians for an extensive range of tasks, from work and education to entertainment.
- **Medical advances**: Defense R&D has contributed to various medical advancements, like imaging techniques, prosthetics, and medications. Notably, the development of the CAT scanner was funded by the U.S. military.

"DARPA has been responsible for some of the most significant technological advances of the past century."
Annie Jacobsen, The Pentagon's Brain

In addition to these specific examples, defence R&D contributes to the creation of new technologies and techniques with potential applicability across a range of civilian sectors. However, the civilian benefits of defence R&D aren't always immediate or readily apparent. For instance, GPS took decades to develop, and the internet was initially intended for military use. Nevertheless, the long-term benefits of defence R&D can be profound.



The Entrepreneurial State: Debunking Public vs. Private Sector Myths: Mazzucato, Mariana

Crowding Into Defense R&D Investments

Analytical Perspectives, Budget of the U.S. Government, Fiscal Year 2024
The Intellectual Spoils of War? Defense R&D, Productivity and International Spillovers | NBER

A paper published in NBER by Moretti, Steinwander and Van Reenan investigates the influence of government and specifically defence-related R&D funding on private R&D investments and their consequent impact on productivity growth. The findings, derived from data spanning multiple industries and countries, suggest a positive correlation, demonstrating a "crowding in" effect. This means that a boost in government-funded R&D prompts significant augmentation in private sector R&D within the same industry. In concrete terms, a 10% increase in government-backed R&D triggers an additional 5% to 6% increase in privately financed R&D. The study also notes international spillovers, where growth in government-funded R&D in a certain industry in one country leads to an increase in private R&D in the same industry in other countries. Importantly for investors, the research concludes that such R&D expansions ultimately lead to productivity gains.

The US Budget for 2024 emphasises strengthening global competitiveness and national security by investing in research and development (R&D) across multiple emerging technologies. Some of the technologies that are targeted for investment include:

1. Trustworthy AI in line with the Administration's Blueprint for an AI Bill of Rights.
2. Quantum information science.
3. Advanced communications technologies.
4. Microelectronics.
5. Nanotechnology.
6. High-performance computing.
7. Biotechnology and biomanufacturing.
8. Robotics.
9. Advanced materials and manufacturing.
10. Digital assets.
11. Undersea technologies.
12. Space technologies.

Key investment data include:

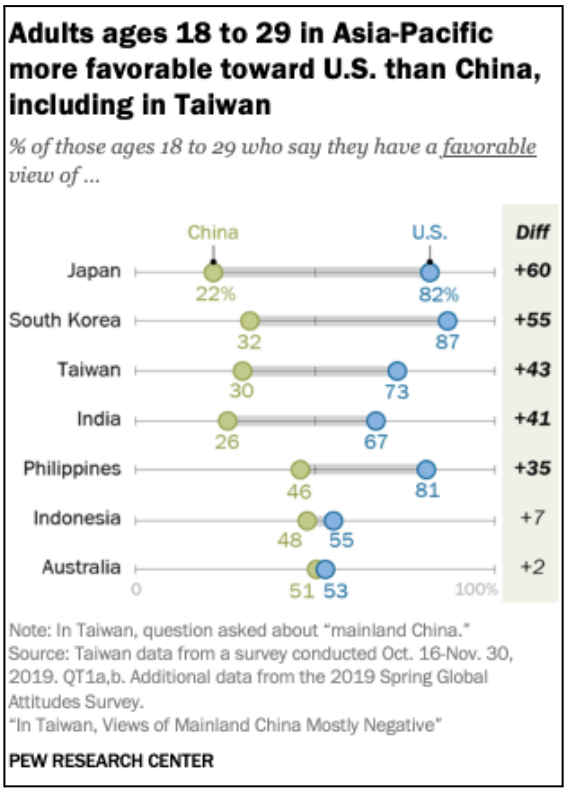
- $96 billion allocated to Department of Defense R&D programs, encompassing development of next-gen microelectronics for defence, growing the bioeconomy, and defence-related quantum R&D.
- $7.2 billion for National Nuclear Security Administration (NNSA) research to ensure a safe, secure, and effective nuclear deterrent and facilitate nonproliferation efforts.
- $30 million allocated to pilot a National AI Research Resource, aimed at providing AI researchers with computing resources and high-quality data.
- $8 million for a multidisciplinary, multi-institution research effort in digital assets.
- $210 million for the Near-Earth Objector Surveyor, an infrared space telescope for discovering and characterising potentially hazardous near-Earth objects.

These investments and the crowding in effects identified by research suggest that now is a crucial time for investors to pay close attention to R&D in these emerging technologies. The alignment of private and public sector interests coupled with substantial financial backing provides an opportune moment for significant returns on investment. As such, these fields present a strong and compelling investment opportunity in the current landscape.

2. The US Strategy in Containing China

The US has adopted a multilateral strategy in response to China's rising geopolitical influence, focusing on strengthening alliances in the Indo-Pacific region, especially with Australia and Japan. A clear representation of this strategy is the formation of the AUKUS security pact, which allows Australia to develop nuclear-powered submarines, potentially undermining China's regional influence. This pact enhances Australia's strategic standing, while also nurturing the US's relationships with key allies.

The AUKUS phase I and II agreement, apart from providing strategic military benefits, also promises potential civilian gains. Technological advancements associated with the development of these submarines could impact sectors like energy, transportation, and medicine. Additionally, this pact is expected to stimulate economic growth and investment in the participating nations. In essence, the AUKUS agreement signifies a crucial move in managing the growing great power competition, demonstrating the commitment of the US and its allies to mitigate China's expanding military power.

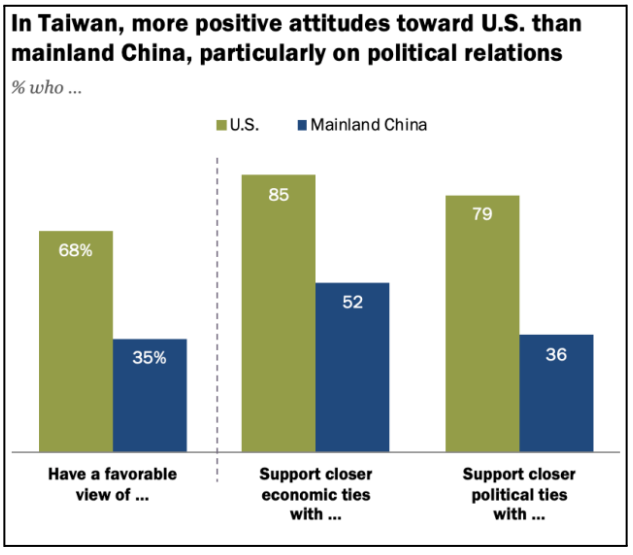


Source: Pew Research

Rising Taiwanese Self-Identity Clashes with Chinese Assertion

Surveying the Experts: China's Approach to Taiwan
Chinese think Taiwan Strait conflict is likely
In Taiwan, Views of Mainland China Mostly Negative

A 2021 survey by the Pew Research Center found that Taiwanese people increasingly identify as Taiwanese and not Chinese, indicating a growing sense of national identity separate from mainland China. This evolution in the collective identity of the Taiwanese population significantly complicates the prospect of a diplomatic solution to the issue of Taiwanese independence. In response to these developments, China's leader, Xi Jinping, has stated, ***"We insist on striving for the prospect of peaceful reunification with the greatest sincerity and best efforts, but we will never promise to give up the use of force and reserve the option to take all necessary measures."*** This stance underscores the potentially volatile nature of the situation. In light of these complexities, preparations for potential conflict by democratic powers in the region, such as the AUKUS alliance and Japan, become a necessary course of action.



AUKUS Pillar I – Australia Going Nuclear

Democracy Sausage: AUKUS and the US alliance with Hugh White
What is AUKUS and what is it not?

The AUKUS agreement was signed on September 15, 2021, and the first boats are not expected to be ready until at least 2030. This is a long timeline, and leaves a wide window of vulnerability but it is necessary for the boats to be designed and built and for the Navy to be trained. The AUKUS alliance is a major strategic development, and the new boats will play a key role in Australia's defence.

The first stage of the AUKUS program will involve the United States providing Australia with access to its nuclear-powered submarine technology. This will allow Australia to begin training its sailors and building the infrastructure necessary to support a nuclear submarine fleet. The second stage of the program will involve the United Kingdom providing Australia with the design for its new submarine. This design will be based on the Astute-class submarine, which is currently in service with the Royal Navy. The third and final stage of the program will involve Australia building its own submarines in Adelaide. This will be a complex and challenging project, but it is essential if Australia is to have a self-sufficient nuclear submarine fleet.

This upgraded fleet will offer Australia greater control and surveillance over the crucial sea routes around Papua New Guinea and Indonesia. In the event of a conflict, these submarines could effectively patrol and secure these waters, safeguarding Australia's interests and allies in the region. It also provides a capacity to "go hunting" if necessary, meaning these submarines could actively seek out and engage potential threats.

Pillar I of the AUKUS agreement involves enhancing Australia's knowledge and proficiency in nuclear non-proliferation and the management of nuclear materials. This initiative is further bolstered by the tactical placement of nuclear bombers within the Northern territories. Together, these strategic moves appear to be charting Australia's course towards becoming a significant nuclear force with the potential capability of deploying its own nuclear weapons.

NATO Expansion in the Pacific

NATO is advancing its ties with four Indo-Pacific countries - Australia, New Zealand, South Korea, and Japan - by signing Individually Tailored Partnership Programs (ITPPs) to foster deeper cooperation on security issues such as maritime security, new technologies, and cyberspace. In addition to countering China's rising influence, these initiatives signify NATO's commitment to addressing security challenges in the region. A liaison office will be established in Tokyo by fall 2023 to facilitate regular consultations with Japanese officials. These enhancements to NATO's relationships, due for formalization before the NATO Summit in Vilnius on July 11-12, highlight the strategic importance of the Indo-Pacific region and extend the alliance's focus beyond its inaugural 2019 Asian summit.

This adds another organisation to the range of multilateral organisations focused on containing China: Chip4, Quad, AUKUS, Five Eyes and now NATO in the Pacific.
https://asia.nikkei.com/Politics/International-relations/Indo-Pacific/NATO-to-upgrade-ties-with-Australia-New-Zealand-South-Korea

AUKUS Pillar II – Creating New Civilian Sectors

Laying the foundations for AUKUS: Strengthening Australia's high-tech ecosystem
Factsheet: Implementation of the Australia – United Kingdom – United States Partnership (AUKUS)
Joint Leaders Statement on AUKUS | The White House

The AUKUS Pillar II, a trilateral initiative between Australia, the United States, and the United Kingdom, is designed to pioneer cutting-edge technologies to boost security and stability in the Indo-Pacific region. It aims to drive advancements in the following areas outlined by the Australian government:

- **AUKUS Undersea Robotics Autonomous Systems (AURAS)** project, our nations are collaborating on autonomous underwater vehicles, which will be a significant force multiplier for our maritime forces. Initial trials and experimentation of this capability are planned for 2023.
- **Quantum technologies. The AUKUS Quantum Arrangement (AQuA)** will accelerate investments to deliver generation-after-next quantum capabilities. It will have an initial focus on quantum technologies for positioning, navigation, and timing. Together, we will integrate emerging quantum technologies in trials and experimentation over the next three years.
- **Artificial intelligence and autonomy**. Trilateral cooperation on artificial intelligence (AI) and autonomy will provide critical enablers for future force capabilities, improving the speed and precision of decision-making processes to maintain a capability edge and defend against AI-enabled threats. Early work is focused on accelerating adoption, and improving the resilience of autonomous and AI-enabled systems in contested environments.
- **Advanced Cyber**. In light of the importance of the cyber domain to advanced capabilities, we are focusing our efforts on strengthening cyber capabilities, including protecting critical communications and operations systems.
- **Hypersonic and counter-hypersonic capabilities**. The AUKUS partners will work together to accelerate development of advanced hypersonic and counter-hypersonic capabilities.
- **Electronic warfare**. The electromagnetic spectrum is increasingly contested. The three countries will work together to share understanding of tools, techniques, and technology to enable our forces to operate in contested and degraded environments. Innovation. Our work on innovation aims to accelerate our respective defense innovation enterprises and learn from one another, including ways to more rapidly integrate commercial technologies to solve warfighting needs.
- **Information sharing**. We will expand and accelerate sharing of sensitive information including as a first priority enabling work streams that underpin our work on agreed areas of advanced capabilities.

Civilian Technological Transformation

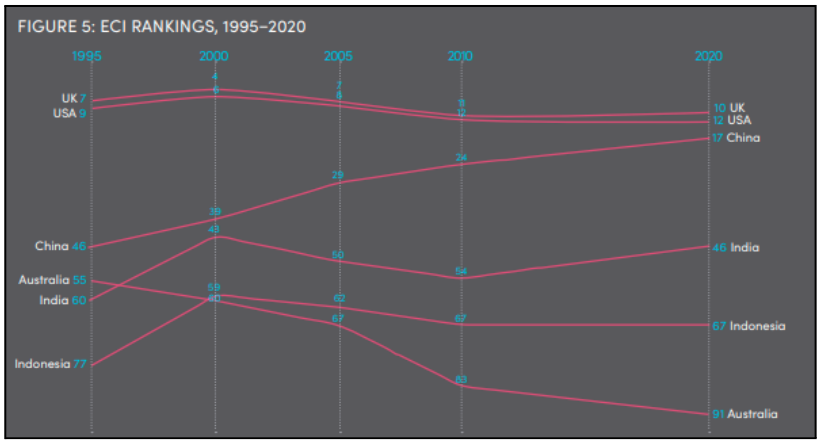
MAXIMISING AUSTRALIA'S AUKUS OPPORTUNITY

The AUKUS pact holds the potential to stimulate a surge in military-technological (mil-tech) innovation reminiscent of the transformative period during the 1940s. During this era, the exigencies of World War II spurred the development of groundbreaking technologies like radar, jet engines, and nuclear power, many of which had far-reaching effects on civilian sectors in the subsequent years.

A compelling argument can be made that the AUKUS pact will foster a similar technological revolution, sparking innovations with substantial civilian and economic dividends. While the primary focus of this tripartite alliance is to equip Australia with nuclear-powered submarines, the collaboration will necessitate advancements in several sophisticated technologies, just as the defence imperatives of the mid-twentieth century did.

The AUKUS pact's wide-ranging research initiatives could generate remarkable technological advancements that ripple through civilian sectors. The development of autonomous underwater vehicles in the AUKUS Undersea Robotics Autonomous Systems (AURAS) project, for instance, could revolutionise marine exploration, resource extraction, and oceanic science. Similarly, the AUKUS Quantum Arrangement (AQuA) might lead to significant advancements in navigation, timing systems, and data security, potentially transforming everything from GPS systems to cryptography. The pact's focus on artificial intelligence and autonomy could yield unprecedented advancements in robotics and automation, thereby transforming sectors from healthcare to logistics. Furthermore, the emphasis on advanced cyber capabilities could foster new ways to protect critical infrastructure and personal data.

Beyond these immediate technological benefits, research into hypersonic and counter-hypersonic capabilities might also stimulate breakthroughs in high-speed transportation technology. The focus on more robust communications systems capable of operating in degraded environments could prove crucial during natural disasters or other emergencies, providing a critical lifeline. The commitment to accelerate innovation and foster information sharing could foster a new era of international scientific collaboration, promoting rapid advancements that drive growth in high-tech sectors.



Source: MAXIMISING AUSTRALIA'S AUKUS OPPORTUNITY

Just as in the 1940s, the vast investments required to realise the AUKUS pact's goals will undoubtedly stimulate economic activity and job creation in Australia, the UK, and the US. This tripartite alliance democratises the benefits of defence research, extending them beyond the borders of the US and fostering a global environment conducive to technological advancement and economic growth.

3. Can China Industrialise Science?

Mapping the Semiconductor Supply Chain: The Critical Role of the Indo-Pacific Region

Assessing China's scientific capabilities necessitates a comprehensive evaluation of its current research and technology commercialization infrastructure and the defence industry. Key to understanding the future trajectory of Chinese technological advancement is analysing the implications of recent US restrictions on China's access to advanced technology. The crucial question is whether China can replicate the model embodied by the U.S.'s defence research establishment, such as DARPA, which has long driven technological innovation in the U.S., producing commercially impactful innovations like the internet and GPS.

The crucial aspect here is the ability of China to foster a similar symbiotic relationship between its defence research sector and wider technology industries. The objective is to cultivate an environment promoting innovation, creative pursuits, and the generation of pioneering technologies. It is no coincidence that the U.S. is targeting specific civilian-military fusion programs in China, likely impacting their overall technological progression.

Ultimately, the ability to advance science is not merely a function of resources and manpower. It requires an environment that champions intellectual freedom, encourages creative inquiry, tolerates failure—elements fundamental to innovation and groundbreaking research. The central question remains: does China's top-down, more centralised approach to technological development aid or obstruct this process? How will China adapt its approach in response to a shifting geopolitical and technological landscape? The answers to these questions are integral to an investment analysis of China's tech sector.

In our analysis, several factors contribute to a cautious outlook on China's technology development:

1. **Geopolitical dynamics restrict collaboration with other tech powerhouses and limit access to advanced technology.**
2. **The Chinese tech industry is dominated by technocrats who often channel resources into less productive ventures.**
3. **Chinese autocrats' actions are creating uncertainties in the technology market, potentially stalling development and investment.**
4. **The current demographic decline will create economic issues for China while also stifling innovation.**
5. **Persistent negative net migration suggests that China is facing challenges in attracting top-tier talent.**
6. **There is a disproportionate emphasis on experimental R&D, with insufficient investment in basic research.**

Prerequisites for Success

The journey towards achieving significant progress in scientific research and technology development is a complex path, determined by a mix of cultural, political, financial, and institutional conditions. Here, we summarise the essential conditions that China, or any other nation, must fulfil to make strides in these areas.

Cultural Conditions:

- A Culture of Innovation and Creativity: A society that values new ideas, encourages risk-taking and tolerates failures can foster an environment conducive to scientific breakthroughs.
- Academic Freedom: For scientists to make groundbreaking discoveries, they need to be able to explore and debate ideas freely.
- Recognition and Reward: Innovators should be acknowledged and rewarded for their contributions to promote continuous development.

Political Conditions:

- Stable Governance: A stable political environment can help ensure continuous investment and focus on science and technology development.
- International Collaboration: Openness to global collaboration can help in the sharing of ideas, technologies, and best practices.
- Regulation and Policy: Policies need to be put in place to protect intellectual property, ensure ethical conduct in research, and create an attractive environment for foreign investment and talent.

Financial Conditions:

- Funding: Sustained investment in research and development (R&D) is crucial. This includes funding for universities, research institutes, startup companies, and individual research projects.
- Financial Incentives: Tax breaks, grants, and other financial incentives can help stimulate technological innovation and entrepreneurship.

Systemic Conditions:

- Education System: A strong education system that emphasises science, technology, engineering, and mathematics (STEM) can produce the talent needed for R&D.
- Infrastructure: The necessary physical infrastructure needs to be in place, including state-of-the-art research labs, tech parks, and broadband connectivity.
- Public-Private Partnerships: Collaborative efforts between the public and private sectors can drive innovation and commercialization of new technologies.

All these conditions interact and overlap in various ways. For China to "do science" effectively, it would need to consider and work on all these aspects in a balanced and integrated manner. The question of China's capacity to develop and advance in scientific and technological fields, particularly in the context of defence, is both significant and multifaceted. It can be framed as:

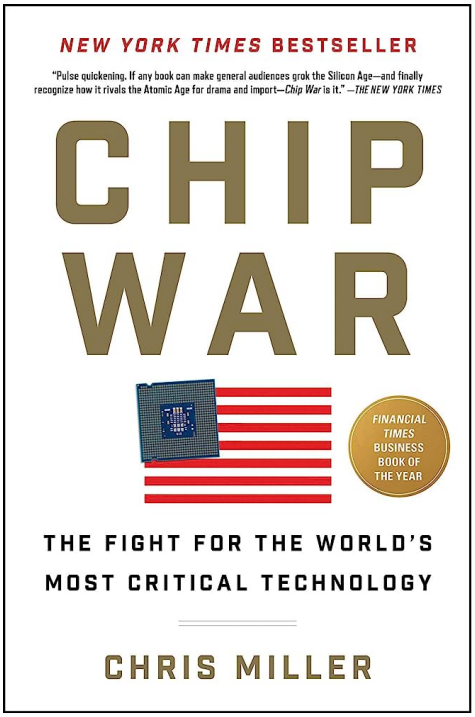
Can China replicate the cycle of defence-related research and development, militarization, civilian innovation, industrialization, and eventual commercialization of technology that has characterised the scientific and technological growth of the United States?

Geopolitical: The Chip Choke

US-Japan Tech Export Restrictions

[Japan and the Netherlands Plan Export Controls on Semiconductor Equipment]

The United States has imposed restrictions on the export of technology to China, in an effort to slow the country's rise as a technological power. These restrictions are having a significant impact on China's tech development, and could have long-term consequences for the country's economy. The US tech ban, which was imposed in 2020, restricts the export of a wide range of technology to China, including semiconductors, telecommunications equipment, and software. Both Japan and the Netherlands agreed to join the US in restricting exports to China of equipment that could be used to manufacture advanced sub-14 nanometre chips (Discussed in Zen on Tech V13).



Starting July 2023, Japan's embargo will limit exports of 23 types of semiconductor manufacturing gear, in line with US efforts to impede China's advanced chip production. Six crucial categories of chip manufacturing equipment, including cleaning, deposition, lithography, and etching, will face export controls. These controls are set to impact several Japanese firms, including Nikon, Tokyo Electron, and Screen Holdings Co Ltd.

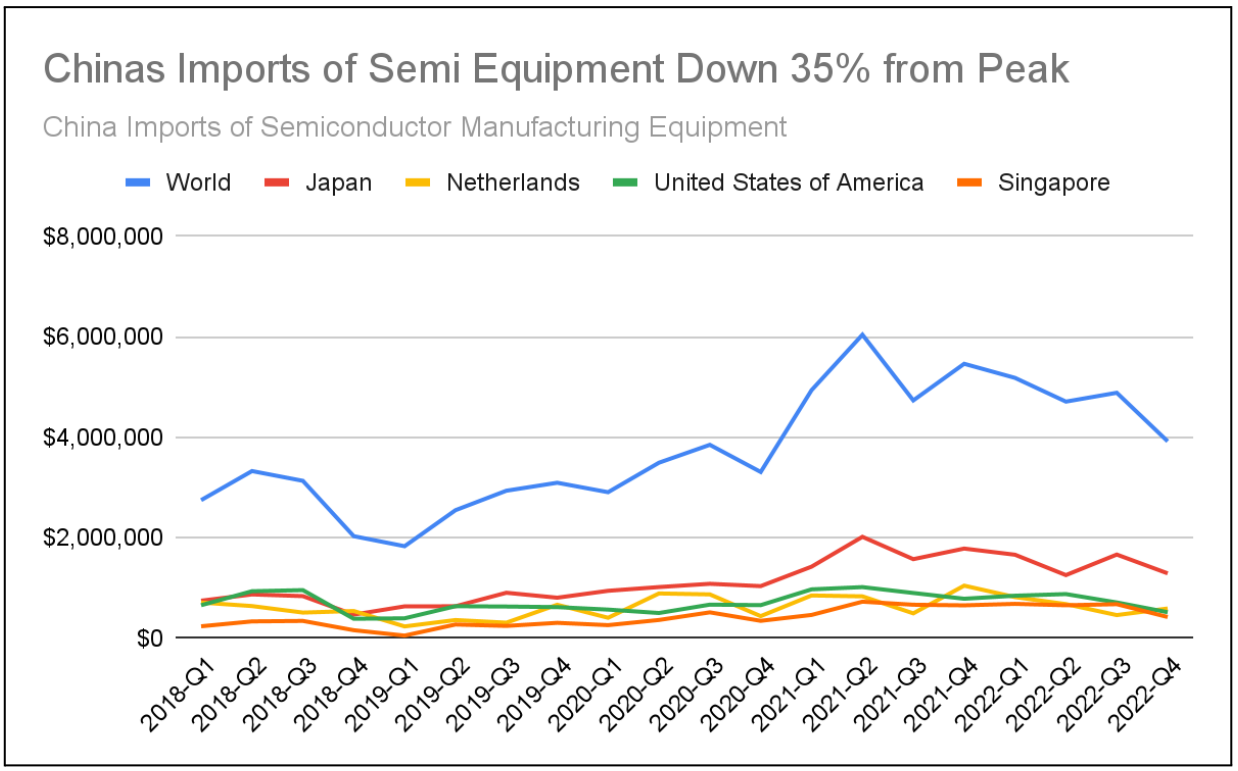
AI: China Will Miss the Boat

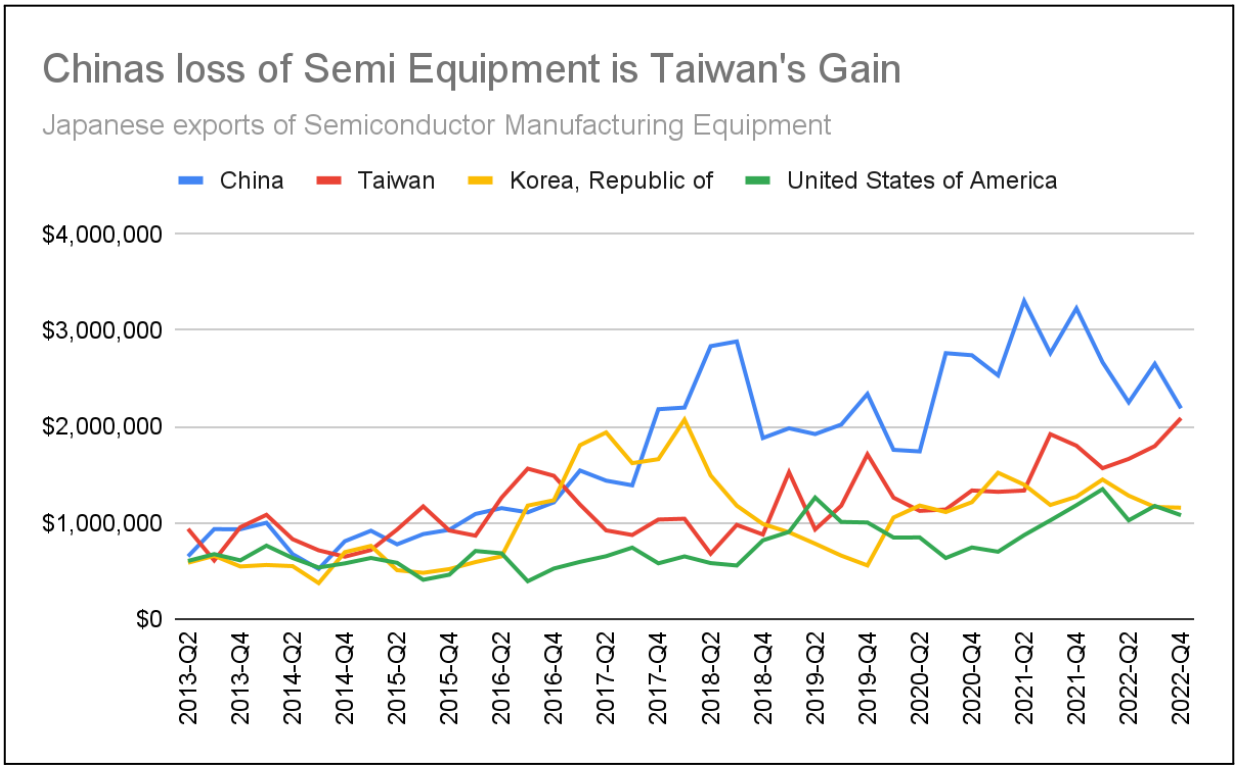
[The Illusion of China's AI Prowess | Foreign Affairs]

Nvidia, renowned for its superior artificial intelligence (AI) hardware and software, caters to a range of AI and machine learning applications. However, recent U.S. technology restrictions have blocked Nvidia's top-tier chips for Chinese firms, critically hampering the development and deployment of large language models (LLMs) or advanced AI systems in the country. The inability to access vital technology for the training of sophisticated AI models threatens to slow the pace of China's AI sector growth. As noted in our Zen on Tech 13 discussion on "Datacenter Destruction", server depreciation typically happens over a three-year cycle, which implies that within 12 to 18 months, half of the data centers in China will be operating on obsolete technology. The extensive adoption of the Nvidia ecosystem might also create compatibility issues if Chinese companies switch to domestic GPUs.

Despite China's active projection of its AI capabilities, a recent report from the Center for Strategic and International Studies (CSIS) suggests that China's AI prowess might not be as impressive as perceived. While China ranked third globally in AI research publications in 2022, it lags behind the U.S. and Europe in critical AI areas such as NLP and computer vision. The report attributes this shortfall partly to China's highly regulated AI environment that restricts the freedom to innovate. Further complicating matters is the country's gloomy outlook on its economic and technological future which could suppress domestic AI initiatives. While Chinese AI companies have raised billions in funding, they have yet to make significant breakthroughs. Coupled with economic challenges including slowing growth and an ageing population, it's doubtful that China will surpass the U.S. in AI anytime soon.

As the leading supplier of chipmaking equipment to China, Japan's restrictions may further suppress Chinese capital expenditure on manufacturing gear, which dropped from $6B in Q2 2021 to $3.9B in Q4 2022. The restrictions on the procurement of vital equipment places Chinese fabs in a precarious position, likely prolonging their race to close the gap with world-leading semiconductor manufacturers. Such an outcome has serious implications for China's semiconductor production capabilities. As one of the world's largest consumers of semiconductors, inability to self-produce could increase dependency on imports, potentially escalating costs for Chinese firms seeking to develop and produce semiconductor-dependent products.





Source: ITC

Financial: Wasteful State Funded Projects

Nanometers over GDP: Can Technocrat Leaders Improve China's Industrial Policy? - MacroPolo
Intel inside? Chinese firm Powerleader's 'home-grown' chip suspected of being a rebadged microprocessor
China's fake science industry: how 'paper mills' threaten progress | Financial Times

China's political landscape shows an increase in technocrats, particularly in the aerospace industry, signifying the quest for technological self-reliance. The 20th Central Committee of the Chinese Communist Party (CCP) witnessed a 35% increase in STEM technocrats, emphasising the nation's approach towards addressing technological deficits crucial for national security. Nonetheless, this strategy faces obstacles due to a highly competitive and fragmented industrial system, often encouraging less focus on R&D and more on GDP growth. Efforts are being made to shift this dynamic, with President Xi Jinping's "New Whole National System" aiming to consolidate industrial policy, strengthening the Party's leadership over scientific and tech innovation.

However, uncertainties cloud the future of China's tech development. Although the present leadership is striving to curb local competition, its deep-seated roots in the political economy of China render it challenging to eliminate completely. The efficiency of this centralised industrial policy approach in generating desired tech breakthroughs and its potential cost-effectiveness compared to the private sector remains unclear.

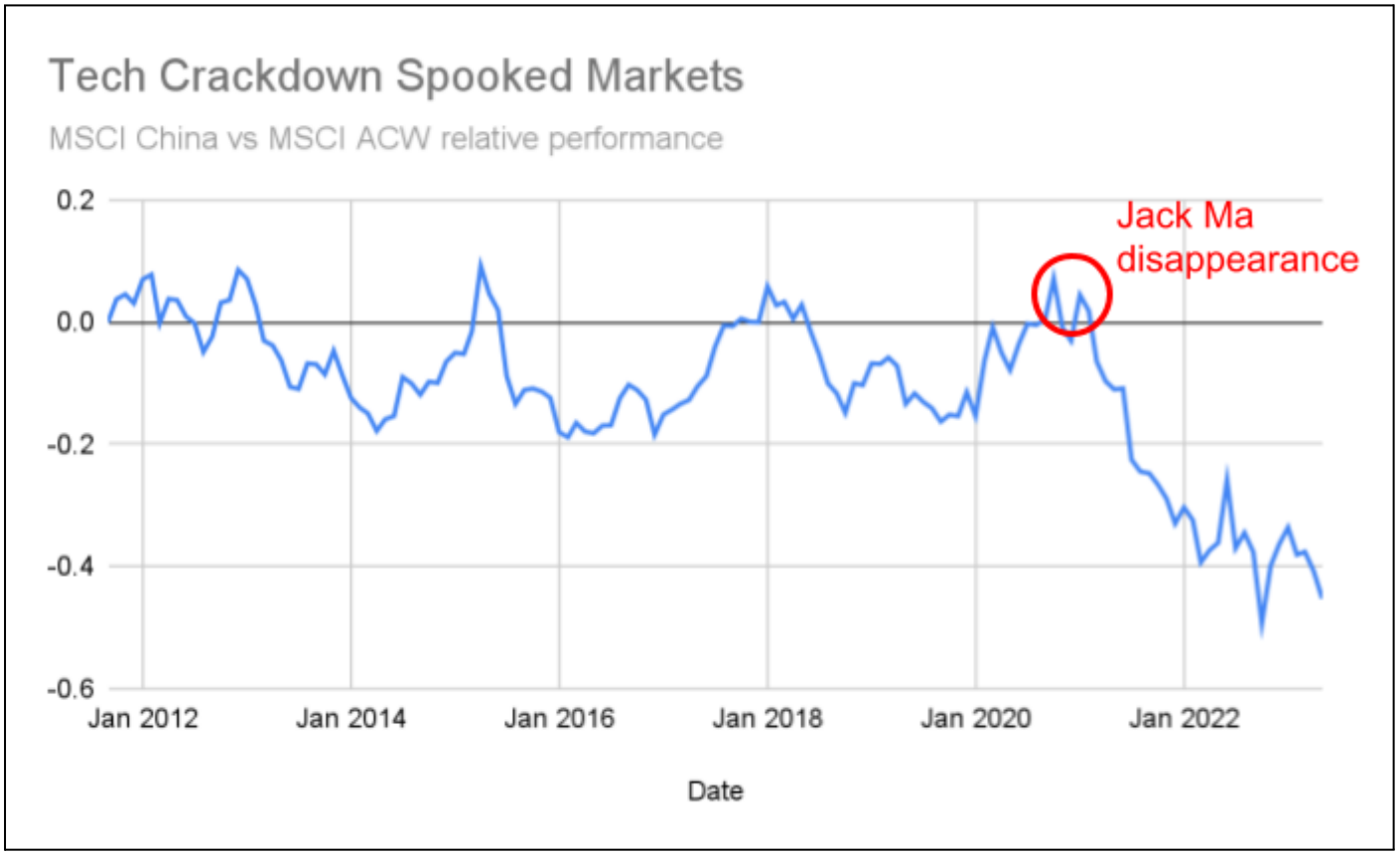
State-funded projects in China have been found to be riddled with instances of fraudulent activities disguised as advancements. A recent example of this is Wuhan Hongxin Semiconductor Manufacturing Co. (HSMC). More recently, Powerleader's Powerstar chips were discovered to be identical to Intel's Core i3-10105 Comet Lake CPU during microprocessor benchmark testing on Geekbench. Powerleader, a Shenzhen-based company with no prior history in semiconductor development, has been repurposing Intel chips for its own computer products, misleadingly branding them as its own creation.

Political: Autocrats Spooking the Markets

[Why did Alibaba's Jack Ma disappear for three months? - BBC News]
[Chinese tech entrepreneurs keen to 'de-China' as tensions with US soar | Reuters]

The Chinese government's tech crackdown that began in 2020 and has continued into 2023 has created an uncertain environment for investors. This is highlighted by events such as Jack Ma's three-month disappearance, leading to increased investor anxiety. The intensified regulatory scrutiny has affected several prominent tech companies including Alibaba, Tencent, and Baidu, who faced antitrust investigations, fines, and other penalties. Furthermore, new data privacy regulations have necessitated user consent for data collection and use. The clampdown also encompasses curbs on online gaming and restrictions on for-profit online tutoring for K-9 students.

This increased regulatory activity has markedly impacted the Chinese tech industry, forcing many businesses to alter their operations or even cease functioning, resulting in a significant investment decline in the sector. The Chinese government asserts the crackdown is essential for the tech industry's healthy development and consumer protection. Critics, however, fear this may stifle innovation and competition. Given the government's resolve to regulate the tech industry more closely, the investment landscape in China's tech sector remains uncertain, urging caution from prospective investors.

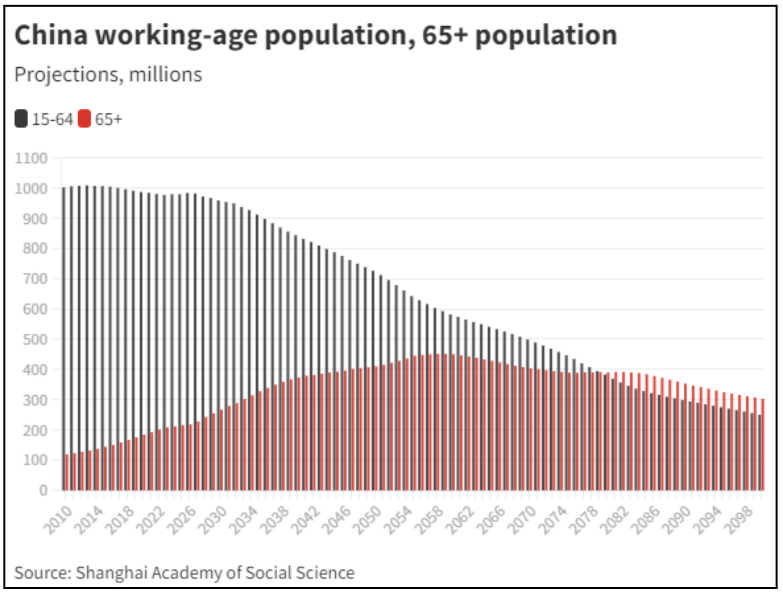


Relative performance of MSCI China index vs Global Equities

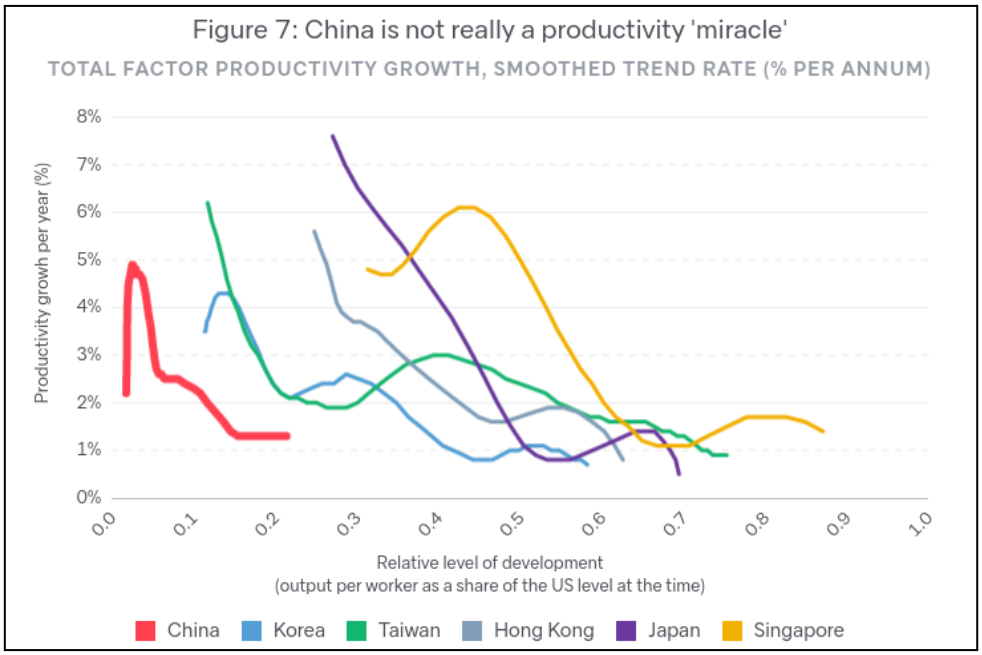
Systemic: Demographic time bomb

[It's not just a fiscal fiasco: greying economies innovate less]
[Revising down the rise of China | Lowy Institute]

One critical element to consider is China's declining and ageing demographic profile, analogous to Japan's situation in the 1990s. As the proportion of elderly individuals rises, the influx of young workers into the labour force tends to wane. This decrease precipitates a downturn in innovation given the propensity of younger demographics to venture into new businesses and undertake risks. Furthermore, a dearth of young workers can cause a slowdown in economic growth due to fewer contributions to the workforce. Consequently, China is likely to endure a slower pace of economic growth and diminished innovation alongside weaker demand.



Though China has achieved substantial productivity gains, averaging 3.9% annually over the past forty years, when juxtaposed against East Asian miracle economies at a comparable level of development relative to the United States, China's performance appears less extraordinary. China's seemingly "miracle-like" productivity growth largely stems from its low starting point during its reform and opening up period in the late 1970s, when its output per worker was merely 2% of America's. This was notably lower than the 10-25% seen when East Asian miracle economies initiated their rapid growth phases. Thus, in comparison, China's productivity growth at similar development levels has considerably lagged.

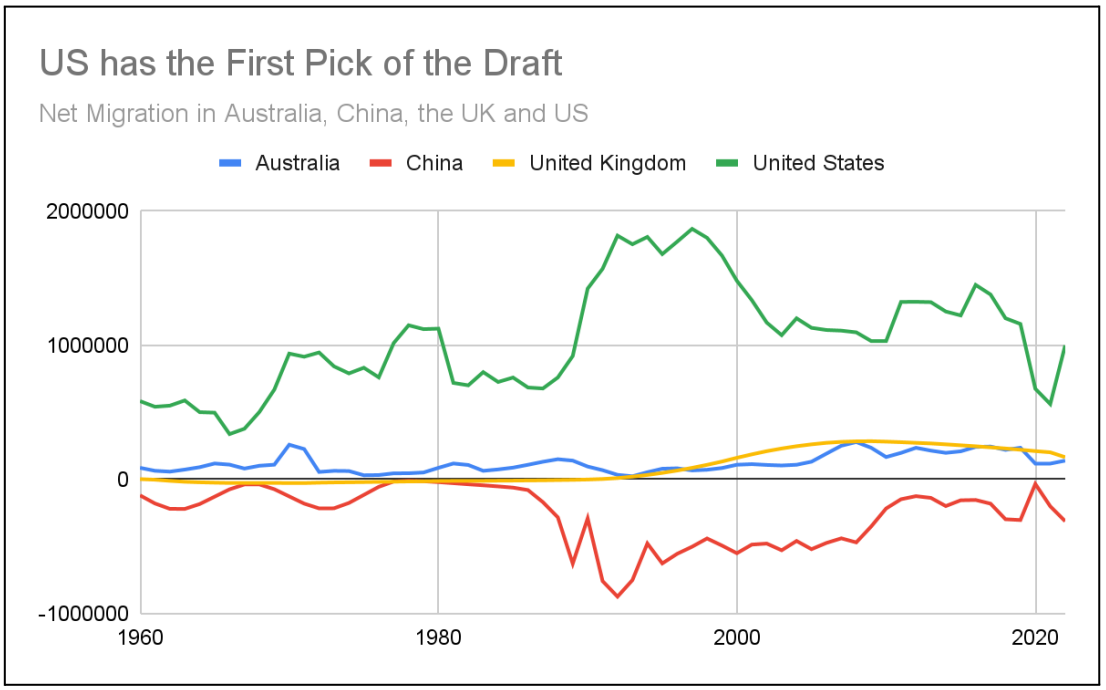


Source: Lowy Institute

Cultural: China Isn't Where Talent Wants to Live

[Why Are More and More Chinese Migrants Risking Their Lives to Cross the US Southern Border?]
[China millionaire exodus to continue this year]

The United States continues to attract a diverse talent pool due to its immigration-friendly policies, drawing in some of the world's best and brightest minds. According to the United Nations data, China witnessed a net loss of around 348,000 people in 2019 due to emigration. Conversely, the immigrant share of the US population is near historical highs, close to 14% in 2019, according to the Pew Research Center. The existing trend also underscores the US's continued appeal as a global technology hub, a factor that may pose challenges for China's technological ambitions.



Source: World Bank

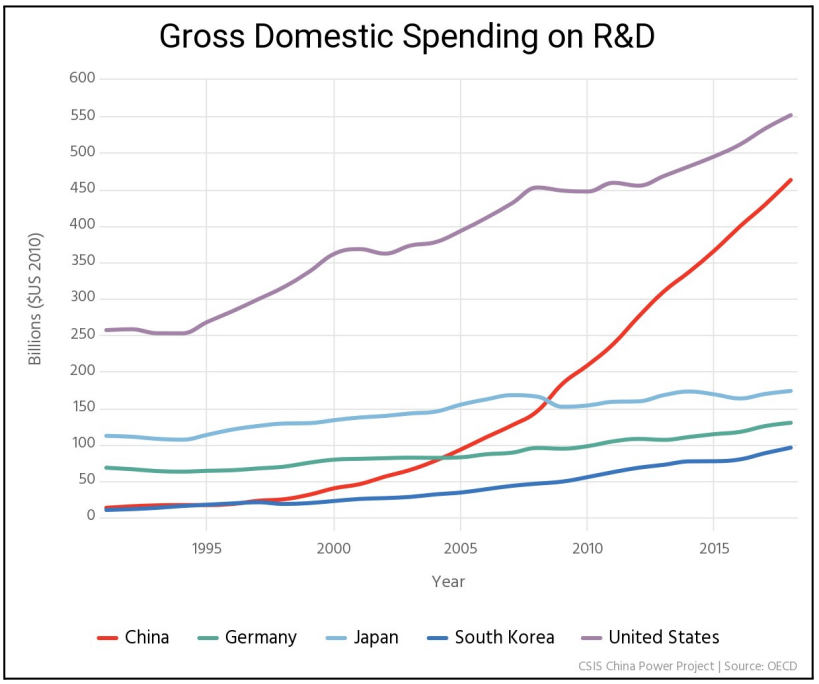
China's young people are facing record-high unemployment as the country's recovery from the pandemic is fluttering. They're struggling professionally and emotionally. Yet the Communist Party and the country's top leader, Xi Jinping, are telling them to stop thinking they are above doing manual work or moving to the countryside. They should learn to "eat bitterness," Mr. Xi instructed, using a colloquial expression that means to endure hardships.

Many young Chinese aren't buying it. They argue that they studied hard to get a college or graduate school degree only to find a shrinking job market, falling pay scale and longer work hours. Now the government is telling them to put up with hardships. But for what? China's Young People Can't Find Jobs. Xi Jinping Says to 'Eat Bitterness.' - The New York Times

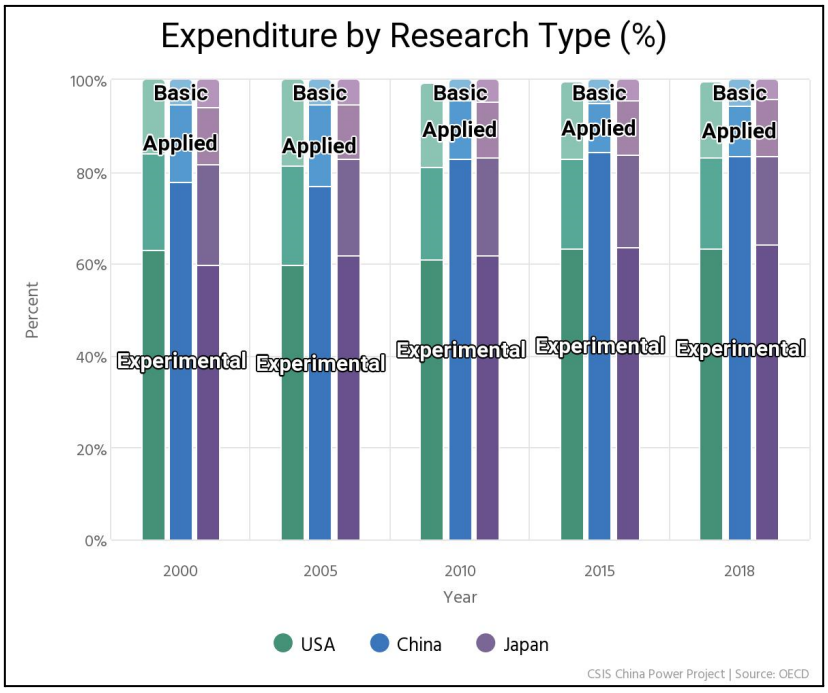
Financial: Little Investment in Basic Research

[Is China a Global Leader in R&D
Research and Development: U.S. Trends and International Comparisons | NSF](#).

China's expenditure on R&D has significantly grown over the past decades, providing a strong impetus for economic growth. From 0.72% of GDP in 1991, China's R&D spending rose to 2.14% in 2018, translating to a nominal increase from $13.1 billion to $462.6 billion. Businesses, particularly state-owned enterprises, account for 76.6% of this investment, so their financial decisions are often influenced by government officials. Meanwhile, government funding has been declining, from 33.4% in 2000 to 20.2% in 2018, but with strategies like "Made in China 2025," Beijing is seeking to invigorate government-led innovation.



The focus of China's R&D investment is primarily in the information and communication technology sector. However, experimental development takes up around 80% of R&D resources from 2000 to 2019, while basic and applied research, essential for groundbreaking technologies, receive less proportional funding. Basic research in China receives less than 5% of R&D spending while in the US it receives 20%. Despite regulatory obstacles, insufficient IP protections, and private sector underinvestment, Chinese leadership is pushing for more focus on basic and applied research.



[Is China a Global Leader in Research and Development? | ChinaPower Project](#)

The Bear Case: Brave Old World

If China persists in heavily relying on global imports for advanced semiconductors and continues to be constrained by export restrictions, it might encounter a predicament reminiscent of the Soviet Union during the Cold War or even Japan in July, 1941. In both historical contexts, limitations on essential resources and technology significantly compromised the nations' strategic plans. For Japan, in particular, the realisation of the crippling impacts of the US oil and steel embargo marked a turning point in its strategic considerations, eventually leading to its fateful decision to confront the US.

In such a scenario, China could be investing substantial financial resources into research and development (R&D), but witnessing only a fraction of its potential return due to limitations on technology access. For a nation aspiring to lead in technologies like AI, 5G, and electric vehicles, this dependence on external resources could seriously impede innovation and economic progress.

Enormous investments in the semiconductor sector could potentially turn into sunk costs, with stringent restrictions on advanced semiconductor technology preventing significant technological breakthroughs. The rest of the world's continual advances in semiconductor technology could widen the technological gap that Chinese industries face, thereby exacerbating the economic losses.

Furthermore, this dependence could have profound implications for China's military technology and defence capabilities. Advanced semiconductors, which are integral to modern warfare systems such as communication devices, radars, drones, and missiles, are at risk of becoming outdated due to restricted access to the latest semiconductor technology. Given the rapid advances in C4ISR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance) capabilities, a hypothetical conflict between a 21st-century equipped power and another reliant on 20th-century weaponry. China with its potential difficulties in accessing cutting-edge semiconductor technology, could find itself severely handicapped. Without advanced capabilities, it would struggle to match the situational awareness, rapid response, and precision strike capabilities of its adversary which we are seeing play out in Ukraine. This asymmetry could fundamentally tip the balance in a potential conflict, underscoring the strategic implications of China's semiconductor dependence.

Continued dependence also could expose broader strategic vulnerabilities for China. As seen during the Cold War, the West could use technology embargoes as leverage, and today's major semiconductor-producing nations could exploit China's dependence on imported technology to exert economic or political pressure. This could place China in an unstable position in international relations, akin to the strategic dilemmas that confronted the Soviet Union during the latter half of the 20th century and Japan in 1941.

The Bull Case: From Dependence to Self Reliance

Despite the aforementioned challenges, there's a compelling bull case for China's technology development that could potentially see it overcoming its current obstacles. China has made remarkable strides in nurturing its own semiconductor industry over the last few years. For instance, in 2021, China's production of semiconductors accounted for 17.8% of the world's output, marking a notable rise from the 14.4% recorded in 2020. This progress can be attributed to the government's active investment in the semiconductor industry and the determined efforts of domestic companies such as SMIC and HiSilicon.

China's semiconductor industry, while still nascent, is poised for leadership on the global stage, backed by a vast pool of skilled engineers and scientists, and a robust manufacturing base. Furthermore, the Chinese government's resolute commitment to developing its semiconductor industry, underlined by significant R&D investments, offers a strong impetus for growth.

As China continues its trajectory in developing its semiconductor industry, it's anticipated to reap multiple benefits. First, it will alleviate China's reliance on foreign imports for semiconductors, enhancing its control over its technology supply chain and reducing its susceptibility to economic sanctions or supply disruptions. Second, a flourishing semiconductor industry will fuel China's economy as this high-value-added industry stimulates job creation across several sectors, including manufacturing, design, and R&D. Third, a potent semiconductor industry is crucial for bolstering China's national security, given semiconductors' pivotal role in numerous military applications, such as communication, radar, and weapon systems.

Chinese government support remains a key factor in this equation, promoting innovation and economic growth. Although China grapples with some challenges, such as intellectual property theft and limited access to some key technologies, its impressive progress in recent years underscore its potential to become a major force in the global technology race. Therefore, in spite of its present-day limitations, China's evolving technology landscape holds promise for its ascent as a global tech titan in the years to come.

In a potential Pacific conflict scenario, China's extensive technological progress, coupled with its strategic ambitions, presents a significantly different picture from that of the twentieth-century confrontations. Notwithstanding its current challenges with advanced C4ISR capabilities, China's rapid advancements in drone technology, hypersonic missiles, and cyber warfare would lend it considerable strength. These cutting-edge technologies could serve to partially counterbalance any disadvantages, presenting a potent threat to democratic powers in the region. **A high-tech China could engage in asymmetric warfare, employing swarms of AI-controlled drones for reconnaissance and strikes, leveraging hypersonic missiles for rapid and unpredictable attacks, and utilising cyber warfare capabilities to disrupt enemy communication and command systems. This paints a scenario of a highly dynamic and unpredictable conflict landscape, requiring the democratic powers to equally match pace in technological sophistication and strategic acumen.**

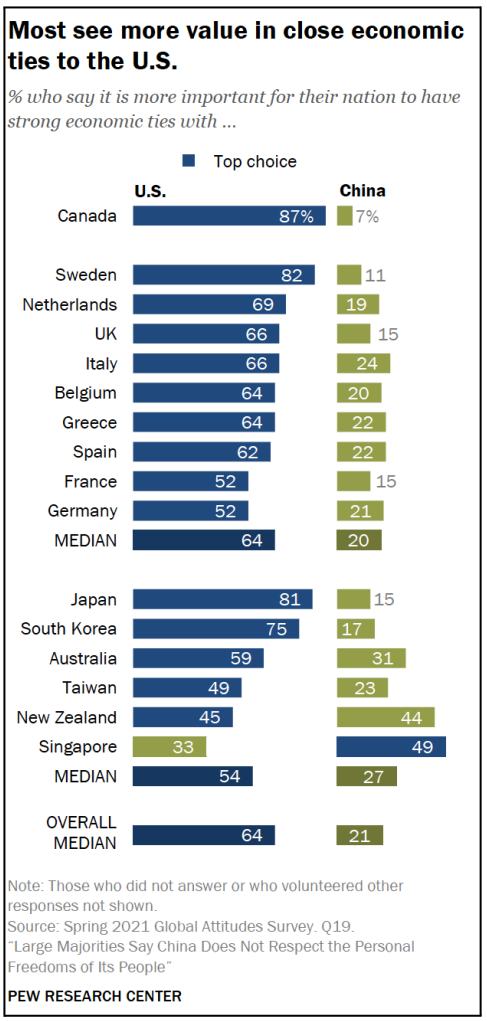
4. The Fateful Choice of Neutral Pacific Nations

As we navigate an era of increased global competition, particularly between the United States and China, several Pacific nations find themselves echoing the predicaments of nations like Ireland, Finland, and Switzerland during the Cold War. The current dynamic is forcing countries like New Zealand to grapple with their allegiances and the tension between economic interests and security needs.

During the Cold War, countries like Yugoslavia and Ireland capitalised on their neutral stances, accepting aid from both East and West blocs and avoiding major entanglements, respectively. Switzerland was able to serve as a hub for diplomacy due to its strategic geographical location and deeply entrenched ethos of neutrality.

The scenario today is quite different. The U.S-China rivalry is presenting unique challenges and choices for Pacific nations. New Zealand, thanks to its remote location, might be tempted to de-prioritize defense and security. However, the launch of the AUKUS pact signals potential opportunities for high-tech defense collaborations and economic capacities, suggesting the need for a more strategic positioning.

Papua New Guinea has already taken a step towards aligning with the US by signing a security pact. This move acknowledges its strategic location between the Asia-Pacific and the Americas, and highlights the importance of security considerations in its decision-making. But it also exposes it to the risks of escalating tensions.



The conundrum for Pacific Nations lies in balancing economic interests with security needs. Aligning more closely with China could yield immediate economic benefits, particularly given China's demand for commodities and its capacity for cost-efficient manufacturing. However, this also entails the risk of dependence on a single, heavily controlled economy - selling one product, to one country, at one price is not a viable long term business strategy. On the other hand, aligning with the US and the AUKUS alliance could present opportunities in high-tech defense R&D and other advanced economic sectors, but it may strain their ties with China and disrupt existing economic relationships.

In essence, Pacific nations find themselves at a pivotal crossroads, with choices that could shape their economic and political futures for decades to come. As they seek to balance their interests, the lessons of neutrality, strategic finesse, and prudence from the past can provide a valuable guide in navigating the great power competition of the present.