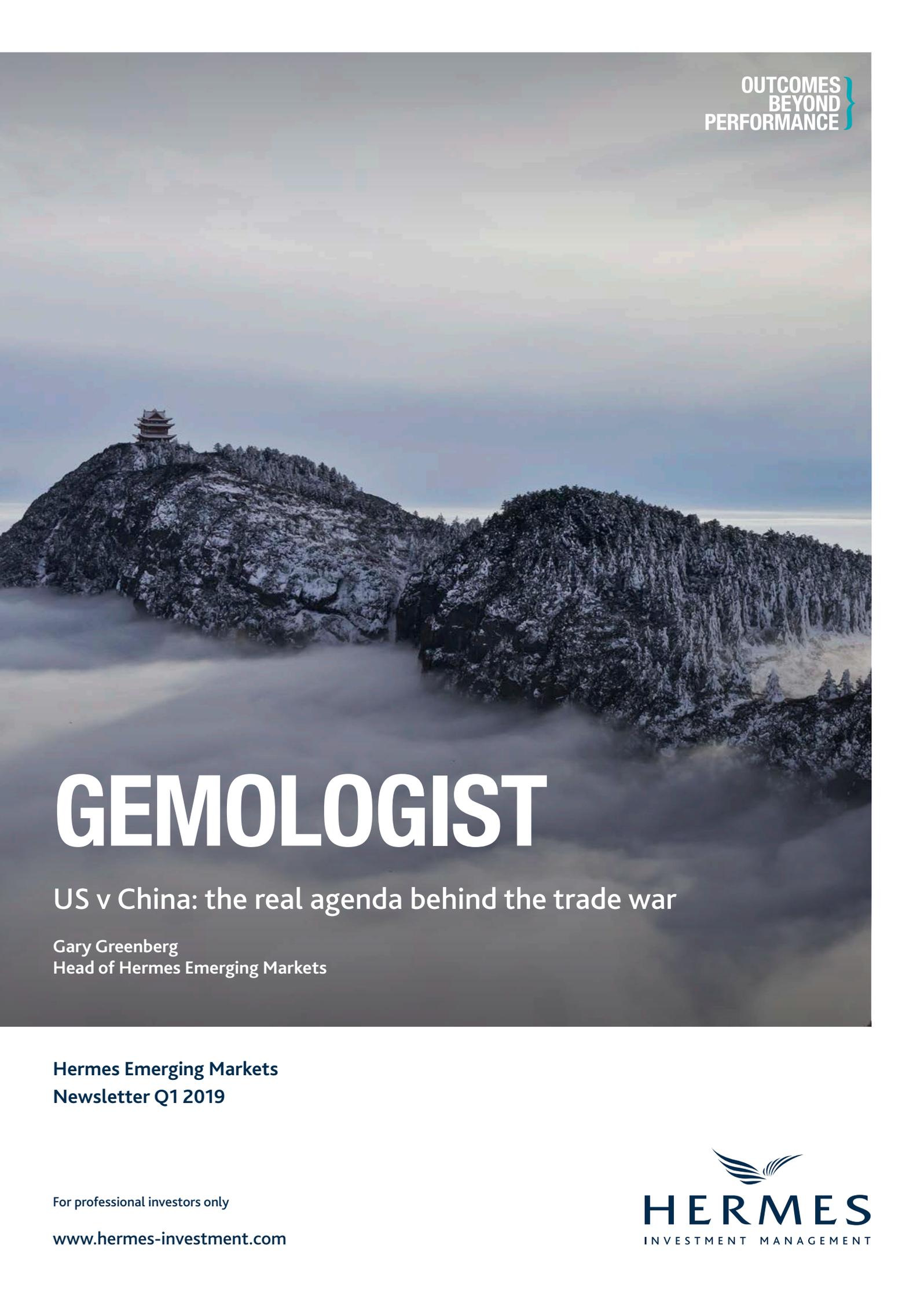


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# GEMOLOGIST

US v China: the real agenda behind the trade war

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Hermes Emerging Markets  
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**Not since the Cold War has the US had a serious rival superpower. Even in that period of intense nuclear paranoia, a sign mounted inside the Pentagon proclaimed: "If we ever faced a real enemy, we would be in deep trouble"<sup>1</sup>. With the rise of an increasingly powerful, influential and technologically advanced China, that adversary could have arrived.**

China's emergence on the global stage poses a genuine threat to future US dominance and, as such, a new world order is likely to be emerging. The current trade war, stemming from perceived bilateral trade imbalances between the two nations, is not a singular confrontation but is likely to be the initial skirmish in a long-running rivalry between the economic, political and military behemoths that has been decades in the making.

## THE RISE OF CHINA

### The West's delusion

Until 2017, China was looked on as a mischievous adolescent by both the US and Europe. It was a country that bullied its smaller siblings, threw temper tantrums and sometimes stole intellectual property. But the world assumed that as China matured, it would follow in the footsteps of more established nations and take its place – in a peaceful, democratic and cooperative manner – among the economic, political, military and cultural leaders of the world.

Predictions that China would shed the skin of totalitarian single-party rule and emerge as a multiparty, liberal market economy have proved to be well off the mark. This outcome, coinciding with the US's retreat from global leadership under President Donald Trump, has created a geopolitical vacuum that the Chinese authorities are eager to exploit.

### China under Xi: the real deal

Back in 2013, Chinese President Xi Jinping was championing the private sector over state-owned enterprises, telling the world that the market would have a "decisive" role in allocating resources<sup>2</sup>. In recent years, he has decisively backpedalled from any libertarian tendencies, instead adopting a more statist and authoritarian stance. In order to strengthen and prolong his leadership, he has removed the time limit on the presidential term. And after a draconian anti-corruption campaign that led to the removal of most of his political rivals, Xi focused on minorities, establishing mass-internment camps for the "reeducation" of up to 1m Muslim Uighur Chinese<sup>3</sup>.

Xi has also asserted China's overseas interests internationally. Breaking an explicit promise to former US President Barack Obama in 2015, he has militarised islands in the Taiwan Strait, which now equate to an archipelago of stationary aircraft carriers complete with landing strips, radar and missiles<sup>4</sup>. Xi has also allowed the harassment of fishing vessels in the South China Sea and caused confrontations with the US Navy<sup>5</sup>.

In order to strengthen his authority in the diplomatic arena, Xi took on a prominent role at the COP24 United Nations summit on climate change in Katowice last November<sup>6</sup>. However, the assertions he has made at the 2017 meetings of the World Economic Forum in Davos and the Asia-Pacific Economic Co-operation summit in Vietnam – in which he championed globalisation – were not quite as well received.

There are growing concerns among advanced industrial economies that China has morphed from being a junior partner to a growing threat. Some of these are caused by Xi's 'Made In China 2025' programme, which envisions China achieving a major industrial upgrade. However, the deepest concern, shared by the Five Eyes Intelligence Consortium – an alliance between the US, UK, Canada, Australia and New Zealand – is the Chinese goal of achieving supremacy in the field of artificial intelligence (AI) by 2030, leading to a position of world dominance economically, culturally, politically, and militarily by 2050<sup>7</sup>. This is Xi's "China Dream".

### At the cutting edge

To the surprise of many, not least the US Congress, the rapid transformation of Chinese output from plastic flowers to advanced technology is now a reality: the nation's volume of high value-added exports overtook that of all its competitors in 2010 and China has continued to extend this lead (see figure 1).

<sup>1</sup> Source: "Destined for war: can America and China escape Thucydides's trap?" by Allison, G. Published by Scribe in 2017.

<sup>2</sup> Source: "Gemologist: the fog lifts on China's economic future," by Greenberg, G. Published by Hermes Investment Management in November 2013.

<sup>3</sup> Source: "China Uighurs: Xinjiang legalises 're-education' camps," published by BBC News on 10 October 2018.

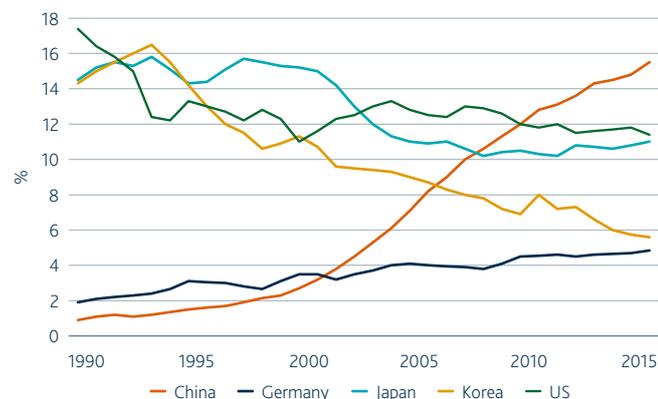
<sup>4</sup> Source: "It's official: Xi Jinping breaks his non-militarisation pledge in the Spratlys," by Panda, A. Published in *The Diplomat* on 16 December 2016.

<sup>5</sup> Source: "Warships' near-collision at sea shows rising US-China tensions," by Tweed, D. et al. Published in Bloomberg News on 2 October 2018.

<sup>6</sup> Source: "China emerges as powerbroker in global climate talks," by Hook, L. and Hornby, L. Published by the *Financial Times* on 16 November 2018.

<sup>7</sup> Source: "Battlefield singularity," by Kania, E. Published by the Center for a New American Security on 28 November 2017.

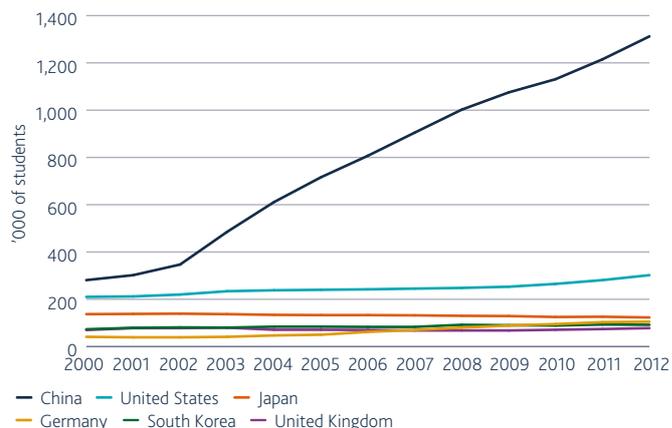
**Figure 1.** Digital bloom: China has rapidly become the world's largest exporter of value-added technology



Source: WTO, Morgan Stanley Research as at June 2016.

In order to compete successfully in the fierce high-tech export market, China has made a concerted effort to strengthen its scientific and technological capabilities. As a result, its count of STEM (science, technology, engineering and mathematics) graduates now dwarfs those of its developed-market competitors (see figure 2).

**Figure 2.** Root, branch and stem: China's voluminous headcount of hard-science graduates



Source: Science and Engineering Indicators 2016, National Science Foundation as at October 2016.

Over the past decade, this growth of STEM education has started to pay dividends. From 2002 to 2007, China's share of 'top 1% cited articles' – those most cited by scientists on a global basis was 4%. However, in the following five-year period to 2013, it leapfrogged every country bar the US to achieve a 10.8% share – and Chinese academics continue to narrow the gap (see figure 3).

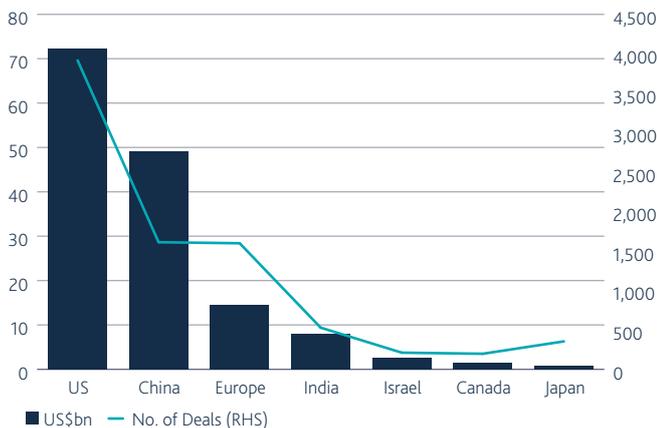
**Figure 3.** Noted: scientists worldwide are paying more attention to Chinese R&D

Rise in top-1% cited articles												
	US	China	Germany	UK	Japan	France	Australia	Korea	India	Brazil	Russia	South Africa
2002-07												
% Share	49.72	4.00	6.55	7.10	4.67	3.42	1.53	1.23	0.66	0.32	0.37	0.09
Ranking	1	5	3	2	4	6	12	13	18	24	24	36
2004-09												
% Share	45.82	5.59	6.82	6.92	4.02	3.85	1.45	1.27	0.69	0.31	0.32	0.10
Ranking	1	4	3	2	5	6	12	13	19	26	25	40
2006-11												
% Share	41.60	7.53	6.89	6.80	3.89	3.52	2.23	1.36	1.09	0.34	0.30	0.16
Ranking	1	2	3	4	5	6	10	13	15	25	28	37
2008-13												
% Share	37.23	10.79	6.46	6.25	3.72	3.42	2.61	1.73	0.81	0.32	0.20	0.19
Ranking	1	2	3	4	5	6	8	13	20	27	33	35
% share increase of Core Papers	-25%	170%	-1%	-12%	-20%	0%	71%	41%	23%	0%	-46%	111%
Change in Ranking	0	3	0	(2)	(1)	0	4	0	(2)	(3)	(10)	1

Source: "Mapping Science Structure 2015" published by Science Press, Science and Engineering Indicators 2016, National Science Foundation.

In addition to the progress it has made in the STEM disciplines, China has become a top destination for venture capitalists. It now attracts more start-up capital than Europe – the world’s largest regional economy – and is second only to the US (see figure 4). In the cutting-edge field of AI, Chinese start-ups increased their share of global AI equity investment to 48% in 2017, while US start-ups attracted 38%<sup>8</sup>.

**Figure 4.** Eastern promise: venture capitalists are deploying more capital in China than Europe



Source: EY Global Venture Capital Trends, 2015, as at October 2016.

## ‘Race of two giants’

China is clearly innovating at a high clip. On many fronts, it is narrowing the gap with the US – and on other measures, it has overtaken its rival.

For instance, Xue Lan, Dean of the Schwarzman College at one of China’s top tertiary education institutions, Tsinghua University, argues that in the field of AI, “China has secured a leading position in the top echelon in both technology development and market applications and is in a race of ‘two giants’ with the US”<sup>9</sup>.

Vs.

**Xue Lan of Tsinghua University finds that China is:**

#1

in both total AI research papers and highly cited AI papers worldwide

in AI patents

in AI venture capital investment

#2

in the number of AI companies

in the largest AI talent pool

## China has the potential to enrich the entire world if its technological advancement can complement its legacy in philosophy, poetry and art.

But China’s technological ascendance is far from comprehensive: it lags the US and Taiwan in advanced semiconductor manufacturing and semiconductor-manufacturing equipment. Nonetheless, the country continues to deliver AI innovations. For example, SenseTime, an unlisted Alibaba-funded enterprise, is a world leader in computer vision. Its consumer facial recognition systems share infrastructure with its security systems, which are used by both Chinese law-enforcement and intelligence organisations. And in the consumer market for drones, DJI, which was recently selected as the sole drone provider to the New York Police Department, is the global trailblazer with 74% market share<sup>10</sup>.

Some commentators find it easy to paint this wave of technological development as the sole product of intellectual property (IP) theft, or of top-down direction from the state. But we think that China’s strong standing in the field of research and thriving venture-capital market – not to mention innovative social networks such as WeChat – show that this is not necessarily the case.

China has the potential to enrich the entire world if its technological advancement can complement its legacy in philosophy, poetry and art. Its innovations – which to date feature primarily in fintech and social media – could eventually expedite progress in fields such as medicine and quantum computing, a field in which China is already pushing the boundaries, as evidenced by its launch of the first quantum satellite into space in 2016<sup>11</sup>.

## Historical precedents

Modern history proves that China is certainly not the first to combine military, economic and development policies to establish a position of strength. Notable examples from the past include:

- Britain’s initiation of trading links with China in 1835 – an early example of so-called gunboat diplomacy;
- US corporates in the 1950s and 1960s in Guatemala and Chile – both United Fruit and Anadarko called on US military power to maintain local trading advantages; and
- The use of industrial policy by Japan, Germany, and the US respectively:
  - Japan’s Ministry of Trade and International Finance, which at its height was one of Japan’s most powerful governmental agencies;
  - Germany’s renowned *Mittelstand* and the *Wirtschaftswunder*, which enabled strength in small- and medium-sized enterprise and the post-World War Two ‘economic miracle’;
  - The US military-industrial complex, in which governments and defence corporations collaborated for mutual benefit and was highlighted by former US President Dwight Eisenhower.

<sup>8-10</sup> Source: “Understanding China’s AI strategy: clues to Chinese strategic thinking on artificial intelligence and national security,” by Allen, C. Published in the Center for a New American Security in February 2019.

<sup>11</sup> “Why China’s perfectly placed to be quantum computing’s superpower,” by Katwala, A. Published in *Wired* on 14 November 2018.

Indeed, US multinationals, which have demonstrated the most successful industrial practices to date, could never be accused of being shrinking violets. They take the demands and wishes of local authorities and partners on board when evaluating projects before playing hardball through aggressive business tactics and the use of savvy legal teams to get exactly what they want. The Chinese government has also applied industrial policies and strategies to US investments.

### Building conventional military muscle...

Humiliated by foreign occupation throughout the 19th century, and well into the 20th, China's resolve to join the front ranks of military powers, is, well, existential. China's defence spending tripled from 2007-2017<sup>12</sup> and is expected to continue to grow at an 8-9% annualised rate<sup>13</sup>, with an increased focus on air, maritime, cyber, space and AI applications, plus unmanned vehicles and overseas logistics. It is projected to reach \$185bn in 2025<sup>14</sup>, and some researchers estimate it will amount to as much as 5% of Chinese GDP<sup>15</sup>.

However, China's focus on defending itself against a land-based invasion, which is a remote prospect at this time, is diminishing in favour of an increased emphasis on defending its overseas interests, including regional contingencies such as the South China Sea and Taiwan. Additionally, as it spends more on military technology, China has become less reliant on its fighting force in terms of manpower. The country is now operating with a slimmer, more efficient and technologically skilled armed force – which is evident in the gradual reduction of the People's Liberation Army from 4m-1m, and a further scaling back is expected as it invests further in naval, rocket and cyber forces<sup>16</sup>.

Amid the current trade tensions, the US is demanding wholesale changes be made to China's political economy, such as slashing subsidies for domestic industries and abandoning the upgrading of manufacturing capabilities, or opening up its internet sector to overseas competition. These requests cannot and will not be abided, as the authorities are dependent on preserving control over Chinese private enterprises more than any other economic resource.

Any economic concessions made by China's leaders would be cosmetic. And some observers think that changing political attitudes mean that underlying any potential trade agreements, however superficial, is likely to be an eventual move toward confrontation. According to Adam Ni, a Visiting Fellow at the Strategic and Defence Centre at the Australian National University, China will be reluctant to push back militarily for the time being. But this window will close next year as the country will feel it is able to project sufficient power in the East and South China Seas to see off US aircraft carriers<sup>17</sup>. Therefore, Beijing could be preparing for the risk of conflict in 2020 and beyond.

### ...and innovating for ballistic silicon

Who would win a military confrontation between China and the US? According to a 2015 paper from the RAND Corporation<sup>18</sup>, China could already potentially have an "advantage" or "approximate par" in six of the nine areas of conventional capability, including launching attacks on air bases or surface targets. And China could achieve air superiority, particularly by preventing its opponent from using space-based weapons. More recent studies point to the importance of a dominance in AI as the key to military superiority in the coming decades. Nevertheless, over the next five to 15 years, Asia will "witness a progressively receding frontier of US dominance," according to Gregory Allen, a Senior Fellow at The Center for a New American Security<sup>19</sup>.

### More recent studies point to the importance of a dominance in AI as the key to military superiority in the coming decades.

### Leader of the emerging world, or emerging world leader?

But China knows that achieving global hegemony requires more than military power alone. The country has learned valuable lessons from the last two World Wars, in which economic power was the decisive factor. As such, its leaders have implemented a combined military-civil integration model where researchers, companies, and government departments develop building blocks with multiple uses – much like the Defense Advanced Research Projects Agency (DARPA) in the US, which is responsible for developing emerging technologies for military use.

This domestic programme is supplemented by China's growing strength in international diplomacy, trading, technology and finance. China started flexing its economic muscles back in 2008 when it helped form the BRICS community (comprised of Brazil, Russia, India, China and South Africa). This allowed the group of rapidly expanding economies to make decisions and take action without approval from the US or the G7. It also provided attractive markets for their exports.

As alternatives to global financial institutions set up after World War II, namely the International Monetary Fund and the World Bank – which only the US holds veto power over – China has formed a number of rival institutions which are illustrative of its growing influence on the world economy. These include the China Development Bank and the Export Import Bank of China, which, along with the Asian Infrastructure Investment Bank, held more assets than the six major Western development banks combined as of 2016<sup>20</sup>.

<sup>12</sup> Source: "Understanding China's AI strategy: clues to Chinese strategic thinking on artificial intelligence and national security," by Allen, C. Published in the Center for a New American Security in February 2019.

<sup>13</sup> Source: "Destined for war: can America and China escape Thucydides's trap?" by Allison, G. Published by Scribe in 2017.

<sup>14,15</sup> Source: "Modernizing China's Military: Opportunities and Constraints," by Crane, K. et al. Published by the Rand Corporation in 2005.

<sup>16</sup> Sources: "Destined for war: can America and China escape Thucydides's trap?" by Allison, G. Published by Scribe in 2017; and "Why China is trimming its army," by Ni, A.. Published in *The Diplomat* on 15 July 2017.

<sup>17</sup> From a talk given to JP Morgan clients on 21 January 2019 by Adam Ni, Visiting Fellow at the Strategic and Defence Studies Centre at the Australian National University. Quoted in an email from Patrick Xu, CFA, from JP Morgan.

<sup>18</sup> "The US-China military scorecard: forces, geography and the evolving balance of power, 1966-2017," by Heginbotham, E. Published by the RAND Corporation in 2015.

<sup>19</sup> Source: "Understanding China's AI strategy: clues to Chinese strategic thinking on artificial intelligence and national security," by Allen, C. Published in the Center for a New American Security in February 2019.

<sup>20</sup> Source: Gallagher, K. et al cited in "Destined for war: can America and China escape Thucydides's trap?" by Allison, G. Published by Scribe in 2017.

China's recent economic, geopolitical and cultural emergence has been remarkable, especially since it has been achieved in such a short space of time. Author, Harvard Professor and former White House advisor Graham Allison has depicted the enormity of China's impact today and how it is likely to continue to grow<sup>21</sup>. According to Allison:

- China is the largest trading partner for 130 countries, including all of the major Asian economies; and
- The US accounted for 9% of ASEAN's total trade in 2015, while China accounted for 15%.

This soft power is also manifesting in China's involvement in the Asian Infrastructure Investment Bank, development of innovative 5G telecommunications technology and preferential financing for developing countries.

However, China has not followed in Russia's footsteps by taking so-called active measures in foreign elections, but its growth in soft power is nonetheless evident. This is the subject of recent research published by the Hoover Institute<sup>22</sup>, which asserts that China has launched a multi-fronted assault on the Western world through non-military means – from cultural practices through to academia, science, politics and economics.

In another challenge to the established political and economic order, China led the welcome of Russian President Vladimir Putin to the BRICS meeting that followed Russia's exclusion from the 2014 G8 gathering following its annexation of Crimea. And, amid these political flashpoints, an ongoing development initiative – the Belt and Road programme with more than 900 projects exceeding \$1.4tn – is expanding China's influence throughout the Eastern and Southern Hemispheres<sup>23</sup>.

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China's extension of soft power is not solely restricted to the economic sphere. The country has attempted to exert its influence on US policy through vigorous political efforts, lobbying and academic institutions. For instance, branches of the Confucius Institute (which is aligned the nation's Ministry of Education) and The China Association of Students and Scholars (the official umbrella organisation for Chinese pupils and teachers in educational institutions) are two means of spreading knowledge, Party perspectives and culture outside the country's borders.

## China: assertive aggressor?

Chinese progress is a legitimate cause for concern among those currently in the driving seat, but the threat it poses has likely been overstated – particularly in the soft-power dimensions of business, law courts and education. Notably, previous US administrations were acutely aware of the obstacles faced by US companies in China, and to a certain extent, the increasing influence of the Chinese government on US academia<sup>24</sup>. But in light of the overall economic opportunities at the time, they chose to let these concerns slide. After all, as in any relationship, influence is a two-way dynamic.

China's newfound assertiveness, expressed most boldly under Xi, and the US's heightened awareness of the country's growing military prowess, has reawakened existential fears on both sides of the political aisle in Washington. While not on the scale of the 9/11 attacks, the rise of China has become the subject of serious discussion, research and debate in the US Congress, with a consensus forming that something needs to be done. The current trade war is merely a by-product of the strategies being implemented and the mounting technological competition between the US and China.

## THUCYDIDES REDUX

### Trade war, technology war, or something worse?

China's technological ambitions could also be heralding a darker future. Graham Allison, Harvard Professor and advisor to the US defence secretaries in the Reagan, Clinton and Obama administrations, says the tension between the US and China is the latest staging of the Thucydides trap: the risk of armed conflict when a rising power rivals a ruling power. With its origins in the Peloponnesian War, where the ascendancy of Athens inspired a fear in Sparta that made war "inevitable", as the ancient historian put it, this phenomenon has resulted in bloodshed in 12 of the 16 cases where it has occurred in the past 500 years. His recent book, which asks whether the US and China can be in the historical minority, puts the current trade dispute between the two countries in a significantly more meaningful context<sup>25</sup>.

### The 5G frontier

But there are other ways to achieve dominance than through military might. In the ancient Chinese military treatise, "The Art of War", Sun Tzu writes: "Ultimate excellence lies not in winning every battle, but in defeating the enemy without ever fighting". This can be seen as the guiding objective of geoeconomics – using economical tools to advance geopolitical objectives.

<sup>21, 23, 25</sup> Source: "Destined for war: can America and China escape Thucydides's trap?" by Allison, G. Published by Scribe in 2017.

<sup>22, 24</sup> Source: "Chinese influence and American interests: promoting constructive vigilance," by Diamond, L. and Schell, O. Published by the Hoover Institution in 2018.

## The Chinese are moving in the direction of creating a 'smart' civilian and military society, where cities, factories, cars, and even people can stay connected with ultra-low latency and continuously improving functionality through AI, requiring a ubiquitous 5G network.

Gaining a geostrategic advantage means winning in many related fields of competition, whether that be in economics, on a military basis, or in terms of cultural influence. It also relies on a stable political environment, such as the one overseen by Xi – which allows for long-term thinking and, most importantly, long-term technological planning and development.

In terms of military strength, the US has held an unassailable position globally since World War II. Now, due to tremendous leaps in technological innovation, military techniques and resources have changed and both the US and China see AI as a means to gaining a strategic military advantage.

Henry Kissinger, a US Secretary of State during the Cold War, said in relation to China: "Far better than challenging the enemy on the field of battle is... manoeuvring him into an unfavourable position from which escape is impossible"<sup>26</sup>.

The Chinese are moving in the direction of creating a 'smart' civilian and military society, where cities, factories, cars, and even people can stay connected with ultra-low latency and continuously improving functionality through AI.

This will require continuous improvements in order to yield a substantial competitive advantage. Therefore the race to develop 5G networks has taken on a new sense of urgency. As such, the prospect of an AI-enabled America reliant on a Chinese-designed 5G network fills US defence planners with a sense of foreboding.

China's Huawei is well advanced in 5G technologies: it has outspent and out-developed Ericsson and Nokia combined in recent years<sup>27</sup>. And its North American counterparts are non-existent, with yesteryear's telecommunications giants Lucent and Nortel long gone.

Chinese telecommunications firms have dramatically increased the number of Standard Essential Patents (SEPs). These protect technology that is essential to a standard, as it is impossible to manufacture standard-compliant products such as smartphones or tablets without using technologies covered by one or more SEPs<sup>28</sup>. Huawei, along with ZTE and the China Academy of Telecommunications Technology, has produced hundreds of SEPs relating to the development of 5G over the years<sup>29</sup>.

### The AI arms race

Who is leading the way in terms of AI military innovation – the US or China? Gregory Allen at the Center for a New American Security holds that China's prospects in the AI-chip semiconductor market are strong, offering a uniquely attractive opening for their older process technology<sup>30</sup>. China hopes to use its success in AI chips to build an enduring competitive edge in the overall AI industry. It is generally accepted that Chinese firms still lag US and Taiwanese competitors in semiconductor technology. But Allen says that in regards to both AI and semiconductors, Chinese firms are closing the gap and that within five years the country will secure a "defensible competitive advantage across many AI application markets".



Illustration by David Cutler.

<sup>26</sup> Quoted in "Destined for war: can America and China escape Thucydides's trap?" by Allison, G. Published by Scribe in 2017.

<sup>27</sup> Source: "Huawei full stack AI," by Baratte, N. and Ma, C. Research published by CLSA on 19 October 2018.

<sup>28</sup> Definitions sourced from "Competition policy brief: standard-essential patents," published by the European Commission in June 2014.

<sup>29-30</sup> Source: "Understanding China's AI strategy: clues to Chinese strategic thinking on artificial intelligence and national security," by Allen, C. Published in the Center for a New American Security in February 2019.

## The future of AI could lie in machine learning, which can be achieved by processing immense amounts of data from an incomprehensible number of domains. In this light, China could have the advantage over the US in the long term.

Huawei appears to be spearheading the development of enabling technology such as 5G, and China seems to have taken the lead in commercial applications of fintech, speech and facial recognition – which can have military uses, too – and in Chinese-language information processing.

The country lags the US in many other core AI spaces, such as hardware and algorithm development, top-tier talent acquisition, international technical standards and in delivering software frameworks and platforms for machine learning, which is dominated by Google, Apache, Microsoft, and Facebook<sup>31</sup>.

Approximately 65% of the world's computers (PCs, notebooks and tablets) and 85% of mobile phones are "made in China"<sup>32</sup>. But the vast majority of the value added is still American. The iPhone, for example, is made in China but the country's contributions account for less than 2% of the cost of the phone. However, 100% of the cost of each device is counted in the US trade deficit with China<sup>33</sup>.

These are weaknesses that the Chinese are aware of and are working hard to mitigate. China ranks as the world's eighth-largest AI talent acquirer in the world, according to the most recent Top AI talent indicators, with 977 individuals compared to the US's 5,518. However, top talent may not be critical in the AI race. China's overall talent pool of AI engineers, at 18,232, compared with the US's 28,536, may suffice<sup>34</sup>.

Kai Fu Lee, former head of Google Greater China, weighs up the relative strengths and weaknesses of each contender. He sees the US as currently being in the lead, thanks to its abundance of world-class engineers. Lee points to distinct advantages for the US in areas such as innovation to progress autonomous driving, where safety issues and the sheer complexity of the manufacturing process require precise engineering expertise.

Lee claims China has a broad base of merely 'good' engineers. And he believes that the future of AI lies in machine learning, which can be achieved by processing immense amounts of data from an incomprehensible number of domains. This development path does not rely on any groundbreaking advances taking place, however, it is all down to amassing the data and having software engineers that are competent enough to decipher and collate it. On this front, he sees China having the advantage over the US in the long term, due to the deep pools of data available to its large number of engineers.

## AI: waves of innovation

Given the hype surrounding AI, it seems pertinent to explore the taxonomy of this environment. Lee breaks AI down into four categories, which he calls "waves":



### Aggregation

In the first wave, AI was used to collect data on the internet, fuelling recommendation engines. Algorithms were used to observe activity and optimise results based on consumer preferences.

The most recognised companies using this form of AI include: Google, Facebook, and Cambridge Analytica. In China, notable operators are Alibaba, Baidu and perhaps most interestingly Bytedance, an online news outlet that uses algorithms to edit news feeds.

Robert Mercer perhaps described the dominant characteristic of this first wave best, saying: "There is no data like more data". China, which has more internet users than the US and Europe put together, generates a lot of data for AI systems to learn from. In Lee's view, Baidu's AI capability is still well behind Google's but he thinks Bytedance and its counterparts could gain a real advantage from the sheer amount of data they can access. However, opportunities in this area are still limited to the high-tech sector and the digital community.



### Business

This involves mining business databases for hidden correlations that are often overlooked. The average person makes predictions on the basis of strong features – a handful of data that is highly correlated to a specific outcome – in a clear cause-and-effect relationship. But AI algorithms also take into account seemingly weak features, and can discover uncorrelated data points, which in reality can allow for more accurate predictions. By processing all of the weak features along with the strong features, algorithms can outperform humans.

This form of AI is reliant on data sets that are already structured, such as those maintained by insurance companies, which already keep records of accidents, fraud, or stock prices on file. US companies have the edge over their Chinese counterparts in this particular approach to AI due to decades of disciplined data storage. Chinese systems, on the other hand, are more idiosyncratic, and with notable exceptions like Alibaba and China Mengniu Dairy, have traditionally been neither scalable nor in a standard format (thus far).



<sup>31-34</sup> Source: "Understanding China's AI strategy: clues to Chinese strategic thinking on artificial intelligence and national security," by Allen, C. Published in the Center for a New American Security in February 2019.

 Perception

In this AI wave, algorithms essentially have eyes and ears and can recognise objects and sounds for what they are. They are capable of picking out individual words and even interpreting the meaning of entire sentences.

The digitisation of our living environment has been taking place at a steady pace through the proliferation of sensors and smart devices. Examples include:

- Amazon's Alexa, which brings digitisation to the home, and Xiaomi's voice-operated home appliances, such as air purifiers, refrigerators and security cameras
- Alibaba's City Brain, which digitises urban traffic flows
- Smartphone cameras that digitise faces to safeguard the data held on devices

All of this is leading to a marriage of digital and analogue technology – or online merging with offline.



AI that can personalise education is still being developed. For this purpose, algorithms can generate questions, thus creating homework assignments that have been tailored precisely to the student's current abilities and learning objectives. There is also the prospect of algorithms being used to grade papers, mark test scores and even provide remote tuition.

China is marginally ahead in this wave, due to the higher acceptance of data usage among consumers and a head start in technology-hardware ecosystems.

**The digitisation of our living environment has been taking place at a steady pace through the proliferation of sensors and smart devices... leading to a marriage of digital and analogue technology.**

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 Autonomous

Lee sees this as the most exciting wave of AI and provides a simple example to illustrate it. California-based Traptic has created a robot that can pick strawberries by using advanced-vision algorithms to spot red berries, check their colour to determine ripeness, and then activate a mechanical tractor-mounted arm to delicately pluck them. Swarm intelligence, which is the collective behaviour of individual and decentralised entities, is a more sophisticated example. It is frequently used to organise e-commerce orders and deliveries but can also be used for more complex tasks like painting houses, fighting forest fires, and conducting search and rescue missions.



Autonomous AI is also at the forefront of the autonomous-vehicle race, in which Alphabet, through its Waymo subsidiary, and Tesla are ahead of Chinese companies. This, Lee believes, is mainly due to Silicon Valley's head start in R&D. Going forward, Lee says that if the most intractable problems with autonomous vehicles are technological, then Google's Waymo has the best shot at solving them much faster than its nearest competitors could.

However, the Chinese government is offering a raft of incentives to help them close the gap. For instance, in the Zhejiang province, highway regulators recently announced plans to build the country's first intelligent superhighway, built with autonomous and electric vehicles in mind. Elsewhere, the Xiong'an New Area, 60 miles south of Beijing, is being transformed into a 2.5m person-strong smart city. Authorities aim for it to showcase the country's technological progress and commitment to environmental sustainability.

If new advances in fields such as computer vision are quickly disseminated throughout the industry, then far more companies would be able to compete on a level playing field. With this outcome, Lee says China would have the edge – especially since its exploration of ways to deploy more autonomous vehicles and the exponential growth in data available could accelerate the AI behind the wheel.

## Collective behaviour

In the military arena, autonomous intelligence is beginning to be applied practically. Drone technology, especially in relation to swarms, is of particular interest to the Chinese<sup>35</sup>. New developments allow drones to autonomously make decisions based on information shared throughout the swarm. This has the potential to revolutionise the dynamics of conflict and can be applied in almost every area of national and homeland security<sup>36</sup>.

China already has unmanned aerial vehicles (UAVs) that can take off and land independently, and which might even have the capacity to team up with other UAVs for multi-drone assignments. Evidence of the potential military capabilities were demonstrated in November 2016, when China put on a display of swarm intelligence by exhibiting a formation of 67 small, autonomous fixed-wing UAVs functioning as a swarm. In addition, a formation of 1000 UAVs was displayed at the Guangzhou Air Show in 2017. In the same year, the China Electronics Group Technology Corporation (CETC) claimed that swarm intelligence is the future of intelligent unmanned systems, and CETC UAV expert Zhao Yanjie characterised future intelligent swarms as a disruptive force to “change the rules of the game” in warfare. Other developments include an autonomous, unmanned, underwater glider which recently completed a three-month deep-sea exploration mission. It demonstrated its ability to support submarines engaging in military missions and detect foreign submarines. Further, an “underwater Great Wall” has been conceived, which could use UUVs to enhance China’s underwater monitoring capabilities.

## A ‘REAL ENEMY’?

In a future conflict, AI supremacy built on a solid 5G network has the capacity to deliver a decisive advantage. Chinese authorities see AI as an opportunity to “leapfrog” the US in terms of military technology<sup>37</sup>. Having the ability to blind the opponent’s command and control apparatus, for example, would give the aggressor a significant edge over its opponent. The US’s current advantages in stealth aircraft, aircraft carriers, and precision munitions could be compromised in the long term due to the entrenched business and political interests that support its military dominance today. These same backers could slow down or even prevent the US from transitioning to an AI-enabled technology paradigm in the future as it focuses on maintaining and upgrading mature capabilities rather than investing in new and disruptive systems. In essence, China perceives AI-driven military technology as a cheaper and more pragmatic way of threatening US military power than trying to develop its own equivalent of American systems.

## China’s rise is driven by a patient, multi-dimensional strategy driven by economic advancement, militaristic innovation and international influence.

The US-China trade war is the public face of a deep-seated rivalry between the world’s incumbent superpower and an emerging – and formidable – challenger. Set in the context of sustained Chinese economic strength and growing international influence, and both countries’ aggressive pursuit of technological breakthroughs that will define their strategic and military prowess in years to come, this trade war can be seen as the opening skirmish in a complex and enduring rivalry. As such, predicting a likely outcome at this point is impossible.

The best future scenario is that competition between the US and China will remain conflict-free and productive, resulting in a balance of power that accommodates each country’s interests. In this new world order, both countries would have their respective spheres of influence, continue to trade goods and services with each other and also share knowledge and culture. But in the current climate, this seems idealistic: if the endgame of the China Dream is global economic, political, technological and cultural dominance, the two countries seem destined to clash, bringing the unipolar world of recent decades to a close.

In the 1980s, the US outspent and out-innovated the Soviets, gaining an unbridgeable technological advantage which contributed to the end of the Cold War. China has learned from the former superpower’s mistakes. It is applying a laser-like focus on technological innovation, investing in fields where it believes it can gain a true strategic advantage rather than trying to match its opponent’s current strengths. This is supported by continued economic progress and a sustained application of soft power through international institutions, development programmes and academic pursuit. China’s rise is driven by a patient, multi-dimensional strategy that is supported by economic advancement, militaristic innovation and international influence.

Under Xi, China is fast becoming an adversary that Pentagon brass would probably be glad to avoid. This, not the trade war, is the real story.

<sup>35</sup> Source: “Battlefield singularity,” by Kania, E. Published by the Center for a New American Security on 28 November 2017.

<sup>36</sup> Source: “The era of the drone swarm is coming, and we need to be ready for it,” by Kallenborn, Z. Published by the Modern War Institute on 25 October 2018.

<sup>37</sup> Source: “Understanding China’s AI strategy: clues to Chinese strategic thinking on artificial intelligence and national security,” by Allen, C. Published in the Center for a New American Security in February 2019.

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