MORGAN CREEK
CAPITAL MANAGEMENT

ALTERNATIVE THINKING ABOUT INVESTMENTS

New China Perspectives

Welcome to the latest issue of Morgan Creek's ***New China Perspectives****. This issue is comprised of research from Morgan Creek's China-based investment team together with curated articles of interest. In addition to timely political and economic news covering greater China, Morgan Creek's China team seeks to provide in-depth perspectives on investing in the technology, consumer and healthcare sectors in the region. Our research leverages the "on the ground" insights of our team together with Morgan Creek's decades-long experience in covering the region. To learn more about our team and investment offerings, please email chinateam@morgancreekcap.com.*

Best Regards,

Mark W. Yusko

Mark W. Yusko
CEO & CIO

NOTES FROM THE BUND[1]

This is the third and final installment of our series analyzing China's capacity to innovate. In the prior newsletters, we discussed why China missed the initial industrial revolution, and the lessons it learned (Part 1) and traced the developmental experiences of past industrialized nations and how China's path to modernization tracks those closely (Part 2). We note the observations of a Federal Reserve Bank research economist, who states that in all those instances, rapid developmental growth happened initially under some form of autocratic government.

In this newsletter, we delve deeper and study the ingredients for technological advancement in China especially in comparison with the most technologically advanced nation on earth: the United States, as a benchmark.

China's advantage lies in its massive population. This size has helped tremendously in China's effort to scale its domestic companies as it provides big consumer markets to sell products or services to, large pools of talent to recruit from and deep capital markets to raise funds.

- Large consumer markets
  China has established a playbook utilizing its large consumer markets to nurture domestic and global champions.

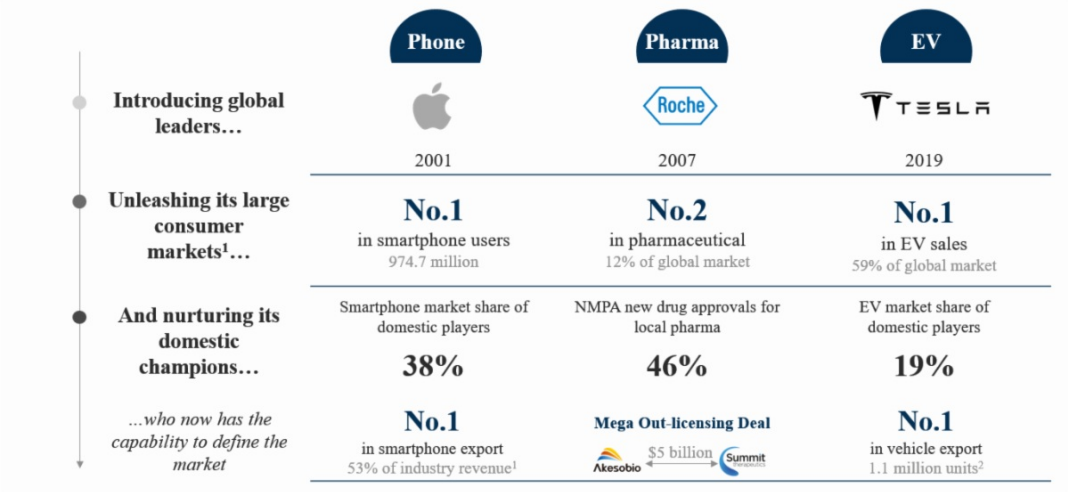

Figure 1: China's Successful Playbook to Nurture Domestic and Global Champions[2]

As the chart above illustrates, China is capable of attracting the best companies in the world in their respective segments to enter the domestic market and build their supply chain in its borders. The dual allure of its unparalleled labor cost advantages and large domestic markets means entering the Chinese market typically made economic sense to global leaders.

After the domestic market has become sufficiently mature where there is segmented demand for low and high-end products, Chinese companies will begin to enter the low-end market and start working their way up towards producing higher margin products. At the same time, Chinese suppliers will also begin to domesticate supply chains to service local customers. This transition has happened in multiple sectors illustrated above, including cellphones, pharma, electric vehicles, high-speed rail and photovoltaics segments, etc.

Given the massive profits involved both through attracting new customers in one of the largest consumer markets globally and cost savings through leveraging cheaper manufacturing, we believe it is unlikely that multinationals will discontinue their China engagements.

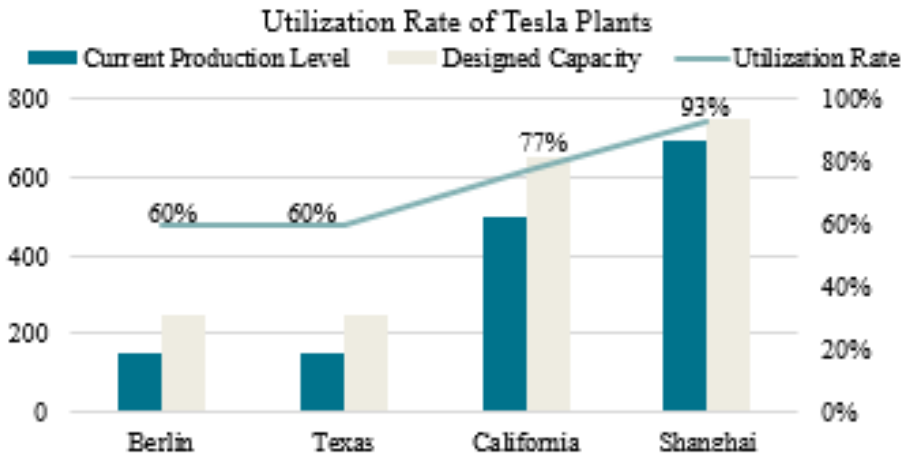

Figure 2: China's Consumer Market Size and Production Efficiency

As an example, the chart above shows the return on investment calculus for Tesla's various factories globally. Despite being a relatively recent addition – Tesla's China factory was only established in 2019 – its Chinese factory is its most profitable, and more than 90%[3] of its supply chain there is sourced domestically. Tesla is trying to replicate its Chinese success by sending their Chinese GM and engineers to its California plant[4], which has been operating for almost a decade

longer. Most recently, Tesla has announced opening another production facility [5] in China. It is possible that Tesla might not be viable without China, given that China represents ~30% of Tesla's sales and China manufactures more than 50% of all Tesla cars. Many other multinationals, including Apple, are in a similar position. Apple currently has approximately 20% of its revenues coming from China, and over 95%[6] of its products made in the country.

- Large pools of talent

  China's large population gives it a competitive advantage in possessing a massive talent pool. Where once those pools were less educated and formed the backbone of its traditional manufacturing sector, today the country graduates almost 10 million university students[7] annually. More importantly, it leads the world in STEM graduates. The chart below indicates that by 2025, China is estimated to have more than 77,000 STEM Ph.D. graduate each year, or roughly 3.3 times that of the US. We believe this increased talent will form a new foundation as China seeks to upgrade its manufacturing industry in the decades ahead.

  As important as quantity is quality: According to US News' global university rankings, China for the first time has more universities ranked within the top 2000 globally than the US, with 338 universities. Chinese state investment in higher education also means Chinese college tuitions are more affordable for students, at an average of $1,750, with an additional $2,500 living cost, compared with $10,440 for tuition and $11,510 for room and board in the US for public universities.[8]

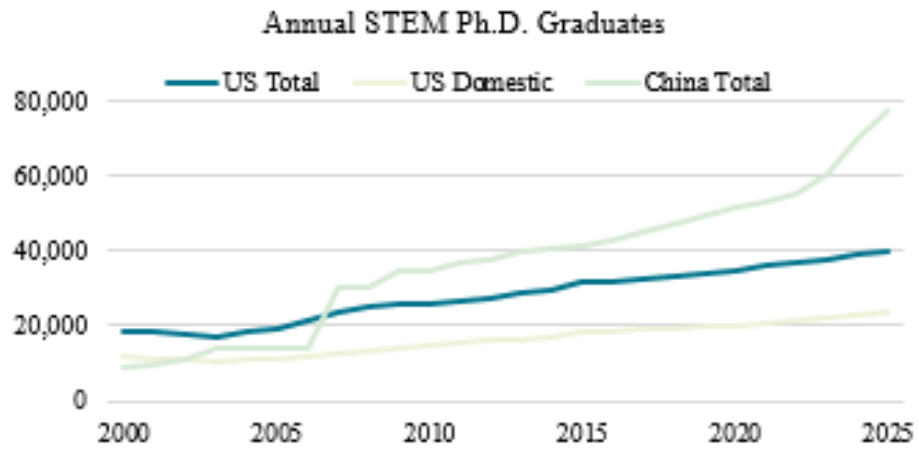

Figure 3: China Generates Nearly 80,000 High-level STEM Talents Annually[9]

Furthermore, given geopolitical concerns and China's own economic growth, there has been a reverse brain drain with overseas Chinese students returning in droves. Today, more than 80% of Chinese overseas students have returned after receiving their education overseas.

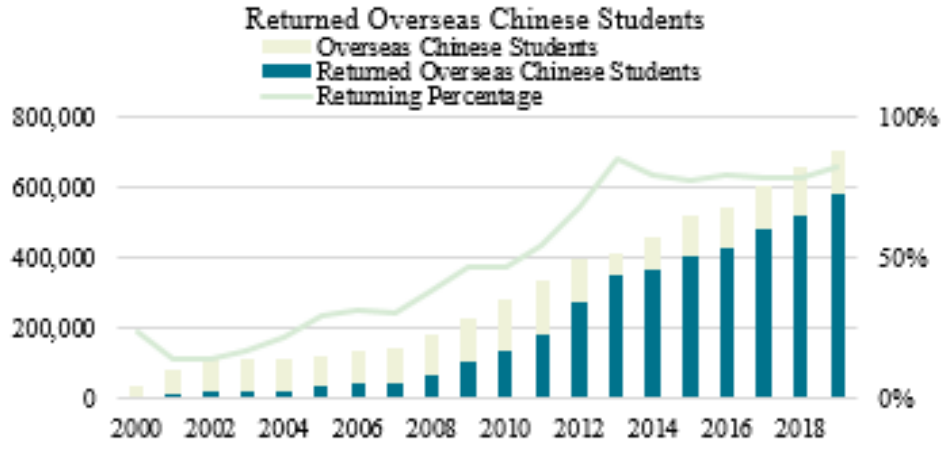

Figure 4: 80% of Overseas Students Returned after Graduation[10]

All this has borne some fruit over the past decade. China is quickly closing its gap with the US in quantity and quality (as defined by number of citations made in papers published on high quality journals) of academic research.

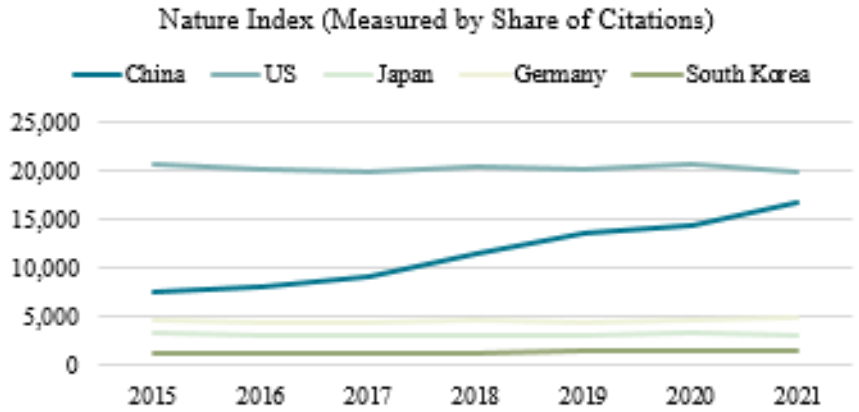

Figure 5: China Closing R&D Output Gap with the US[11]

This has created a positive cycle with German-British academic publishing company Springer Nature reporting that the number of "high-level" scientists living and working in China has surged 350% from 2012 to 2021, compared to cities in North America, Europe, and the rest of the Asia-Pacific region which roughly doubled their scientist headcounts. Consequently, WIPRO has shown that China has overtaken US in the number of international patents generated globally since 2019.[12]

All this said, the US remains by a significant margin the current technology leader globally in many advanced sectors, and academic R&D and patents, while important indicators and necessary for future technological progress, by themselves are not sufficient conditions nor guarantees of technology leadership. We believe that it does show, however that China is making the right steps forward.

- Deep capital markets

  China today is the second largest stock market by capitalization and volume of trading. The chart below shows that China generally has sufficient capital to support the development of its homegrown champions. In Q1 2023, China was also the largest market for IPOs globally.

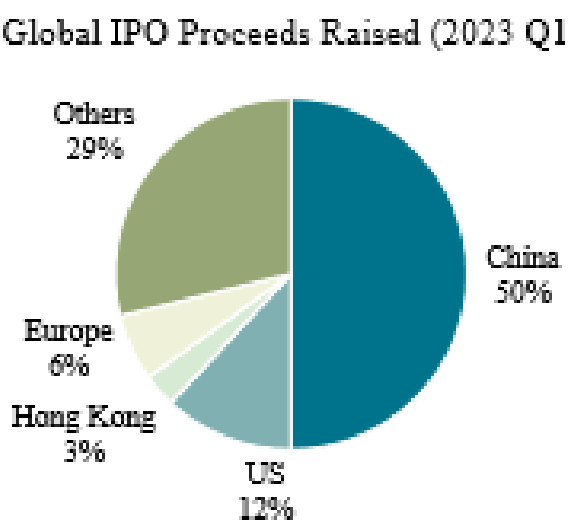

Figure 6: China's Stock Market Tops World in 2023[13]

However, the US has historically had the edge in capital markets by virtue of the fact that it has the reserve currency of the world. This has allowed it an advantage in printing money and the low interest rate environment has been advantageous for inflating asset valuations, which could be used partially for funding innovation. Boston Dynamics, one of the leading robotics companies globally, was founded in 1992 as a spin off from MIT and has never made a profit in its life – it essentially survived from subsidies from the Defense Advanced Research Projects Agency ("DARPA") and then Google[14], which had access to strong liquidity in the public markets. This funding allowed the company to continue its revolutionary work in the field of robotics for more than two and a half decades without showing a commercially viable product. It has since changed hands multiple times – to Softbank in 2017 and Hyundai Motors in 2020. In 2020, the firm sold its first product, the robot dog (Spot), and so far, the business model remains unclear. Billionaire Silicon Valley luminaries – who made their wealth building companies that went public on US stock exchanges, funded OpenAI. It was founded in 2015 and has yet to make a meaningful profit. In fact, it appears that the company's losses actually doubled to $540 million in 2022 as it looked to develop ChatGPT.[15] The company's strategic backer is Microsoft – a listed technology behemoth that can access public markets if necessary and continue to support OpenAI's operations. The list goes on: Moderna, the pioneering mRNA company, took in $10 billion of federal funding [16] to develop its Covid-19 vaccine.

These funding advantages are unique to American companies and allow entrepreneurs to take the long view in terms of experimentation and developing innovative technology, regardless of years of potential financial loss.

Chinese companies, on the other hand, have to find a business model proposition and path towards profitability within a number of years, as external capital markets are limited compared to peers in the US. Even Huawei – one of the greatest companies to ever come out of China from a technology perspective – gives their business units a timeline for profitability.

This capital advantage also extends to the consumer, where the American consumer finances most of their purchases on debt – buy now and pay later and financing from corporations (auto loans, etc.) – in a manner that is unsustainable for any other country.

This advantage will last as long as the USD remains the world reserve currency. While the US dollar is likely to retain its pre-eminent status given the lack of alternatives, strains are showing in the current system. Externally, many countries are beginning to conduct their trade in alternative currencies, including Russia, Brazil, Argentina, etc. and internally, record high inflation due to

decades of loose monetary and fiscal policies have also raised the cost of USD funding for innovation.

There has been recent concerns that China's population advantage is eroding with its aging demographic. News headlines have speculated on China's demographic time bomb and its adverse economic implications. However, it is important to note:

- China is still benefitting from a demographic dividend, albeit the window of opportunity is closing. The UN estimated China's working age population at the end of 2022 to be 980 million and by 2050, projections are that this number will decline to 767 million. However, even in this scenario, the number is still more than twice the *entire* current population of the US.

- China's changing size is also an opportunity if China approaches it appropriately. China has been making consistent efforts towards digitalization of its industries and moving up the value chain towards advanced manufacturing. China is utilizing this window of time to automate labor-intensive traditional manufacturing industries.

Lastly, geopolitics has shifted the battleground from services to manufacturing, as countries are now scrambling to reshore and friendshore critical high technology industries. The US has a lead in the consumer and services innovation by virtue of the fact that it has the largest and most developed market in those sectors globally, with China coming in second. Because the US had a lot of consumer/services data and use cases, it was able to "digitize" and innovate rapidly, examples being in the social media and fin-tech spaces, among many others. With the contest now shifting towards manufacturing, China may be for the first time competing on a more equal playing field given the robust and deep industrial ecosystem already present in the country.

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CHINA NEWS SPOTLIGHT

Chinese Builder Halts all Offshore Debt Payment on Property Market Weakness: A Hong Kong-listed Chinese real estate developer said it will suspend all offshore debt payments, citing weakness in the country's property market, deteriorating sales and constrained liquidity. "After careful consideration, the company will suspend payments to all offshore creditors to ensure fair treatment among all offshore creditors," Central China Real Estate Ltd. *Read More.*

U.S.-China Tech Battle Entering its 'Primetime' — and Generative A.I. could be the Next Frontier: Generative artificial intelligence, the technology that viral chatbot ChatGPT is based on, could be the new battleground in the battle for tech supremacy between the U.S. and China, according to one analyst. Despite the two nations seeking better relations after U.S. Secretary of State Antony Blinken met with Chinese President Xi Jinping this week, analysts said the tech tensions will continue. *Read More.*

Abu Dhabi Fund's $1 Billion Stake In EV Maker NIO Highlights Growing Arab-China Ties: An agreement this week by an investment arm of the Abu Dhabi government to invest more than $1 billion in Shanghai-headquartered electric vehicle maker NIO is the latest example of growing Arab-China business ties and an economic diversification effort by oil-rich Middle East nations. *Read More.*

Chinese Battery Giant CATL Seals $1.4 billion Deal to Develop Bolivia Lithium: Chinese battery giant CATL (300750.SZ) confirmed a $1.4 billion investment to help develop Bolivia's huge but largely untapped reserves of lithium, cementing on Sunday a partnership with the government made in January.
The agreement connects CATL, the world's largest manufacturer of electric vehicle batteries, with Bolivia's salt flats that are home to the world's largest lithium resources. *Read More.*

Innovent and RemeGen Enter into Clinical Trial Collaboration Investigating Combination

Therapy of TYVYT® (sintilimab injection) and Novel ADC Candidates for Advanced Solid Tumors in China: Innovent Biologics, Inc. ("Innovent") (HKEX: 01801), a world-class biopharmaceutical company that develops, manufactures and commercializes high quality medicines for the treatment of oncology, autoimmune, metabolic, ophthalmology and other major diseases, and RemeGen Co., Ltd. (688331.SH/09995.HK), today announced that they entered into a clinical trial collaboration and supply agreement with for the combination therapies of TYVYT® (sintilimab injection) with RC88, a novel mesothelin(MSLN)-targeting antibody-drug conjugate (ADC), or RC108, a novel c-Met-targeting ADC, respectively, as potential treatment options for advanced solid tumors in China. *Read More.*

Jiangsu Hengrui Medicine and Shanghai Hengrui Pharmaceutical Report Androgen Receptor Degradation Inducing PROTACs: Jiangsu Hengrui Medicine Co. Ltd. and Shanghai Hengrui Pharmaceutical Co. Ltd. have patented proteolysis targeting chimeras (PROTACs) comprising cereblon (CRBN) ligands coupled to an androgen receptor targeting moiety via linker. *Read More.*

[1]The Bund is a historic waterfront area in central Shanghai, where Morgan Creek's office is located. From the 1860s to the 1930s, it was the rich and powerful center of the foreign establishment in Shanghai, operating as a legally protected treaty port. The picture above is part of the historical waterfront.

[2]Sources: Bankmycell (May'23), Newzoo (Mar'23), IDC (Jan'23), IBIS World, BioCentury China Summit (McKinsey, 2021), CDE annual report (2021), EVVolumes, Counterpoint (Mar'23), CarNewsChina (May'23).

[3]Source: Tesla's China ties help EV maker bounce back from COVID chaos - Nikkei Asia

[4]Source: Tesla sends Shanghai boss and aides to jumpstart U.S. output | Reuters

[5]Source: Elon Musk: Tesla to build new battery factory in Shanghai - BBC News

[6]Source: Apple's Reliance On China Poses A Problem For The Company (forbes.com)

[7]Source: China's universities produce millions of graduates each year, but many can't get a decent job and end up unemployed or in factories | South China Morning Post (scmp.com)

[8]Source: College Enrollment Trends in the U.S. and China | US-China Institute (usc.edu)

[9]Source: CSET (Aug'21).

[10]Source: Wind Economic Database.

[11]Source: Springer Nature (Jun'22).

[12]Source: China overtakes US as leader in international patent filings - Nikkei Asia

[13]Source: PWC (Apr'23).

[14]Source: Boston Dynamics bought by Hyundai, profitability end game is still unclear (verdict.co.uk)

[15]Source: OpenAI's Losses Doubled to $540 Million as It Developed ChatGPT — The Information

[16]Source: FACT SHEET: Biden Administration Announces Historic $10 Billion Investment to Expand Access to COVID-19 Vaccines and Build Vaccine Confidence in Hardest-Hit and Highest-Risk Communities | The White House