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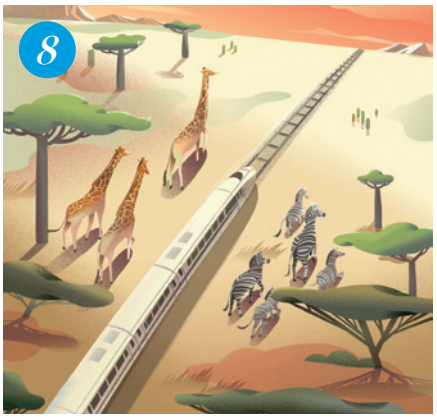
Comment

A Confucian Renaissance 6
China's success has some asking whether the Middle Kingdom is ready to lead the world—it may not be, but it can make big contributions

Globalization



Africa: A Long-term Engagement 8
China has been involved in Africa for longer than one might at first guess, but its engagement with the continent has only recently been deepening

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Innovation

Space: China on the Final Frontier 13
China may be far behind the US in terms of space development, but it is already a significant power and catching up

Brian Christian, author most recently of *Algorithms to Live By*, discusses the gaps and overlaps between humans and machines 18

China's Two-speed Auto Market 21
Like its whole economy, China's auto market is changing. Breakneck growth is now past and innovation, specifically in new-energy vehicles, is the future

Kapil Kane, Director of Innovation at Intel China, gives us the inside story of his Ideas2Reality program, which turns engineers into "intrapreneurs" 25

Economy & Finance

China's Stocks Go Mainstream 36
After several years of denials, Chinese mainland equities finally gained entrance into MSCI—but its markets have not exactly been "Westernized"

China's Offbeat Sharing Economy 41
The so-called "sharing economy" has exploded in the past year. But with borrowed basketballs and communal chargers, can its influence really last?

Dan Harris, lawyer at Harris Bricken, draws on his decades of work providing legal help to foreign enterprises in China to shine a light on China's shifting legal landscape 50

Business Barometer 46
Latest figures on economic growth and business sentiment

Company

BGI's Gene Dreams 54
Following a very successful IPO, China's biggest genetics company is continuing to evolve

Downtime

China Data 66
From video games and nuclear fusion, to wastewater and marijuana, the numbers you need to know

Xiong'an New Area 68
Earlier this year, China announced the creation of its special economic and development zone, Xiong'an New Area. What was it before, and what will it become?

Bookshelf 70
Must-read books on China, economics and history from former UBS Chief Economist George Magnus

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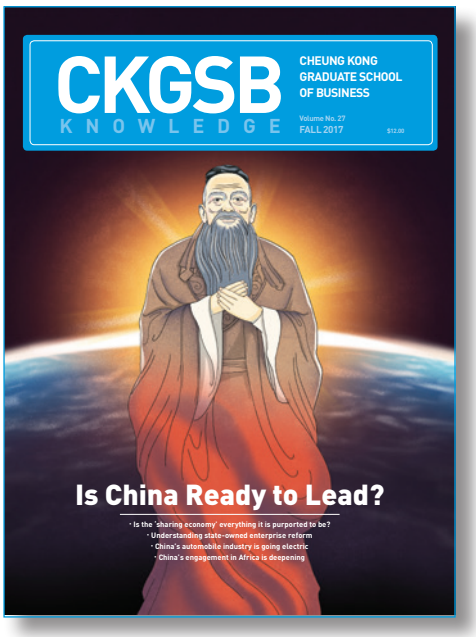
Entering a New Age

After four decades of economic growth, China has become a powerful country—its capacity as world manufacturer and appetite for raw materials and, increasingly, high-end consumer goods are now major drivers of the global economy. But while China is already taking a more active role in shaping the wider world, is it ready to be the "leader" of the global order?

We address this question in this issue's Comment (page 6). Leading the world requires more than economic strength, and even in that arena China is weaker than the headline numbers would sometimes suggest. It can, however, contribute greatly to reshaping global values, most particularly through the promotion of Confucian ethics as a counterbalance to the weak points of liberal capitalism.



Our lead story, "Piece by Piece," (page 30) delves into one of the most important, and arguably most misunderstood, elements of the Chinese economy: state-owned enterprises (SOE). Reform of this sector is vital for China to create a healthier economy, but "reform" does not, as it did once, necessarily equate to privatization or a retreat of the state. This time round, it is a strengthening of it. Another area where reform and change is evident is in China's equities markets, which MSCI formally acknowledged earlier this year. Read about the state of China's markets in "China Stocks Go Mainstream" (page 36).

This issue of *CKGSB Knowledge* is heavy on technology, science and innovation. Beyond the state-controlled economy is the so-called "sharing economy," which in China is booming this year—perhaps too much. Get a detailed analysis of the situation in "Sharing Economy on Borrowed Time?" (page 41) Another area of intense innovation is China's auto industry, which is experiencing a broad government-backed switch to new-energy vehicles—find out more in "China's Two-speed Auto Market" (page 21), and then blast off to the final frontier with "China's Rocketing Space Industry" (page 13), before taking in China's efforts at exploring and commercializing the smaller end of the universe in "BGI's Gene Dreams" (page 54), about China's biggest genetics company. We also bring you Q&As from very different areas of technology. Intel Director of Innovation Kapil Kane describes how he helps to turn Intel engineers into tech entrepreneurs (page 25), and author Brian Christian discusses man and machine on a more philosophical level (page 18).

Two more Q&As come from the more strictly business world. Gill Zhou, Greater China CMO for IBM, talks about Big Blue's continued evolution, as well as the evolution of the marketing department in the digital era (page 59). Lawyer Dan Harris of Harris Bricken draws on his decades of experience providing legal help to foreign enterprises in China to provide insight into broad shifts in China's legal landscape (page 50).

China is also, of course, going out to the world more and more these days, but this is not exactly a new phenomenon, particularly in Africa. Read about China's commitment to the continent in "A Long-term Commitment" (page 8). Finally, we leave you with a lighter, but nonetheless important, story on China's music industry, which may be on the cusp of breaking through to global consciousness, in "China Moves to the Beat" (page 63).

As always, there is more than enough in this issue to think about and to discuss. If you have any comments or opinions to contribute, we would love to hear from you. (*lzhou@ckgsb.edu.cn* or *ckgsb.knowledge@ckgsb.edu.cn*).

Yours Sincerely,

Zhou Li
Assistant Dean, CKGSB

For more insights on the Chinese economy and business, please visit the CKGSB Knowledge *site: http://knowledge.ckgsb.edu.cn/*

Is China Ready to Lead?

China offers world leadership a complementary viewpoint

China's growing economic power—combined with the perception that the US is retreating from global matters under the Trump administration—has many people calling for more active Chinese leadership in the world, albeit for different reasons. Many developing nations see China as a champion and as an investor. Western countries wish to see China shoulder a greater share of the burden of global leadership, and a growing number of Chinese citizens want China to reclaim its ancient role of international paramountcy.

But is China ready to "lead the world?" Has it reached the stage where it can set the international tone, take the central role on global issues and provide preeminent guidance toward the future? With China's pledge at the World Economic Forum in January to defend global free trade and support the Paris climate agreement, just as the United States seemed to be abdicating its roles in both arenas, the answer for some was a "yes."

That may be a premature assessment.

Perceptions and Reality

Economic strength, while important, is far from the sole factor in determining a nation's global influence. In the early 1800s, China was the world's largest economy, but the country projecting itself around the globe was a small island nation in northern Europe, the United Kingdom. And although the United States overtook the UK as the world's largest economy around 1890, it didn't become the globally dominant power until after World War II.

China, of course, has only recently reclaimed its position as an economic powerhouse. The foundations of that powerhouse economy are actually weaker than they seem for several reasons, including the following:

> Confucianism has great potential to offer a new dimension to the world's common values system

1) *Shifting Gears:* After three decades of astounding growth, the Chinese economy is slowing down. Since the 2008 World Financial Crisis, China has been pushing to switch its economy from being export and investment-driven to consumption and innovation-led. Such fundamental changes do not happen overnight.
2) *Big Economy and a Large, Poor Population:* Although China in absolute terms is the second-largest economy behind the US, it ranks only 71st in per capita GDP terms, close to the level of Mexico and Kazakhstan. People can be misled about China's wealth if they only see Shanghai's futuristic skyline with its growing forest of supertall skyscrapers. They may find it hard to believe that almost 11 million people in China lived on less than $3.10 a day in 2013, notwithstanding the Chinese government's historic achievements in lifting more than 700 million people out of extreme poverty (the World Bank's poverty line is $1.90 per day). The fact is, China's economy is not yet rich and is far behind that of Japan, which is both rich and "old" while China is becoming "old" before it is rich.
3) *Constrained Market:* Reform of the inefficient state sector lost momentum in 2008 when China undertook massive stimulus spending via state-owned enterprises (SOEs), to stabilize the economy. Inefficient SOEs suck resources from the private sector. According to Gavekal Dragonomics, a Beijing-based economic consulting firm, state companies obtain almost 30% of all loans but contribute less than 10% of GDP.
4) *Trapped Redback:* Despite the acceptance of the RMB by a handful countries as a settling currency for trade with China, the "redback" is still under strict control and is not yet fully convertible. Because of the government's emphasis on maintaining financial stability, full convertibility of the RMB cannot be expected any time soon. Envisioning an economy with such a tightly controlled currency as ready to set global policy is difficult.

But while China may currently lack the capacity to lead the world, that does not mean it has nothing to contribute to global leadership. Far from it.

Global Problems, Chinese Solutions

The discussion about China's leadership role in the world is not simply the result of the expansion of the Chinese economy, although that is important. It also stems from a parallel crisis of faith in the current global order. The fall of Leman Brothers in 2008

triggered a new era of skepticism toward capitalism.

The surprise success of Thomas Piketty's 2013 book, *Capital in the Twenty-first Century*, describing the return to wealth inequality, is another sign. Indeed, Piketty argues that the progressive concentration of wealth is an inherent feature of the liberal capitalist system. That should come as no surprise given the explicit responsibility of companies to shareholders rather than to society.

After driving economic growth for the past few centuries, capitalism has been increasingly challenged on how social good, at national and global levels, is created and maintained. In this regard, however, China has much to offer to the global discussion—specifically, values found in traditional Chinese culture, most particularly Confucianism.

A Chinese Renaissance

Confucianism is commonly perceived as a philosophy of hierarchy that favors the rulers. But growing interest in Chinese culture, a bi-product of China's economic success, means more people are going back to ancient texts to rediscover the true values of Confucianism. Some compare this to the revisiting of Greek and Roman classics in Renaissance Europe.

The foundations of Confucianism are the Five Constants: Humanity, Righteousness, Propriety, Wisdom and Sincerity. (They used to be translated as Benevolence, Justice, Order, Knowledge and Integrity.) Overall, there is an emphasis on humanity and harmony, and especially on the greater good of society. These are the exact aspects that liberal capitalism is accused of lacking—indeed, the lack of concern for the little guy underpins the recent global backlash against the "elites."

Confucianism has great potential to offer a new dimension to the common values system of the world because of its nature and history.

1) *A Philosophy for All:* Professor Tu Weiming, a world leading scholar of Confucianism, suggests that the core Confucian values of humanity and propriety can be new parameters to add into universal values. One can become a Confucian Christian, Muslim or Buddhist. As Professor Tu suggests, the values of compassion, social justice, moral standards and sense of responsibility in the revised Confucianism are complementary to those of rationality, individual freedom and human rights emphasized in the Western tradition.
2) *Re-engagement at Home:* Today, people at all levels of society in China have re-engaged with national history and Confucianism, from the very top—Xi Jinping delivered a keynote speech at the 2,565th Anniversary of Confucius' Birth in 2014—down to the bottom, where schoolchildren are learning the basics of Confucian morality. Xi often quotes Confucius in his speeches. In his 2014 speech, he stated that "contemporary human beings face such outstanding problems as widening wealth gaps, endless greed for materialistic satisfaction and luxury, unrestrained extreme individualism, continuous decline of social credit, ever-degrading ethics and increasing tension between man and nature." He encouraged people to find answers to those issues by leveraging ancient wisdom, including Confucianism.
3) *Asian Origin, Global Impact:* Thanks to China's increased importance in the world and Tu's influence in academia, the World Congress of Philosophy, held every five years, will take place in Beijing next year. According to Tu, not only were people in Japan, Korea and Vietnam once strongly influenced by Confucianism, but so were some of the Enlightenment's great thinkers such as Voltaire, Quesnay and Leibniz. In Tu's view, traditional Asian values can become a new set of values for the world. Indeed it is interesting to notice that Confucianism is gaining popularity amongst the younger generation in the West—Chinese philosophy is now one of the most popular courses at Harvard, third only to "Introduction to Computer Science" and "Principles of Economics."

Common Aspirations

Some in the West view the effort to reconnect with the basics of Chinese culture with skepticism. Is it sincere? Does it include the possibility of Samuel Huntington's "clash of civilizations," a springing of the Thucydides trap by cultural nationalism?

This fear is misplaced. China's contribution to the world of its ancient philosophies does not mean "taking over" in any sense of the phrase, but rather the emergence of a new, more cooperative and inclusive form of the global values system that marries the technology, progressiveness and individualism of Western liberal capitalism, with the moral temperance, humanity and mutual responsibility of Confucianism. This is contrary to Huntington's prediction of a clash between what he called "Sinic Civilization" (China, Korea and Vietnam), and "Western Civilization."

But the challenge of sharing Confucianism with the world falls on the Chinese. Since the time of Confucius in roughly 500 BCE, and especially since Confucianism became the state philosophy in the Han Dynasty, the ideas of Confucius have been interpreted and modified many times. Importantly, it was the object of criticism in mainland China for almost a century.

Today, there are many versions of Confucianism in China and in other parts of the world. Through more exchanges between government officials, academics and business people, China needs to become better at articulating the core values of Confucianism among its own people as it starts engaging in serious dialogue with other nations on the global stage.

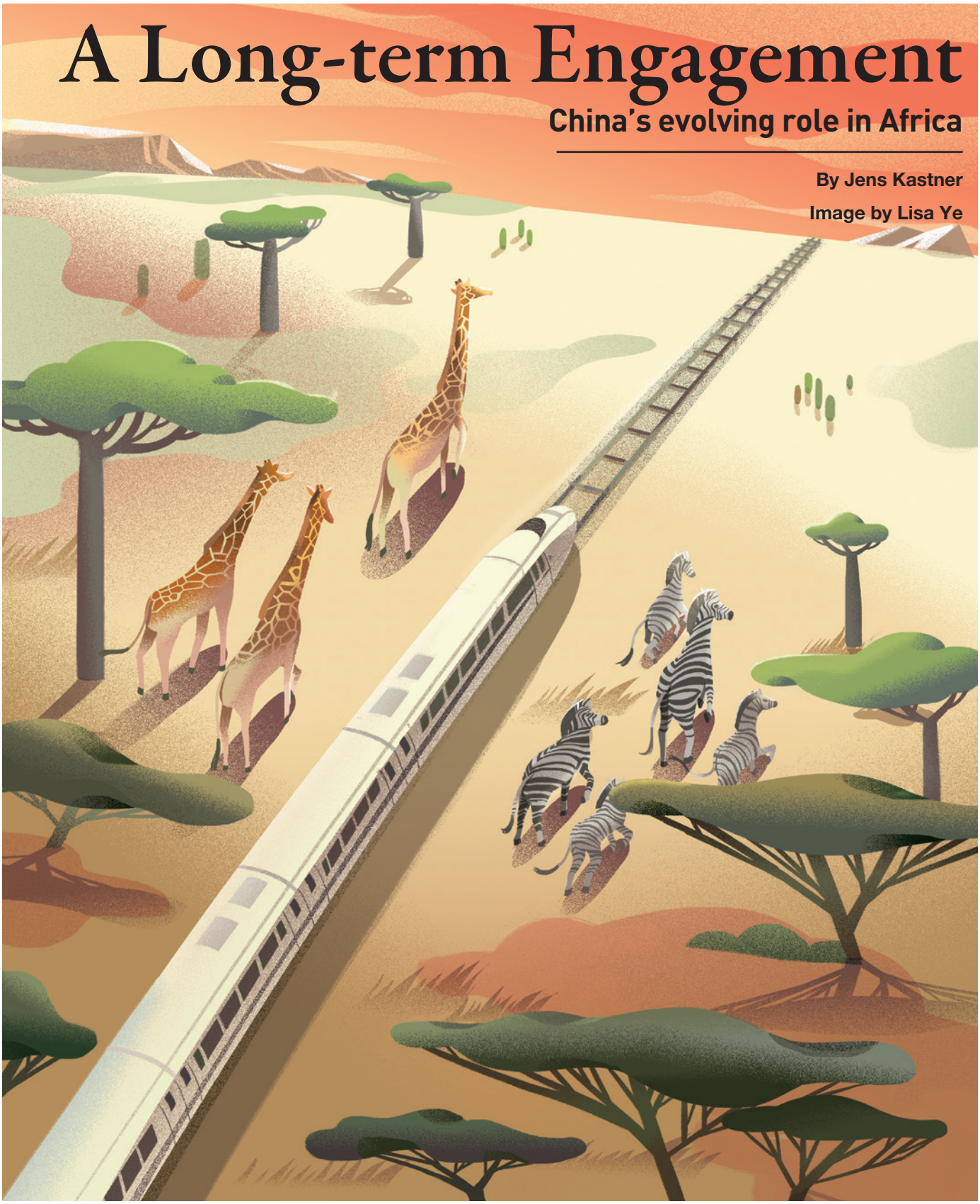
Regardless of the calls for China to take on global leadership, the reality is that it will take years, or even decades, before China's economy is sufficiently strong and further reforms have taken root. On the cultural front, however, China now has an opportunity to start a dialogue with other major nations by rediscovering its ancient values. Its concept of *Tianxia*, or "all under heaven," may offer a new and universally accepted perspective as the world re-globalizes, with or without China's leadership. — *Zhou Li*

A Long-term Engagement

China's evolving role in Africa

By Jens Kastner

Image by Lisa Ye



China has been quietly involved in Africa for decades, but it is only recently that the relationship has taken on dramatic importance, both economically and politically

Fortunately, no one was injured when a $12 million bridge being built by a Chinese firm in Western Kenya collapsed before it was opened last June, though the incident was an embarrassment for Kenyan President Uhuru Kenyatta. Then campaigning for re-election on policies that included infrastructure development and Chinese partnerships, he had been to "inspect" the Sigiri bridge as part of his campaign only two weeks before.

Shortly afterward, the Chinese-built Nairobi-Mombasa rail project opened 18 months earlier than planned. The 470-kilometer (290 mile) line slashes travel time to four-and-a-half hours—half of the time required by bus—but the $4 billion price tag raised eyebrows. Critics claim the cost was inflated because the project was rushed for political purposes and now risks saddling the nation with monstrous debts to China for decades to come.

Although Kenyatta won re-election in August, the policy of Chinese engagement with Kenya's economy is clearly being questioned. This stands in contrast to Ethiopia where a new Chinese-built railway, also costing $4 billion, links the capital city, Addis Ababa, to the port of Djibouti on the Arabian Sea.

With services still ramping up, the line promises to cut transport time between the two locations from three days to 10 hours. The hope is that Africa's first fully-electrified cross-border line will at last provide access to global shipping lanes for Ethiopia just as the east African country is developing into a textile hub.

The two tales reflect the complexity of China's expanding involvement in Africa. Total Chinese investment in the continent reached $3.5 trillion by the end of 2015, nearly seven times the 2007 figure. In the first six months of 2017, Chinese foreign direct investment (FDI) into Africa was $1.6 billion, up 22% from a year earlier, while imports from Africa jumped 46% to $38.4 billion, according to China's Ministry of Commerce (MOFCOM).

Altogether there are around 10,000 Chinese firms operating in Africa, 90% of them private, according to a recent report by McKinsey. The same report also estimates that Chinese firms already handle 12% of Africa's industrial production, valued at $500 billion a year.

But like high-profile infrastructure projects, private ventures can have mixed results, says Jilles Djon, Director of Operation at the Shanghai-office of the African Chamber of Commerce (AFCHAM). In the two years Cameroon-born Djon has held the position of AFCHAM's Director of Business Operations, he has seen more individual Chinese entrepreneurs fail in Africa than succeed.

"Some cut corners by not paying for feasibility studies and some make the mistake of entering multiple African countries at the same time," Djon says.

Successes, however, are impressive. In 2016, jobs created from Chinese FDI projects hit an all-time high of 38,400, more than double the number in 2015 and more than three times the number created by the next biggest investor, the US, according to EY (formerly Ernst & Young). More importantly, Chinese firms are bringing capital investment, management know-how and entrepreneurial energy, all of which are helping to accelerate the progress of Africa's economies.

"In the past, China saw Africa only as a market for Chinese-made goods or a source for raw materials for the Chinese economy, but that has been changing amid different initiatives by the Chinese government to encourage companies to go abroad, such as OBOR [One Belt, One Road]," says Djon. "This, in turn, makes more Chinese private sector players willing to put up with the risks of entering the unknown."

Depletion to Development

Africa's 54 countries comprise an area more than three times the size of China, and Chinese interest varies enormously by geography. Companies engaged in resource extraction—mining, petroleum, timber—for export to China are concentrated in Angola, Congo, Guinea and Zambia as well as South Africa.

Manufacturers have been drawn to populous Nigeria and Ethiopia, on opposite coasts. Agricultural producers focus on Kenya. There also is considerable engagement

north of the Sahara desert: almost a quarter of Chinese FDI projects in Africa in 2016 were in Egypt, according to data compiled by EY.

Over the last decade, the focus has moved from resource extraction and farming toward manufacturing. Benjamin Cavender, Associate Principal with Shanghai-based China Market Research, who has frequently visited Africa on behalf of international investment funds, attributes the change to several factors.

"Many companies have trouble manufacturing cheaply in China because wages have risen," Cavender explains.

Another reason is that African countries' have high import tariffs, especially on electronics. This makes Africa-based production more attractive. Owing to weak local supply chains, manufacturing focuses on assembly of imported parts of electronics, home appliances, vehicles, fashion and footwear in Ethiopia, Nigeria and South Africa, Africa's largest markets.

> Power outages are commonplace in Africa, but [Chinese-made] refrigerators will keep the food fresh without electricity for up to three days
>
> Benjamin Cavender
> Associate Principal
> China Market Research

Other drivers have been the devaluation of African currencies versus the RMB, as well as the EU's extension of preferential treatment to exports from Africa compared to exports from China. Cavender also sees tremendous opportunity for growth in the local markets themselves, with Chinese companies tending to adapt to local needs faster than Western peers.

He points to Hisense, a Chinese home appliance-maker, as an example. The company designs refrigerators specifically for African needs by making the freezing temperatures much lower than usual. "Power outages are commonplace in Africa, but that kind of refrigerator will keep the food fresh without electricity for up to three days," says Cavender.

Likewise, the overwhelming success of Chinese mobile phone brands in Africa is built on localization. Data from the India-based technology consultancy Counterpoint Research shows affordable mobile device brands Tecno and itel, both owned by Shenzhen-based Transsion Holdings, took the third and first spot respectively in the African mobile market in the third quarter of 2016. Taken together, Transsion has grabbed 40% of the African market, out-competing much bigger opponents like Samsung.

"Chinese smartphones and feature phones have bigger batteries because electric sockets for recharging may not be readily available to the African consumer," says Shobhit Srivastava, Research Analyst at Counterpoint. "Similarly, these phones have two or three slots for SIM cards rather than one, as signal coverage remains patchy and a substantial number of Africans commute across borders."

However, most phones are made in China and shipped over to Africa. Srivastava notes that while sales of mobile phones in Africa are likely to continue doing well due to the continent's relatively low smartphone penetration rate of 50-60%, manufacturing such complex devices in Africa is likely some ways off.

"You would not readily set up a factory if you cannot even source basic things such as battery chargers locally," Srivastava says.

History, Diplomacy, Economy

China's involvement in Africa has received much recent coverage, but it is not entirely a new phenomenon. One of the earliest contacts was by famed admiral Zheng He, who made a once-off voyage to Africa in the 15th century. But direct involvement remained minimal before the modern era.

When Mao Zedong declared the People's Republic of China in 1949, most of Africa was controlled by Western colonial countries, which had subjugated the continent in the 19th century. In the early years of the PRC, China used aid to spread the Communist message and to challenge the international influence of its rival, the Kuomintang-dominated government based in Taiwan, which still claimed dominion over the mainland.

"Their civil war became a diplomatic war, fought in the halls of ministries of foreign affairs across the third world," writes Deborah Brautigam, author of *The Dragon's Gift*, published in 2009. "Ideology and political strategy were then the primary thrusts behind China's extensive aid program."

China's financial help has also clashed with Western efforts, not least because African leaders often preferred China's "non-interference" policy. This generally means it does not link human rights or governance issues to aid and economic cooperation.

A key event in crafting non-interference while increasing investment was a 1995 Africa trip by Zhu Rongji, who became China's Premier three years later. Zhu visited the Tanzania-Zambia (Tan-Zam) Railroad, the largest and most expensive foreign aid project China had undertaken up to that time.

The 1,162-mile long railway was constructed in the early 1970s to upstage the Soviet Union's foreign aid efforts in the region. According to John F. Copper, an

American political scientist and the author of *China's Foreign Aid and Investment Diplomacy*, Tan-Zam was a resounding political success for China, but a practical nightmare, suffering from construction issues, frequent engine breakdowns and financial losses. But Zhu Rongji deftly turned the railway's shortfalls into an opportunity for engagement.

"When Zhu visited in 1995, he cited the problems the Tan-Zam Railroad had encountered and promised to do something," said Copper.

Then-President Jiang Zemin toured Africa the next year. He later spearheaded the Forum on China–Africa Cooperation (FOCAC), which paved the way for the rise in Chinese investment in Africa. FOCAC has been held five times since 2000, bringing together more than 80 ministers from China and 44 countries and representatives from more than a dozen international and regional organizations. China's aid pledges made within the framework of FOCAC included building economic zones in Africa that attracted considerable funds and were effective in promoting economic growth.

According to Copper, the idea comes from the Chinese development playbook. Most prominent was the special economic zone (SEZs) initiated by the Deng Xiaoping reforms in the late 1970s, which attracted foreign capital and fostered economic growth. The SEZs have been a huge success, and building such zones abroad would expand China's trade opportunities.

The first African SEZ was established in Zambia in 2007. There are now seven zones: in Algeria, Egypt, Ethiopia, Mauritius, Nigeria (two), and Zambia.

"The bulk of Chinese investment goes into zones and industrial parks, where there is cheap power because of [Chinese-built] hydro dams and low taxes," said Charlotte King, Africa Lead Analyst of the Economist Intelligence Unit, a UK-based think tank. "These zones embody China's approach: paving the way in Africa with help of government-government MOUs [Memorandums of Understanding] and letting the private sector doing the heavy lifting."

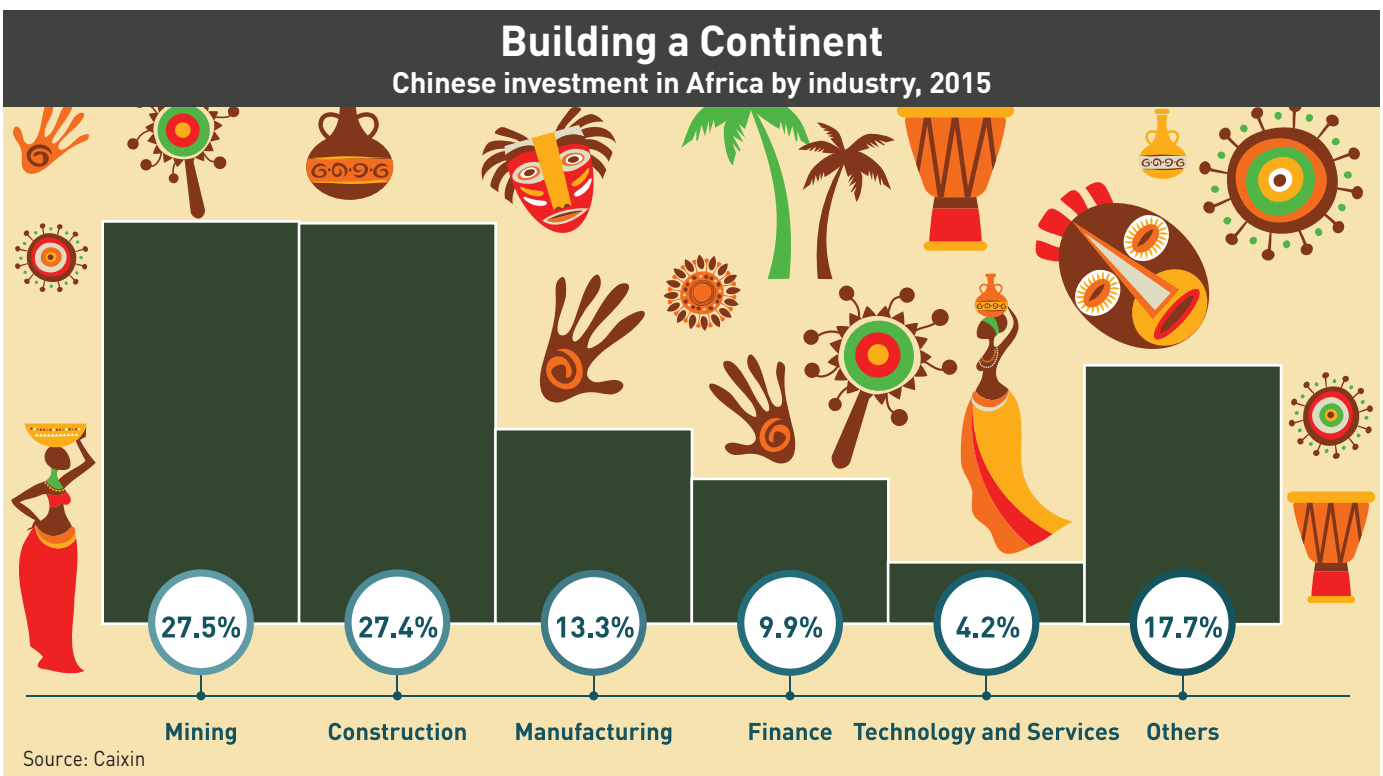
Uncharted Territory

As China's momentum in Africa has picked up, so too has the need to expand beyond economic involvement. A key event marking the deepening of China's long-term commitment came in July, when China dispatched military personnel to set up its first-ever overseas base in Djibouti, the small, but strategically-placed country on the Gulf of Aden.

China's agreement with Djibouti establishes a military presence in the country until at least 2026, with a contingent of up to 10,000 soldiers, according to international current affairs magazine *The Diplomat*. Its stated purpose is to resupply navy ships taking part in peacekeeping and humanitarian missions off the coasts of Yemen and Somalia.

Another apparent aim reflects increasing risks: to be ready to evacuate Chinese nationals from the region. China has already been forced to do this in recent years during the Yemen and South Sudan civil wars, as well as from Libya, when Western coalition forces toppled Muammar Gaddafi. But there are additional, even longer-term considerations in play.

"Although China will not say so, the Djibouti base extends its global power as its blue water navy needs support facilities there and in other parts of world," says



On the platform of the Chinese-built Ethiopia-Djibouti Railway

David Shinn, a professor who served as US Ambassador to Ethiopia and Burkina Faso. "Depending how China uses the Djibouti base, it may signal the end of the non-interference policy," he adds.

One pressing question stemming from China's engagement is if it is helping stabilize Africa, which, unfortunately, is accustomed to a certain amount of turmoil. Western voices often accuse China, with its policy of non-interference, of fueling corruption and civil wars in Africa. They also accuse Chinese FDI of exploiting Africa's weak environmental regulations. African voices also often decry the loss of jobs resulting from Chinese imports flooding the market and the low wages Chinese firms active in Africa pay to local employees.

Shinn, in his opinion, says that the short answer is yes, China is helping to stabilize Africa. However, the full picture must include the risks associated with the large trade surpluses China has developed with African countries in recent years, except those exporting natural resources to China.

"If that trend continues it could be harmful to Africa," Shinn says. "The other issue is that there are so many value-added goods coming in from Asia that it makes it difficult for African manufacturers to compete." Neither the export nor import issues are close to being resolved.

Osita Agbu, Professor of International Relations at the Nigerian Institute of International Affairs, has a different take. According to him, the trade deficit is not dangerous as it reflects the importation not only of Chinese consumer goods but also machinery and equipment needed to make African economies reasonably competitive.

"The point is that while China does have a big role in Nigeria, we never had serious problems with them," Agbu says. "The Chinese are setting up the Tinapa Free Trade Zone in Calabar [in southern Nigeria] and the Lekki Free Trade Zone in Lagos [Nigeria's largest city with a population of some 16 million]. With their ports, warehouses and connecting infrastructure, these zones will ensure international transactions that will be good for the future of Nigeria, as well as that of the whole west coast of Africa."

Positive, but Uncertain

The balance currently seems to be a win-win. A recent survey by pollster Afrobarometer showed 63% of 56,000 people polled in 36 African countries felt that China's influence in their countries was somewhat to very positive. At the same time, the July McKinsey report showed that nearly a quarter of the Chinese firms in Africa said they had covered their initial investment within a year or less.

The main threat to China's growing relationship with Africa is probably instability in African countries. For example, Kenyan President Kenyatta, who was embarrassed by the Chinese bridge collapse, won re-election in August in a contest that was then annulled by the Kenyan Supreme Court.

Tensions escalated with many fearing a repeat of the 2007 election standoff when a disputed presidential poll resulted in the deaths of more than 1,000 people and weeks of bloodletting. And it is important to keep in mind that Kenya is viewed as one of the more politically stable of Africa's countries.

But Copper, the old African hand, downplays fears of such political mishaps derailing the long-term China-Africa cooperation. "This project is so big and has been so successful it can no doubt weather a few storms," he says.

China's Rocketing Space Industry

Another player arrives at the final frontier

By Helen Roxsburgh

Image by Beibei Nie

China's space program is still far behind that of the United States, but it has fast caught up with other nations. The implications of China's presence in space are far-reaching, in terms of economics, technology and the military

When the 2,600-pound goddess of the moon finally let her jade rabbit out, it first turned a victory circle on the powdery lunar regolith before trundling away. The goddess was *Chang'e 3* (from Chinese mythology), an unmanned lunar lander, and the jade rabbit was *Yutu*, a lunar rover. The day was December 14, 2013, and as *Chang'e 3* touched gingerly down, it marked the first soft landing on the moon in almost four decades—and a milestone in the development of China's growing space power.

In an age when governments and private companies alike are set on human exploration of Mars, another moon landing may seem like back-page news. China, however, has long viewed its space program as important to bolstering national prestige and influence, boosting national defense, and promoting domestic industries and economic realignment.

"Exploring the vast universe, developing space programs and becoming an aerospace power have always been the dream we've been striving for," President Xi Jinping said on China's first Space Day on April 24, 2016. That date was the anniversary of the launch of China's first satellite, the *Dong Fang Hong I* (The East is Red I), which reached orbit in 1970.

Beijing arrived late to the final frontier, but is making ambitious efforts to catch up. By 2018, it aims to send a probe to the dark side of the moon—the first-ever such trip—and to put astronauts on the moon by 2036.

While space may be the most difficult environment to conquer, the challenges are not only technical. China must compete against more established players, allay international security fears, as well as balance the considerable cost of a space program against other considerations, such as public opinion concerned about a slowing economy.

Looking to the Stars

China's celestial endeavors date back seven decades. In 1956, China developed its first rocket and missile research institute—two years before the creation of NASA. In the early years of the People's Republic, China's space program was given significant support by Mao Zedong, who saw it largely as a military undertaking.

Chinese engineer Qian Xuesen was known as the "Father of Chinese Rocketry." He studied in the United States in 1935 and was later recruited to Caltech where he worked on developments that included the founding of the Jet Propulsion Laboratory. When he returned home in 1955, he helped lead a nuclear weapons program that led to China's first successful atomic bomb and hydrogen bomb tests. He also headed China's ballistic missile program, and then, naturally, the early Chinese space program.

Despite this early start, China's focus on space lapsed during the following decades of turmoil. It wasn't until the 1990s that China's space program began to accelerate. In 2003, China became the third country to put a man in space with its own rocket (after the Soviet Union and the US). In 2008, Chinese astronauts made the country's first spacewalk—and momentum has been growing ever since.

"The space-science program in China is extremely dynamic and innovative," Johann-Dietrich Wörner, Director General of the European Space Agency (ESA) said recently at a Paris meeting. "It's at the forefront of scientific discovery."

Today, China has more than 100 satellites in space, launched mostly from locations in the south of the country, including the newly-built Wenchang Satellite Launch Centre on Hainan Island. Its most recent successful launches include the Long March 7 rocket last July. In 2016, it conducted a total of 22 space missions, tying with United States for the country with the most launches.

"China's success is in laying out a long-range plan and sticking to it," says John Logsdon, Professor Emeritus of Political Science and International Affairs at the George Washington University. "China's various Five-Year Plans for its space program have been made public and executed. It's about having a long-range vision that space is an important area of competence and capabilities, and step-by-step developing world-class technologies and capabilities."

Long-term planning was evident in April when Tianzhou-1, China's biggest and heaviest spaceship to date, was launched. It docked with the Tiangong II space lab, launched last September, and conducted in-orbit refueling—a challenge at the edge of technical capacities in space. While the Soviet Union was the first to pull off docking between unmanned ships in 1967, in-orbit refueling is an engineering feat that has only been completed a handful of times.

The launch of Tianzhou-1 is a crucial step towards two of Beijing's most important goals: to send a rover to Mars by 2020 and to launch and resupply a manned space station by 2022. China is also testing the ability of astronauts to stay on the moon for extended periods. A current experiment has volunteers live in a "simulated space cabin" for 200 days at a time, helping scientists understand what is needed for humans to remain on the moon for long periods.

Power Vacuum

Space programs have always been closely linked with international relations, defense and military goals, and China is no exception. China's answer to NASA is the state-run China National Space Administration (CNSA), established in 1993, which holds responsibility for planning and developing space activities.

Tian Yulong, CNSA's Secretary General, told an international conference in April that China has signed more than 100 space-cooperation agreements with 30 countries and space agencies. But even with this international collaboration, China has had to develop its own domestic talent from scratch, with the talent pipeline centered on the prestigious Beijing University of Aeronautics and Astronautics.

"The failure of groups like NASA to work with China has to some extent incentivized and motivated China to do more themselves on growing talent, as a matter of domestic pride and sustainability," says Richard Suttmeier, an expert in China's science policy.

China has also been an enthusiastic participant in international training programs, including a nine-week summer program run by the International Space University.

"The summer program brings together people from around 26 different countries for an intensive program on all aspects of space," says Logsdon, "China has been the largest participant for the last ten years. Of the 120 people there this year, 25 are Chinese. Sending people for that kind of training is just one example of China's focus on developing human capabilities."

China is also a member of the UN Committee on the Peaceful Uses of Outer Space and the UN Platform for Space-based Information for Disaster Management. For many decades, however, China's space program has raised suspicions because of its military links.

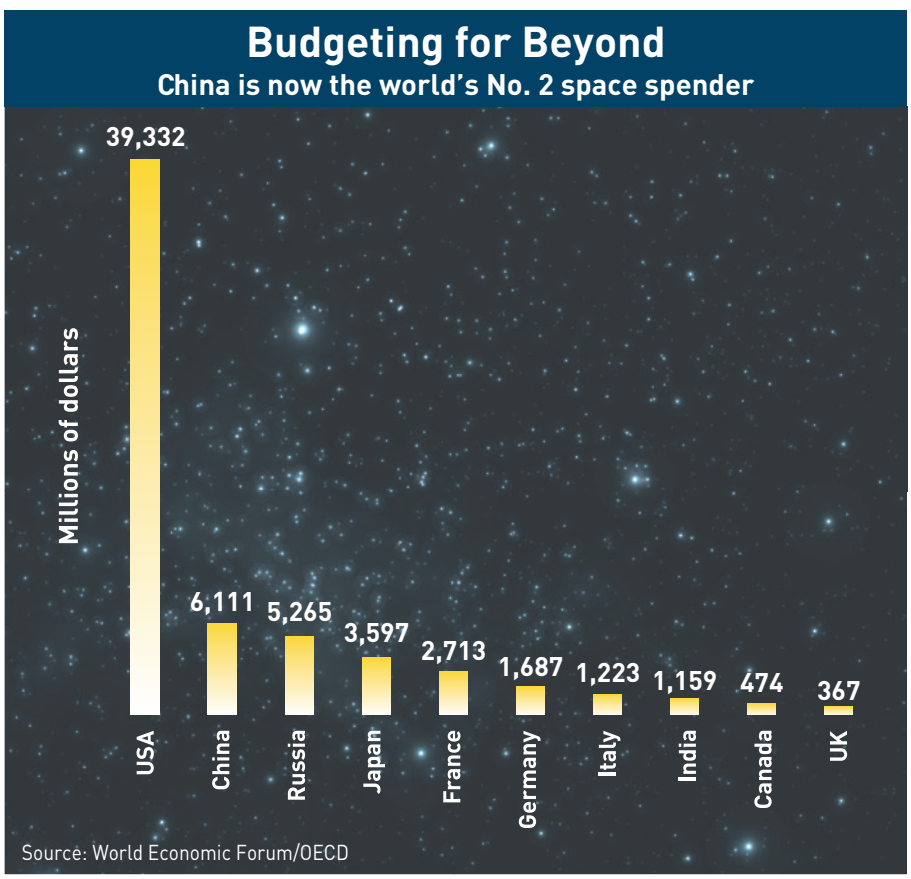
"China's space capabilities are closely linked to its military," says Dean Cheng, Senior Research Fellow at The Heritage Foundation. "The Ministry of Industry and Information Technology (MIIT) is in overall charge of China's space industries, which are all state-owned enterprises. MIIT is also in charge of the defense industrial complex. China's space launch facilities are also all run by the military."

This has made some international agencies wary of working too closely with Beijing. Others fear China might allow its space program to be used by countries with more aggressive purposes.

"The major concern is that China [could] become a country supporting things like missile development in places like North Korea and Iran," says Denis Simon, Executive Vice Chancellor of Duke Kunshan University, and an expert on Chinese science policy. "The more China becomes embedded in the larger fabric of the global space industry, the more responsibility China has to take for being cautious and vigilant that its technologies do not get used for nefarious purposes."

Earthly Challenges

Even with the rapid pace of advancement in China, conquering space is no mean feat—it is fraught with danger, both technical and political, and failures are inevitable. Last



July, China's launch of its new heavy-lift rocket, the Long March-5 Y2, failed while carrying its heaviest-ever satellite. This failure could delay future projects, such as the planned rover flight to the far side of the moon in 2018.

However, Denis Simon estimates the Chinese have a 97% success rate with rocket launches, which is a very low rate of failure. And there are huge gains in prospect. China's manned space station, if launched as planned in 2022, could potentially become the only one in orbit, as the International Space Station approaches the end of its planned service life.

"If the International Space Station is de-orbited in 2024, and there is no replacement, then it is likely that China's space station, scheduled for launch around 2020, would be the only space station," says Cheng, although experts disagree on the likelihood of this scenario due to political tensions.

Because of the global security concerns that have dogged China's space program, the country has had to build up much of its knowledge domestically, as countries like the US were unwilling to allow access to its own research. US suspicion of China dates to the work of the Cox Committee, which concluded in the 1998 that China "has stolen or otherwise illegally obtained US missile and space technology that improves PRC military and intelligence capabilities."

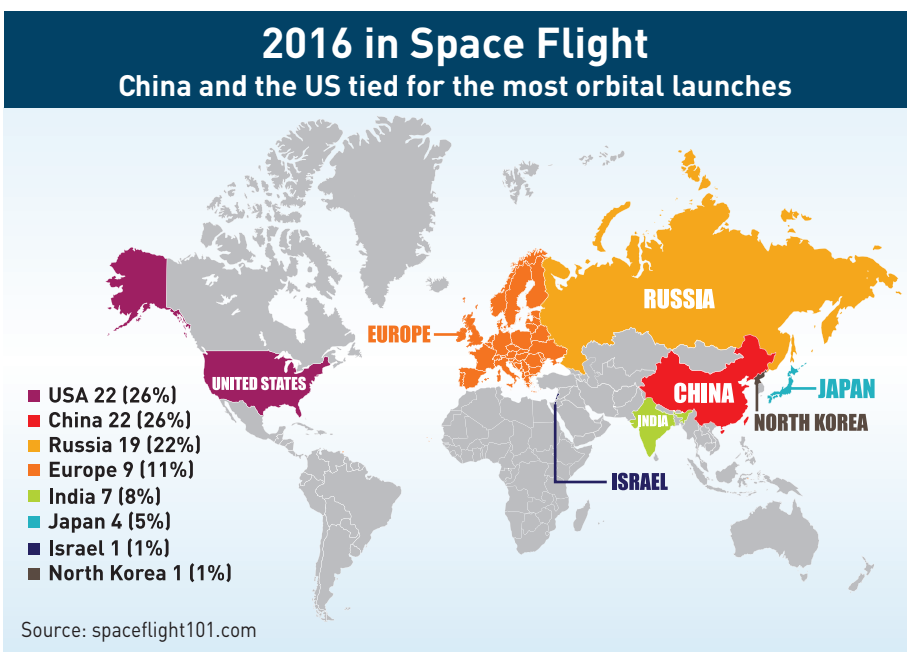
Although China has denied the claims, and nobody has ever been convicted, this thinking has influenced China-US scientific collaboration for decades.

"It hasn't been easy for China, which has faced issues about access to technology because of the close linkage between the civilian space and military space programs," says Simon. "Access to foreign technology has been difficult… China has done a great deal through self-reliance and through indigenous innovation."

Simon continues: "It is only recently that space collaboration has picked up with the US, and it's done so with a great deal of caution. So, China has worked with a number of other countries and the European Space Agency to jointly advance and develop their space capabilities."

Indeed, the CNSA has ramped up space-science efforts and collaborative projects, including a pioneering $440m X-ray telescope, which is planned for launch by 2025. The mission is financed with European partners and involves hundreds of scientists from 20 countries, preparing to study matter under extreme conditions that can be found only in space.

China also faces significant competition from rivals in the development of space technology, particularly from neighboring India. Already a space power, India launched a satellite into orbit around Mars in 2014, the only country to do so on the first attempt. Meanwhile, Russia is still the only nation that can regularly launch humans into space and bring them back, sending about four crews every year to the International Space Station. But at $6.1 billion in 2013, China's financial commitment is larger than that of India, Russia and Japan individually—although that is still well behind NASA's 2013 budget of $39 billion.



Private Space

President Xi hopes the space missions will fuel a wave of Chinese innovation in robotics, aviation, astronautics and AI to help boost the economy. The state is also providing support for the emerging private space sector. Although there are only around a dozen commercial space enterprises in the country, the nascent sector has attracted significant investment.

In May, rocket design startup One Space Technology announced that, months after completing its A-round of financing last year, it had secured an unspecified amount from Chongqing Two Rivers Aviation Industry Investment Group. Weeks earlier, the Tianyi Space Research Institute announced that it had raised close to RMB 100 million ($15.3 million) in its own round of financing.

Another major player is Kuang-Chi Science, led by Liu Ruopeng, the "Elon Musk of China." His company is developing cutting-edge aerospace technology, including a balloon-launched capsule called The Traveler, which aims to take six passengers as high as 100 kilometers above earth. It has performed two test launches since 2015, the second of which safely carried a live turtle.

Even Chinese social media giant Tencent is looking beyond Earth. It is investing in America's Moon Express, a startup that aims to put drones on the moon; Argentina's Satellogic, which specializes in satellite imagery; and America's Planetary Resources, which is examining asteroid-mining.

Chang Guang Satellite Technology,

Nighttime launch of a Long March-5 Y2 heavy lift rocket

founded two years ago by more than 40 institutional and private investors with technical support from the Chinese Academy of Sciences, is one of many micro-satellite and nano-satellite assembly plants to have emerged. Each has plans to send small satellites into space. Chang Guang aims to launch 60 satellites by 2020.

China's BeiDou Navigation Satellite System, the country's answer to GPS, is another motivation for China's space research. The system, already covering 317 Chinese cities, is eventually intended to cover the globe, especially countries tied to the Belt and Road Initiative. By 2020, thirty-five satellites should be operational. Businesses related to BeiDou are expected to be worth $58.1 billion by 2020, said Ran Chengqi from Beidou Navigation Satellite System, speaking at a conference in May this year.

But while investors seem optimistic, China has a long way before its commercial space industry catches up with the likes of Elon Musk. His SpaceX is leading the way in private rocket launches—including deliveries to the International Space Station—and making strides toward reusable rockets and manned missions.

With the economic boom of recent decades fading, Beijing recently set its 2017 national GDP growth target at 6.5%, the lowest in 25 years. Some experts are concerned that funding might slow further as other priorities compete for attention.

"It may be that Chinese leaders will feel that the investments are higher than justified," says Dean Cheng. "Alternatively, as a means of moving the Chinese economy up the value chain, fostering advanced technologies and indigenous innovation, and improving productivity, space may be seen as a means of improving Chinese economic growth and performance."

For the time being, China remains a relatively small player in the satellite industry. But experts say the country could easily catch up in numerical terms because it is building satellites more cheaply, although it is not yet clear if China's private space companies are making money.

To Infinity

In space terms, China is still behind Western governments and private companies like SpaceX, and the future promises more jockeying between rival nations. The international space market looks set to be dominated by extremely fierce competition as China continues its huge investment into space-science, satellite and navigation technologies. And apart from rivalry over scientific achievement, China's space program will continue to cause security jitters between China and other nations.

But, China intends to be a major player in space and, with a strong and growing domestic talent pipeline, Beijing's power in the heavens only seems set to grow. In twenty years, the world could be watching China land its first astronauts on the moon—just as planned.

Man and Machine

Brian Christian, author of *The Most Human Human* and *Algorithms to Live By*, discusses the gaps and overlaps between humans and machines

By John Christian

Decades before Siri and Alexa began battling it out for best virtual assistant, computer scientist Alan Turing invented the eponymous Turing Test of machine intelligence. The test goes: if a human operator cannot, after a text conversation, determine if he is talking to a human or a computer, then the computer is "intelligent" insofar as the operator is concerned.

Today, the Loebner Prize, an annual competition in artificial intelligence, sets a panel of judges the task of finding via the Turing Test the "Most Human Computer" and also the "Most Human Human," or the person the judges least often mistake for a computer. In 2009, author Brian Christian entered the competition and later produced the best-selling book *The Most Human Human*, which investigates the nature of intelligence. His second book, *Algorithms to Live By*, co-authored with cognitive scientist Tom Griffiths, was published last year.

In this interview with *CKGSB Knowledge*, Christian dives into the ideas underlying both books.

Q: You hold degrees in philosophy and computer science. Why did you start with such a dual track approach and how has that influenced your career?

A: I have always been motivated by curiosity and by the big questions: "What does it mean to have a mind?", "What is the nature of intelligence?", "What is the nature of reality?" Philosophy gives us a way of framing these questions, but the rigor available in computer science offers a set of tools and insights that, for me, are also strikingly applicable to that set of questions. There are fertile intersections between the two areas, which I have explored in my books.

The first, *The Most Human Human*, investigates the question of intelligence. What are the hallmarks of intelligent behavior? What is the nature of interpersonal communication? And, at the broadest level, what have we learned about what it means to be human by attempting to build machines in our own image? In large part, that's the story of what we have learned about ourselves from our failures to replicate certain aspects of our own intelligence.

The second book, *Algorithms to Live By*, in a way takes the question from the flip side—what do minds and machines have in common? And what are the things that we can learn from the sometimes unexpected parallels between problems in computer science, and problems in our everyday lives?

There is a dialogue between the two books where they almost ask the same question from two different sides: what do we learn about the differences between humans and machines, and what do we learn from the similarities.

Q: The first book is a critique of the perception that a certain dehumanization results from our constant interactions with and through machines. But given the pervasiveness of digital culture, how do you begin to fight back?

A: There is a paradox that as communication tools become more powerful, we are communicating with one another in ever lower-bandwidth forms. In the last century, we went from meeting in person to talking on the phone. We went from talking on the phone to writing emails. Then we went from writing emails to texting. And now from the text message to the emoji, or to the single-button "Like." We have almost reduced human conversation to its logical minimum, literally in some cases to a single bit of information. I think this has a homogenizing effect.

Another example is the Gmail Smart Reply, which includes automatic suggested replies to messages. If someone proposes a meeting, it might offer "sounds good" and "sorry, I can't make that." But we should be mindful of what we are trading off in that equation of efficiency. I think the Turing Test gives us the perfect illustration. In a Turing Test you have nothing except the idiosyncrasies of your word choice to assert your identity.

Q: Before we get into talking about the second book, can you demystify the term "algorithm"?

A: The concept of algorithms far predates the computer, and arguably predates mathematics, and so one of the goals of the project was in fact to re-humanize them. You can think of an algorithm as just a discrete series of steps, a process that you follow to get something done. Any process that you can break down into steps is an algorithm, including a cooking recipe.

Computer science gives us a way of recognizing some really fundamental things in everyday life. One of the examples the book gives is if you are hosting a party, or if you are at a large dinner, there is a moment where everyone shakes hands with one another in greeting. You might have noticed that when there are more than a few people there, it takes a noticeably long time for everyone to make sure that they have shaken everyone else's hand.

Computer science gives us a language for identifying what's going on here. And so, for example, the number of handshakes that need to happen grows with the order of *n* squared, the square of the number of guests at the party; computer scientists would call this a quadratic algorithm. It doesn't scale well! Part of the real value of computer science is that it gives us a vocabulary and a rigorous set of tools for identifying even these everyday things that are around us in life.

There is a paradox that as communication tools become more powerful, we communicate in ever lower-bandwidth forms

Q: You make the point in the book that despite computers being extremely powerful, there are problems that cannot be solved by brute force of calculation. To arrive at solutions, you need to introduce an element of randomness or simplification. How has developing algorithms to tackle these types of tasks helped change our understanding of handling difficult tasks more broadly?

A: One of the most valuable contributions of theoretical computer science has been complexity theory, which is a way for understanding and ranking how difficult problems are. In broad terms, you could say mathematics is about finding the correct answer to a problem and computer science is about deciding how hard the problem is.

Computer scientists deal with what are known as "intractable problems," or "NP-hard" problems. In this set of problems there simply is no scalable way to get the exact correct answer every time. To address them, computer scientists turn to a toolkit of strategies. These include things like settling for approximate solutions, or settling for algorithms that are correct only most of the time.

One of my favorite examples comes from the world of encryption. If you want secure banking or commerce, the starting point is usually generating an enormous random prime number, and that requires finding efficient ways of determining whether a large random number is in fact prime. One of the best ways to do this is using the Miller-Rabin test, which happens to be wrong 25% of the time.

We asked the developers of Open SSL, an open-source library for secure communications technology, which uses this test, what they do about that and the answer was they just run the test 40 times, and accept that the margin of error of 25% to the 40th power is good enough. And this is in banking and even in military applications.

The deeper point is that computer science really gives us a way of thinking in new terms about what it means to be rational. Behavioral economics has highlighted the idea that people are fallible, they make mistakes, they have cognitive biases and behave "irrationally" and so forth. Computer science, I think, offers a bit

of a different story: many of the problems that we face in life are simply hard, that is, computationally intractable. In many real-life situations we trade off the quality of the answer or decision that we ultimately get with the pain or the cost of actually thinking about it.

Q: Tell us about one such tradeoff situation.

A: A classic one is the explore/exploit tradeoff—how much time do you spend gathering information, and how much time do you allocate for using the information you've got? Computer scientists refer to this as the "multi-armed bandit" problem, which references the "one-armed bandit," a nickname for casino slot machines.

It goes like this: in a casino, each slot machine is set to pay out with some probability, and it is different for each machine. If you go to play for the afternoon you will want to maximize your return. This involves some combination of trying different machines out and some amount of time cranking away on the machine that seems the best.

For much of the 20th century, the question of what exactly constitutes the best strategy was considered unsolvable, but a series of breakthroughs on the problem over the last several decades yielded some exact solutions and broader insights. The details of the optimal algorithms are difficult to explain concisely, but the key consideration is how much time you have. If it is your final moment in the casino, you should pull the handle of the best machine you know about. But if you are going to be in the casino for 80 years, then you should spend almost all your time initially just trying things out at random.

These algorithms are now powering huge parts of the digital economy. Google, for example, has an enormous pool of ads that they could serve for any particular search query. They could always serve the ad that got the most clicks historically, but on the other hand they have a lot of ads that they have never served that they need more information for. The algorithm optimizes the process.

In more personal terms, I also feel like this is an idea that helps us makes sense of the arc of a human lifespan—why children seem so random and older people seem so set in their ways. Well, in fact they are both behaving optimally, with respect to how long they have in life's casino.

Q: Might thinking about life in terms of algorithms take some of the magic out of it? For example, there seems to be a qualitative difference between "trying to find the optimum romantic partner" and "falling in love."

A: In many areas of life there is a mixture of an intuitive, emotional, ineffable process and a more deliberate, intentional, rational process. Buying a house is one example of the two working together.

Sometimes you walk into a house and something doesn't feel right, and you may not ever be able to articulate why. Or on the other hand, you might feel good as soon as you set eyes on it. Nobody can tell you what is good, or what isn't—but there is an algorithm that can help you with the more rational part of the equation, which is whether to settle for something good or hold out for something even better. This is called an "optimal stopping problem," and the answer is surprisingly specific: 37%. The optimal way to pick a candidate is to get through 37% of the available options or of the time allotted, and then commit to the next option that is better than all previous ones.

> Computer science really gives us a way of thinking in new terms about what it means to be rational

When it comes to something like romance, most people, including me, are resistant to the idea of a methodical approach—it's just not romantic. But in practice, we are more logical about it than we realize. If you're the parent of a teenager and the teenager says, "You know, I met this amazing person who is going to a totally different college, so I'm just going to put my life trajectory on hold and follow them across the world…" you would say, "No way! You think this is the relationship you should stake the direction of your life on, but maybe if you just go to your college you will meet someone else." But if someone at 35 says the same thing, "I met this incredible person, and I am going to move across the world," one is more inclined to say, "Go for it! You know what you're looking for at this point."

This is anecdotal, but I think it is interesting that 37% of the average life expectancy in the first world is about 28-29 years old, and the average age of someone at their wedding is also 28-29 years old. There is sort of a funny sense in which these principles may offer us a macro-level understanding of societal norms and patterns, even if we are reluctant to apply them at the individual level.

Q: What will you work on next?

A: I am working on a book that is about the intersection of computer science and ethics. I think that's the next big thing. As we were discussing, I think we are at a point where philosophy and computer science are very much in dialogue with one another and this to me seems like the next wave that's breaking. We are increasingly deploying automated systems to make consequential, moral judgments, like who gets parole. There is this question of how do we ensure that the systems we are entrusting such decisions to actually uphold our sense of human and civic values. There is a fascinating conversation that is just beginning to happen, and that is what I am researching right now.

New Cars in a New Economy

China's two speed car market

By Shasha Chen

Image by Beibei Nie

Like its whole economy, China's auto market grew at breakneck pace in the 2000s, and while it is now slowing down, it still contains enormous potential in terms of both raw sales and innovation as China shifts toward electric

Eric Zhang recently turned electric. That is, the 29-year-old marketing professional from Beijing recently bought a BYD E5, an all-electric sedan made by Shenzhen's BYD Auto. He is one of three people in his immediate circle of friends to buy a new-energy vehicle (NEV) this year.

Zhang says they all made the choice based on a practical consideration of license registration and cost. Beijing is one of eight Chinese cities that have restricted the number of conventional vehicles on the roads. In 2011, the city introduced an annual public lottery to decide who would be eligible to register new internal combustion engine cars.

"The chances of winning are lower that 0.2% in Beijing, which means many of us, even if we enter the lottery repeatedly, will die before we get a license," says Zhang. NEV licenses are not won through a lottery, but simply bought after standing in a queue.

Influenced by the push-and-pull of government policies, car buyers like Zhang are transforming China's auto market. China's NEV sales volume surged from 8,000 units in 2011 to 507,000 in 2016, according to the China Association of Automobile Manufacturers (CAAM). It is a sharp contrast to the slowing growth of overall automobile sales in China.

"NEVs are increasingly an option due to government incentives," says Stanley Yan, Senior Analyst with Franklin Templeton SinoAm Securities. China provides subsides that amount to about 23% of the price of a vehicle. That's lower than some Scandinavian counties, for example Denmark's 29% subsidy, but higher the US's 18%.

Although the NEV market is on a steep upward trajectory, it is also beset by problems in terms of both developing technology, and in the creation of a marketplace that can succeed in the in absence of state support.

Cruise Control

"China's automobile market is maturing," says Bill Russo, the Shanghai-based Managing Director of Gao Feng Advisory Company, a strategy and management consulting company. He says slower growth is becoming the norm and sales increasingly skew towards new-energy vehicles and cars with high-tech functionality, such as self-driving capabilities.

In the first half of this year, sales of passenger cars totaled 11.25 million, up by only 1.61% from the same period last year. This is a significant downshift for an industry that has been a world-beating growth machine for decades. China's modern automobile industry started in the 1980s, when foreign manufacturers like Volkswagen entered China to set up joint-ventures. Later, local producers like Geely Auto and Great Wall Motors were founded. In 1985, the infant industry produced 5,200 vehicles. Growth remained low until 2001, when China joined the World Trade Organization, and then the market boomed.

The growth rate of passenger car sales surpassed 56% in 2002, and maintained double-digit growth for years afterwards. In 2009, China overtook the US to become the world's largest car market, with sales surging 46% year-on-year to hit 13.6 million vehicles.

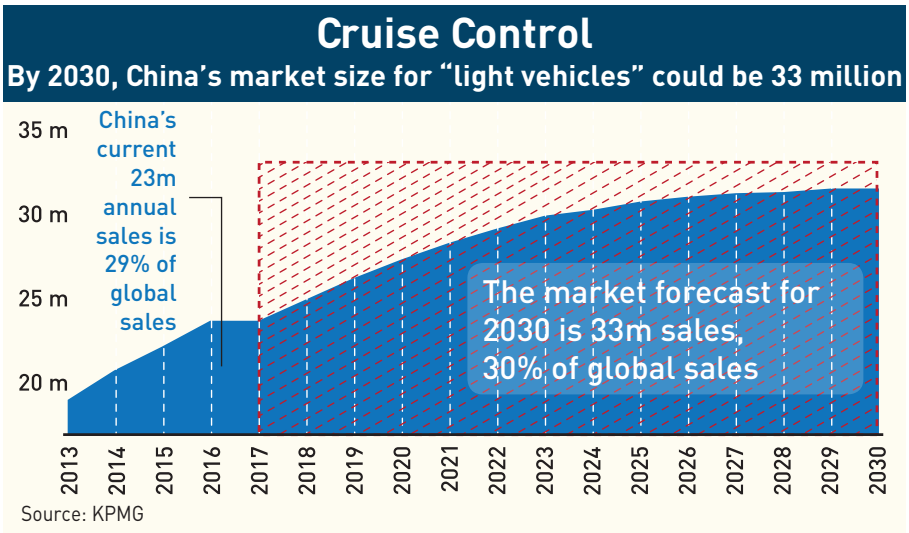
"Several of my colleagues and I purchased our first vehicles in 2001 and 2002, and we received generous car allowances from our employer," recalls Mingxin Zhao, who works for a government-owned company in Beijing.

Mirroring an overall slowdown in the economy, the car market has since grown sluggish. In 2015, annual growth of car sales was just 4.7%, according to CAAM. The government reacted by introducing nationwide tax incentives in 2016, which resulted in a 13.7% year-on-year surge with 28 million cars sold. But according to Russo, the tax incentive merely caused consumers to move up planned purchases—and indeed, this year the impact has faded with auto sales posting year-on-year decreases in both April and May.

Consumer attitudes towards cars are also changing. In a 2016 survey of 3,500 Chinese consumers by McKinsey, about half of respondents indicated that car ownership is no longer a status symbol. However, the number of consumers who say they are interested in buying an NEV has tripled since 2011.

For consumers in first-tier cities, purchasing a new car is only one of several options open to them. "Alternatives like buying a used car, leasing or renting, and relying on e-hailing and car-sharing services hold increasing appeal," said the McKinsey report. Rental and sharing services could reduce annual vehicle sales by 10% by 2030, McKinsey predicts.

Russo echoed McKinsey's findings. In addition to the disruptive forces identified by McKinsey, he says, "Hardware innovations, such as autonomous driving technology, will be commercialized through the development of on-demand mobility services and the larger digital ecosystems."



Bumpy Ride

Central to the changes outlined by Russo and McKinsey is the push for new-energy vehicles. But despite the excitement and solid growth numbers so far, there are challenges ahead.

Even as an owner of a new NEV, Eric Zhang still has doubts about their overall competitiveness against petrol-driven vehicles—not the cars themselves, but the charging stations. "The lack of power stations means we rent a gas-powered car for long weekend trips," Zhang says.

The government is working to address this as part of the electric vehicle push. In the "Made in China 2025" initiative unveiled in 2015, the NEV sector was listed as a prioritized industry and plans were included to subsidize charging stations. At the end of 2016, the State Council also announced that it would tighten planning regulations for new factories that plan to build traditional vehicles with internal combustion engines. The thinking being that stimulating electric vehicle production should stimulate charging station construction.

"The NEV industry has strategic importance for China, not only for the automobile industry to compete globally, but also for pollution control and energy independence," says Stanley Yan.

Since 2012, the Chinese government has spent billions subsidizing local electric car and battery makers. Most notably, its support has been critical in helping the Shenzhen-based automaker BYD, in which Warren Buffett has a stake, to become the world's largest electric car and bus maker.

But the carrot-and-stick strategy has some issues. "The approach has stimulated the NEV market, but also created negative developments in a few cases, such as fraudulent behavior among some manufacturers for subsidies," says Hoi Tran, Partner and China Head of Automotive, KPMG China.

The low-end NEV power battery sector is expected to enter overcapacity status in 2018, with fragmented manufacturing and insufficient innovation, said Zhang Junyi, a partner with Nio Capital, an investment firm co-established by electric vehicle company NextEV, Sequoia Capital and Hillhouse Capital. "Meanwhile, the production of high-end power batteries for premium electric cars still lags demand, and the core NEV technology trails behind global competitors," Zhang says.

To tackle the problems, four government ministries announced in January this year that subsidies for NEVs will decline by 20% from 2016 levels. The Chinese government is also seeking to acquire advanced foreign technology through regulatory changes.

In January 2017, the Ministry of Industry and Information Technology (MIIT) issued a market-entry requirement for NEVs, which forces manufacturers (including joint ventures) to disclose details of the technology used in development. MIIT is also expected to introduce a quota system in 2019, which will require all large automobile manufacturers to produce NEVs (10% of their output in 2019 and 12% in 2020). Those who fail to meet the targets will face financial penalties, including potentially losing their license to sell traditional cars in China.

The quotas talk triggered instant partnerships between foreign giants and local NEV producers. Examples include Volkswagen's JV with Anhui Jianghuai Automobile Group, which was announced this May, while Ford Motor's JV and Anhui Zotye Auto sealed a tie-up this August for NEV production. Both Jianghuai and Zotye are among the top ten NEV manufacturers in China.

The medium-term goal of the government is to have five million NEVs on China's roads by 2020, but some see this as unrealistic. "Once China reduces subsidies to NEV manufacturers and consumers, NEV growth will be challenged," concludes Stanley Yan.

Promise Remains

China, as the world's most populous country, still offers opportunities to both domestic and international auto manufacturers. "China will be the dominant marketplace in terms of market size, innovation and consumer behaviors in the future," says Hoi Tran. He expects lower-tier cities will experience double-digit growth in coming years.

In KPMG's Global Automotive Execu-

tive Survey 2017, global executives also see China's future as bright. China aims to have 70% of its population—some one billion people—living in cities by 2030, up from less than 60% at present. This increasing urbanization is expected to provide abundant market opportunities.

The KPMG report also highlighted the openness of Chinese consumers to try new things. Executives rated China over Germany and America in terms of consumers' adoption of new and disruptive products and mobility services.

"Chinese consumers are a major force for innovation as they are open to new technologies," says Hoi Tran. "Given the high penetration rate of mobile devices and the adaptation to e-commerce, mobile banking and social media, technologies have become an integral part of the everyday life of a Chinese consumer."

> [New-energy vehicles] are increasingly an option due to government incentives
>
> Stanley Yan
> Senior Analyst
> Franklin Templeton SinoAm Securities

This phenomenon will drive innovation in China's automotive industry, including NEVs, in the form of connected cars that integrate with wireless networks, and self-driving cars. Last year, the Shanghai state-owned car-maker SAIC launched its first "Internet car," the Roewe RX5, with e-commerce operator Alibaba. This connected vehicle integrates into the "Internet of Things," connecting to both the web and other devices. The model sold more than 90,000 units in 2016 after hitting the market in July, becoming the most popular new nameplate among 93 models launched in China last year.

The popularity of the RX5 may have been helped by the fact that it is an SUV, a vehicle type gaining popularity across the board. China's SUV sales totaled 4.53 million in the first half of 2017, up 16.83% year-on-year, making it the only growth segment among passenger cars.

Overall, the future remains bright. According to the KPMG survey, 75% of executives believed that the global share of vehicles sold in China will be above 40% by 2030, or 43 million cars annually. But China's vehicle-to-population ratio (currently 106 vehicles per 1,000 people) is unlikely ever to reach the US level of 800 per 1,000.

In a nation infamous for miles-long traffic jams, that may not be a bad thing after all. But, cautions Russo, "China is still likely to approach Taiwan's current level of 280 vehicles per 1,000 in the next 10 years."

New Frontiers

The desire of Chinese domestic automakers is to go global, but exports accounted for less than 5% of automobile output in the past five years. "Chinese manufacturers still need to improve international competitiveness, especially in developed markets, but there will be a growing trend for Chinese car makers to venture internationally," predicts Zhang Junyi. This includes building factories abroad and expanding sales into more markets.

Several automobile brands including Geely, BYD, Jianghuai Automobile, BAIC and SAIC, have built factories overseas, according to the CAAM. In August this year, Xu Haidong, secretary-general of CAAM, said the international expansion has been viewed as a necessary path for Chinese automobile makers to grow from being big to being strong.

The lower cost of Chinese automobiles gives China an edge in African, Southwest Asian and Latin American markets. But the development plan issued by MIIT and several other ministries this April has set a challenging goal of selling Chinese cars into developed markets by 2020—though Toyota eventually became a hit in the US, it failed hard when it first entered the market in the 1950s.

In recent years, Chinese car companies have tried opening research operations in advanced markets to attract top technicians and technology. One example is Great Wall Motors, which has built two technology centers in America for research into innovation in automobile components. The company's exports surged by 154% to 17,100 units in the first half of this year, but exports still accounted for only 2.64% of total revenues.

Independent innovation in the Chinese automobile field, a stated target of the "Made in China 2025" initiative, remains weak and manufacturers are dependent on key foreign technology and equipment. But Zhang Junyi believes that gaining a head-start in the development of NEVs would create new opportunities for China in international markets, particularly with the Trump administration apparently backing away from supporting such technologies.

More mergers and acquisitions and overseas expansion are expected in the NEV sector, according to analysts. Just this year, Chinese battery giant CATL acquired a 22% share in Finnish car manufacturer Valmet Automotive, while BYD set up a production facility in California, employing 700 people.

Despite the limited presence of Chinese automobiles internationally, future opportunities loom large. Currently, China is already the world's largest passenger car manufacturer, as well as the top NEV exporter. With China's production chain beginning to expand globally, "the world is likely to be driving far more cars from China in the near future," summarizes Stanley Yan.

Innovation from the Inside Out

Kapil Kane, Director of Innovation at Intel China, describes how his Ideas2Reality program uses human resources already at hand to search for the 'Next Big Thing'

By Tom Nunlist

How do big multinational companies innovate? According to Kapil Kane, Director of Innovation at Intel China, there are three ways: partnership, acquisition and in-house development. The problem with the last of these is that in-house R&D laboratories may be good at invention but not at innovation—that is, finding new uses for, or making improvements to, existing products and processes. Kane aims to fix this with his Ideas2Reality (I2R) program at Intel China.

I2R is a startup program nested inside Intel's China operation. It encourages employees to submit ideas, which are vetted, incubated and accelerated using the same principles used by leading Silicon Valley accelerators, such as Y Combinator, with the aim of producing viable business applications. By looking inside the company, Intel is leveraging the talent and knowledge of its engineering staff by training them to think like entrepreneurs—and by this standard, it is as much focused on people as it is on technology.

Kane holds a master's degree in Mechanical Engineering from Stanford University. Early in his career, he played an important role in developing Apple's first touchscreen products, and later moved to China to oversee aspects of the manufacturing of MacBook computers. He has been living and working in China for 10 years, mostly in Shanghai.

Q: Before heading the innovation program at Intel China, you were at Apple. What did you work on there?

A: After working at my first job out of college, designing cars at Johnson Controls, I enrolled in a Ph.D. program at Stanford, studying product design and engineering. While there, I interned at Apple one summer. Although I was not fully aware of it at the time, because of the extreme secrecy, I, along with couple other engineers, ended up creating the first-ever multi-touch screen that went on to find its way into the very first iPhone that Apple released.

Q: Amazing! What was your role?

A: We were just kids! Our mentor was the real brain behind the project, I was the mechanical guy and the third guy was in reliability, so his job was to try to break everything that I designed. As I said, we had no clue about the iPhone, but we were toying with this idea of having a big screen that you could interact with by touching with all 10 fingers—our first version actually resembled something more like the iPad. And the killer app was the map: you could zoom, you could rotate and twist using your fingers.

The whole thing was so much more exciting than what I was doing in graduate school. I really pleaded with my professor and said, "Please let me go." Luckily, I had enough credits to get a master's degree, so I was able to graduate. However, I would say my real education happened at work. "Design thinking," "being human-centered," all these hot terms that you read about now, I learned all that on the job and from really amazing people.

Q: What brought you to China?

A: It was the first MacBook Air, which was, at that time, the thinnest computer ever created. In fact, it was so thin that the only way to make it was to carve the body out of a solid block of aluminum—what this meant was that we had to design the process to design the product. To accomplish that, we decided to move a few people from Cupertino to China, and I signed up for the challenge.

The main reason for this was that when we designed components and sent the specifications to the Chinese manufacturers, they would come back and give 10 reasons why they can't do it. Then we'd have to change the design and this wasted a lot of time. But if we were here, right on the factory floor, seeing how it's made, we could quickly tweak the design or challenge them about the manufacturing process. That's why I came to China about 10 years ago.

Q: And then you moved to Intel?

A: I moved to Intel about five years ago, at first to create a tablet computer for underprivileged children—it was an evolution of the "One Laptop per Child Program" started by MIT's Nicolas Negroponte. Our challenge was to create a tablet that would be cheap enough and rugged enough to become the next version of this classic program.

Eventually I ended up working on a holistic solution for education in places with low internet infrastructure called Education Content Access Point. It's like a Wi-Fi access point, but you can carry it with you. Teachers in remote areas can simply put it in their bags and take it to the class. They have everything they need without having to be connected to the internet.

Q: And how did the innovation program within Intel get started?

A: Intel operates out of more than 10 sites in China. Some of these sites had a policy similar to Google—employees were given time to pursue their own creative projects. We had some small successes, but the president of Intel China thought we might do better by uniting these efforts. The thinking was that if we could do this innovation in a more systematic way, we could actually make an impact. My position was created about two and a half years ago.

The program is called Ideas2Reality, or I2R, and there are two phases: incubation and acceleration. The incubation phase happens year-round. Anyone at Intel can submit an idea to our online platform. Along with the idea there are a few simple questions to answer: what resources are needed to bring that idea forward, and what will be delivered at the end of the day if those resources are granted. Then every month a committee of experts in various fields gets together, goes through the ideas, and determines which ones are worthy of seed investment, almost like an angel investor. From there, we provide some resources, access to mentors, interns and a bit of money to develop the idea.

This keeps the workforce engaged on things that matter to them. It keeps them motivated and happy. In return, we get a huge bag of cool new technologies.

Then comes the second part: acceleration. Now that we have all these technologies, we try to turn them into viable businesses. Innovation is about creating value, not about creating demos—you have to build something that customers are willing to pay for. Twice a year, we select a batch of five to seven projects for the acceleration program that lasts six months.

The inspiration came from the famed Silicon Valley accelerator Y Combinator and SOSV's (Sean O'Sullivan Ventures) China Accelerator right here in Shanghai. We start with a business model canvas: their key assumptions, their partners, revenue stream and so on. The thing is, 99% of people in this program are engineers—they have no idea about business concepts, and that's where we have to start. We introduce them to the concept of minimum-viable product (MVP). Their goal is to deliver an MVP and a validated business case in six months. These we bring back to Intel management.

> We are engaging the mindset of our innovators so that they can talk about their ideas in a way that makes sense to business leaders

Ideas2Reality has produced numerous technologies, such as the Home Care Robot, pictured here with its co-inventor Cao Lu (left)

Q: So you are teaching them to be business people and marketers, in addition to engineers.

A: Right, we are engaging the mindset of our innovators so that they can actually talk about the ideas in a way that makes sense to business leaders. Usually if you ask engineers to explain their ideas, they start getting into technical details. We don't want to hear any of that. Tell us why the idea matters. What is the problem you are trying to solve? How big is that problem and why do you believe you are the right person to solve the problem?

They also need to be taught how to deliver a good pitch in five minutes. Many engineers are uncomfortable talking to anyone outside of their group, so we challenge them to get out of Intel and talk to people. We actually require them to spend one day per week in a startup accelerator. We recently launched a program called I2R StartupX in partnership with XNode, a co-working space and a startup accelerator in Shanghai just to do that. They talk to other startups there, they talk to would-be customers and potential partners, right there in that setting and not in the comfort of their offices. At the end of this acceleration, we have solid business logic to bring back to the business units.

Q: What is the scale of the program in terms of people involved and resources devoted?

A: Intel China has about 7,000 employees and this program is for them. Since the program began, we have had 350 ideas come in—one every couple of days. Out of these 350, we have incubated about 70. When it comes to acceleration, in our first three completed batches, we have accelerated about 20 projects. Right now, we are working on the fourth batch, which has seven projects.

As for administration, we have just two full-time headcounts dedicated to this program—it's me and another employee. But we also get help from a bunch of part-time volunteers from various business functions like finance, HR, employee communications, legal and venture capital. Super lean—that's how we have managed to survive various downturns in the recent past.

Q: Can you give an example of a successful project?

A: We had a really interesting project that came from Li Weigang, a guy in the Network Processing Group. He had created a software program to make data encryption and decryption run faster on Intel hardware. What he noticed was that, with a few tweaks, he could re-purpose the same code to compress large amounts of data in very little time—specifically, the kind of data created during human gene sequencing. The only problem was that it was not his group's responsibility.

He came to us and we not only helped him develop the technology, but also connected him with some of the world's largest genome sequencing companies, BGI and Novogene (see article on page 54). They simply loved what he had created. It solved a major pain point for them. With the customer already loving it, we were able to convince the right business group to make it a part of their next release. In June this year, it became an official Intel product.

> We are changing the mindset of our workforce. These "intrapreneurs" we create [will] give us the next big thing

Q: Only someone deep in the weeds could spot a need like that?
A: Exactly, such ideas are born out of real people doing real things in their day-to-day jobs where they connect the dots. Decision makers in the business units sitting in the US wouldn't necessarily know of customer pain points in China, or how large that opportunity might be.

This is exactly why our program exists. Engineers that see these problems don't have the communication channels to reach the decision makers. Then, more importantly, they don't have a customer, but the reason they don't have a customer is because they don't have the resources to develop a solution. In other words, it can be a very chicken-and-egg problem. Our Ideas2Reality program solves that problem.

Q: In the more traditional startup model, the founders would get a stake in the company. How are your employees rewarded?
A: Ideally, founders should get a stake in the business that he or she has created, but we are still in the early days and we have not yet had a blockbuster success. Without a big bang success story, it is hard for me to go to my higher-ups at Intel and say, "Hey, you need to change the compensation model." However, at this point our employees are super happy to be recognized. We have this Wall of Fame at all sites featuring our innovators. We also feature them in posts on our official WeChat account. Another great motivator is that they get to go and network with the top leaders of our company not only in China, but also worldwide.

We also tried twice to encourage our employees to leave Intel and start their own companies, but both times we did not succeed. In the first instance, the guy got cold feet, which goes to show that taking risks is not for everybody. Some people are happy with a corporate job, but one that still allows them to do cool things.

Compensation is something I think about a lot. Eventually someone will ask to become the GM (general manager) of a group that they helped create, and that would be a great problem to have!

Q: What are your other internal goals with this project?
A: There is no other program like this at Intel. Although there is a group at Intel in India called Ideas2Reality, they are far from a program like ours. They start with ideas that originate from brainstorming in small groups and have the team and resources within the group to develop them further. What I want to do is bring our bottom-up approach to innovation to other corporate locations and eventually to our headquarters.

I believe what we have found here is a good model that is similar to what startups are doing right now. If you look at the startup ecosystem, there are incubators, there are accelerators and there is seed funding. We are mirroring all that, but within the company.

The other focus for us is people. Yes, we are creating projects and new businesses. But, more importantly, we are changing the mindset of our workforce. We are turning our innovators into "intrapreneurs," that is entrepreneurs inside of a large organization. That's what I say is the true value of our program. These "intrapreneurs" we create are the ones who are going to give us the next big thing.

Q: In other words, you are trying to change the corporate mindset?
A: Before we get into that, I'd like to clarify one thing. People often confuse innovation with invention. Invention is creating something new that did not exist before while innovation is finding new ways of using existing things to create value for the customers and bring in revenue for the company. Touch screens, cellular communication and internet browsing are great examples of inventions that existed before the iPhone came along. Apple merely packaged them together and that won the hearts and minds of consumers around the world. That's innovation!

Now there are essentially three ways to innovate as a big company. You can partner with an outside company, you can do an acquisition outright or you can create innovations on your own. Traditionally creation has been the job of the lab, the R&D center, but R&D centers do not necessarily innovate, they invent things.

The question I see then is, if you can partner with outside companies, why are you not willing to partner with your own employees? Look inside and see what you have! There is one remark that our Intel China president made that I quite like: there is a willingness to back a couple of guys dropping out of school and creating a startup, and that is great. But what about guys coming from a Fortune 500 company, or a Fortune 50 company, who have been in the business of technology for 10 years? When they come up with an idea, what is stopping you from backing them?

Q: Yes, what is stopping a company from backing them?
A: I think it's just human nature. We tend to listen to people far from us, the so-called "experts," rather than those who are close to us, our own employees. But, at Ideas2Reality we are striving hard to change that.

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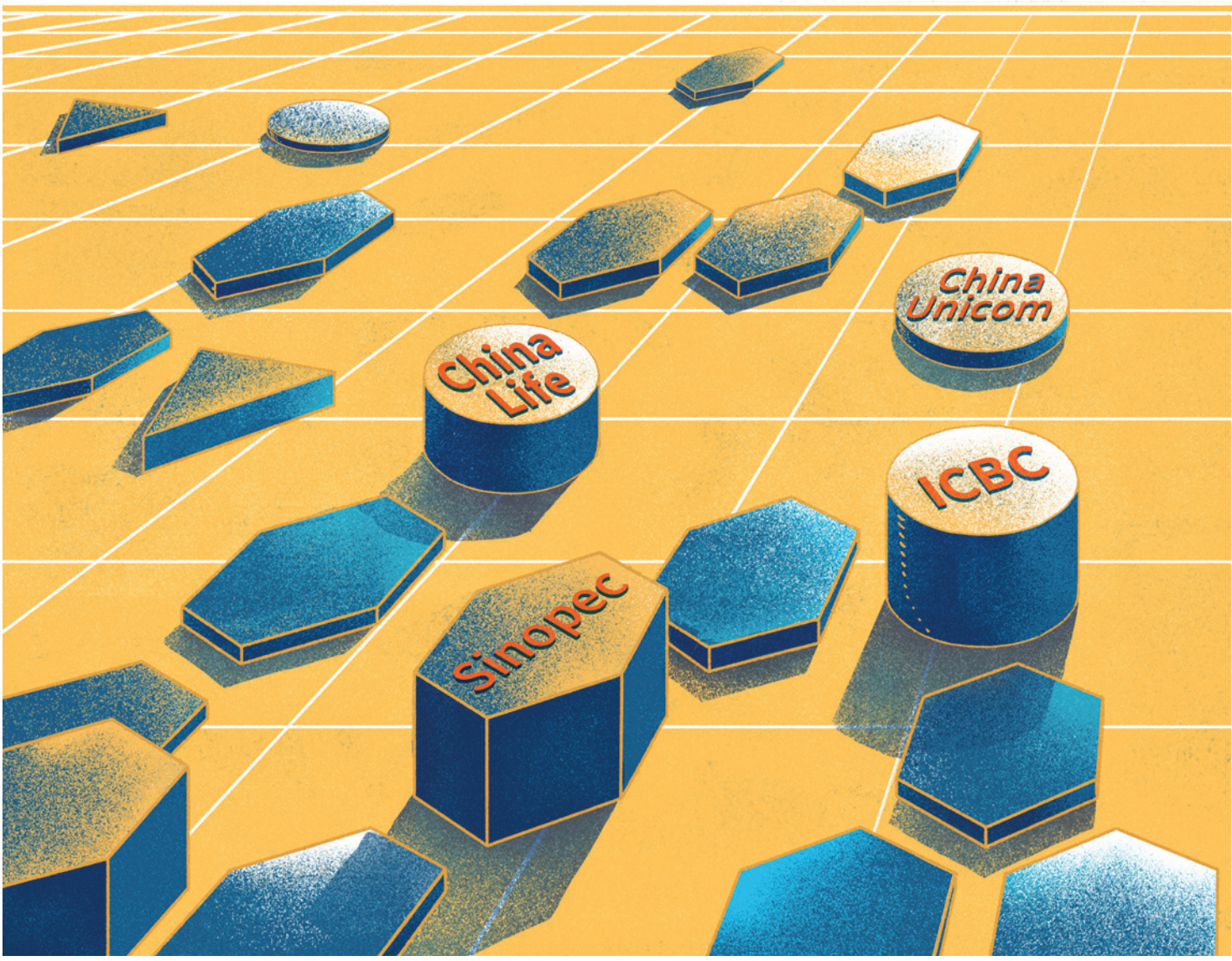
Piece by Piece

SOE reform is among China's biggest challenges

By Tom Nunlist

Image by Wei Bingnan

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For the past few years, China has been pursuing a new and ambitious state-owned enterprise (SOE) reform program, but unlike past efforts, this one is not about privatization, but just the opposite—SOE growth and strengthening

Beijing is making yet another attempt to reform its bloated array of state-owned enterprises (SOEs). Employing millions of people across all sectors, the estimated 150,000 SOEs dominate key Chinese industries making everything from silk to steel to spacecraft.

Yet, for all their size, they only provide 16% of jobs, less than a third of national economic output, and a return on assets of only 2.9%. Hugely inefficient, debt-ridden and responsible for most of China's ballooning corporate debt, SOEs are a drag on an economy that Beijing wants to transition from investment and export-driven to services and consumption-driven.

The latest reforms aim to reduce the numbers of SOEs, through bankruptcies, debt restructuring and mega-mergers, and improve their international competitiveness. Anyone assuming that this involves privatization, however, will be disappointed.

"Many interpret [these reforms] as a kind of privatization, but they are not," says Gao Song, Co-CEO and Head of Research at PRC Macro, a Beijing-based economic forecasting firm. "This will be the Chinese model—state-capitalism with Chinese characteristics."

An example occurred last August when a mix of Chinese state-owned and privately-owned companies, including Alibaba, Baidu and Tencent, purchased 35% of the shares in China United Network Communications for RMB 77.9 billion ($11.7 billion). Listed in Shanghai, the company is part of state-owned China Unicom, China's second largest telecom operator.

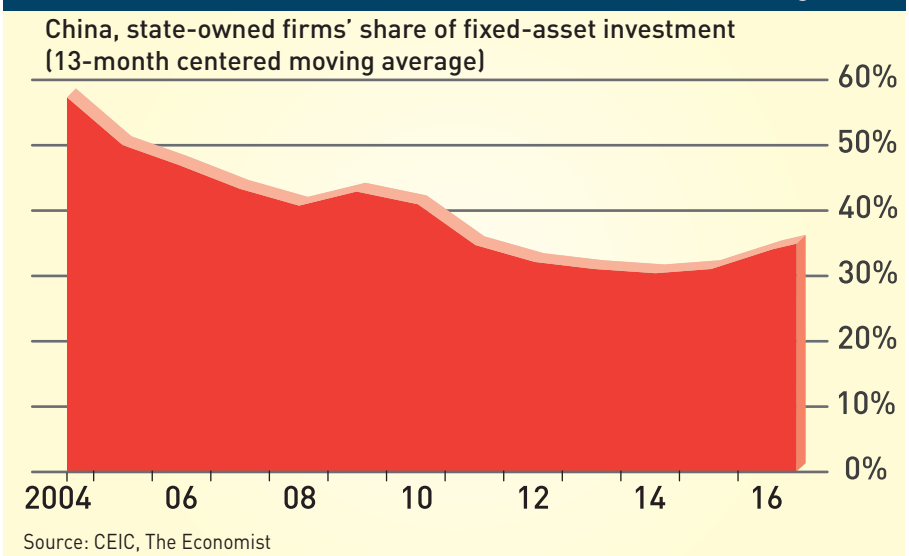
Beijing heralded the deal as a milestone in "mixed-ownership reform." Many commentators, however, think that rather than freeing Unicom to act more efficiently, it is an example of the private sector subsidizing an SOE.

"SOEs are arms of the Party," says Andrew Batson, Director of China Research for Gavekal Dragonomics, an economic research firm. "They have a special mission in addition to the ordinary corporate mission." Ten years ago, China was moving away from that vision of SOEs, but Batson says now the emphasis is on creating a concentrated, efficient and powerful state sector.

China has tackled SOE reforms in fits and starts, so it is unclear why these reforms will succeed when previous attempts to reign in SOEs have failed. And even if SOEs are forged into effective tools of state economic and policy influence, it may impede the private economy, which state-run *Xinhua News Agency* says accounts for more than 60% of GDP growth and over 80% of jobs.

Comeback Corporations

The SOE share of fixed-asset investment is on the rise again



Source: CEIC, The Economist

End of an Era?

State-owned enterprises formed after the founding of The People's Republic of China in 1949, when the state seized control of all businesses. Until the 1980s, they dominated the economy accounting for 90% of industrial output in 1978. From the 1980s onwards, gradual reforms were initiated, but SOEs remained highly inefficient, largely because their goals have little to do with profit.

"SOEs perform both commercial and policy roles—even those in fully competitive sectors," says Ying Wang, Senior Director and Head of the China Research Initiative at Fitch Ratings in Shanghai. "For example, a local steel plant is not just a steel plant. It may supply power for the local region. It may even have schools and hospitals affiliated with it."

By the mid-1990s, two-thirds of all SOEs were in debt and the Chinese banks that lent them money were saddled with billions of dollars in non-performing loans. This prompted a deep, painful reconstruction of the SOEs, led by Premier Zhu Rongji, lasting from 1997 to 2003.

Thousands of SOEs were merged or sold, leading to the layoffs of tens of millions of workers (there are various credible estimates on the exact numbers). There was experimentation with privatization, and larger SOEs were listed on foreign stock exchanges, for example, China Mobile on the New York Stock Exchange. Those reforms also saw the creation of the State-owned Assets Supervision and Administration Commission of the State Council, or SASAC

SASAC owns, directly or indirectly, and regulates all SOEs. It directly oversees "strategically important" SOEs, including companies such as China Unicom, Sinopec and other giant oil and gas firms, as well as companies in coal, electricity, key airlines, railways, and mining.

"During the period under Zhu Rongji, there was an emphasis on SOEs becoming 'normal companies'," says Batson. The idea was that state-owned enterprises would operate like other enterprises, except that they were owned by the state. That approach has dramatically changed.

Debt to Society

"Since about 2012, the SOE share of the economy has stopped declining," says Batson. He notes, however, that there is debate about that size of that share. Batson's preferred metric is the SOE share of fixed-asset investment, which hovered around 32% from 2013-14, and since 2015 has gradually risen back to around 36%.

"It may seem like a small change, but compounded over time it is having a big impact on the structure of the Chinese economy," says Batson. He estimates that, had the previous declining trend continued, the SOE share of fixed-asset investment today would be 10-15%, instead of 35%. The total SOE share of GDP would be 5%.

"There is increasing emphasis in official documents and rhetoric on the role of SOEs as servants of the Party and government policy," explains Batson, indicating why the trend has changed.

In June this year, the Director of SASAC, Xiao Yaqing, wrote in the Central Party School's *Study Times* that Communist Party members at SOEs are the "the most solid and reliable class foundation" for the Communist Party to rule. Of the 40 million or so SOE employees in China, 10 million are Party members.

However, such rhetoric only underlines the role of SOEs as policy vehicles. In the wake of the 2008 Global Financial Crisis, the Chinese government unleashed a program of stimulus, including injecting funds largely via SOEs. Shortly afterwards, China's economy began slowing and the response was further spending. Much of this money went into infrastructure, a field where SOEs dominate.

While stimulus spending helped keep the economy ticking over, it also created a mountain of debt, which the International Monetary Fund (IMF) put at 235% of GDP in 2016. This poses a serious threat to China's economic stability. Speaking at the National Financial Work Conference in July this year, President Xi Jinping said that the SOE debt problem is "the priority of priorities."

Reformation

SOE debt is central to the reforms taking place. The current effort began at the Third Plenum of the 18th Central Committee in 2013, which outlined an ambitious plan to overhaul the economy, including introducing market forces to make SOEs more competitive. The first phase of reforms amounts to a tabulation of "who owns what."

"Even now, a lot of SOEs don't have a balance sheet," says Gao. "There are SOEs controlled by different government ministries and no one knows what the assets are… And nobody knows who is responsible for the debts of SOEs."

The end of 2017 is the deadline for this during which SOEs will also become corporations. In July, the government announced this was about 90% complete. Gao says that China will "definitely meet that deadline," but cautions against placing too much significance on the listing of accounts.

However, other substantial reform moves are underway. In September 2016,

> SOEs are arms of the Party. They have a special mission in addition to the ordinary corporate mission
>
> Andrew Batson
> Director of China Research
> Gavekal Dragonomics

Guangxi Nonferrous Metals Group declared bankruptcy with RMB 14.5 billion ($2.2 billion) in debt, or a debt-to-asset ratio 216.8%. Although SOE bond defaults are increasingly common, *South China Morning Post* reported that the Guangxi group was the first entity to go into liquidation.

Some commentators see this as evidence that regulators are prepared to crack the whip to get SOEs into shape, especially as Fitch Ratings predicts both Chinese state and private company insolvencies are on track for another big increase in 2017. In 2016, they rose to 5,665 from 3,684 in 2015. However, bankruptcies are still comparatively rare (the US had four times as many in 2016) and up to August, only 12% involved state-sector enterprises.

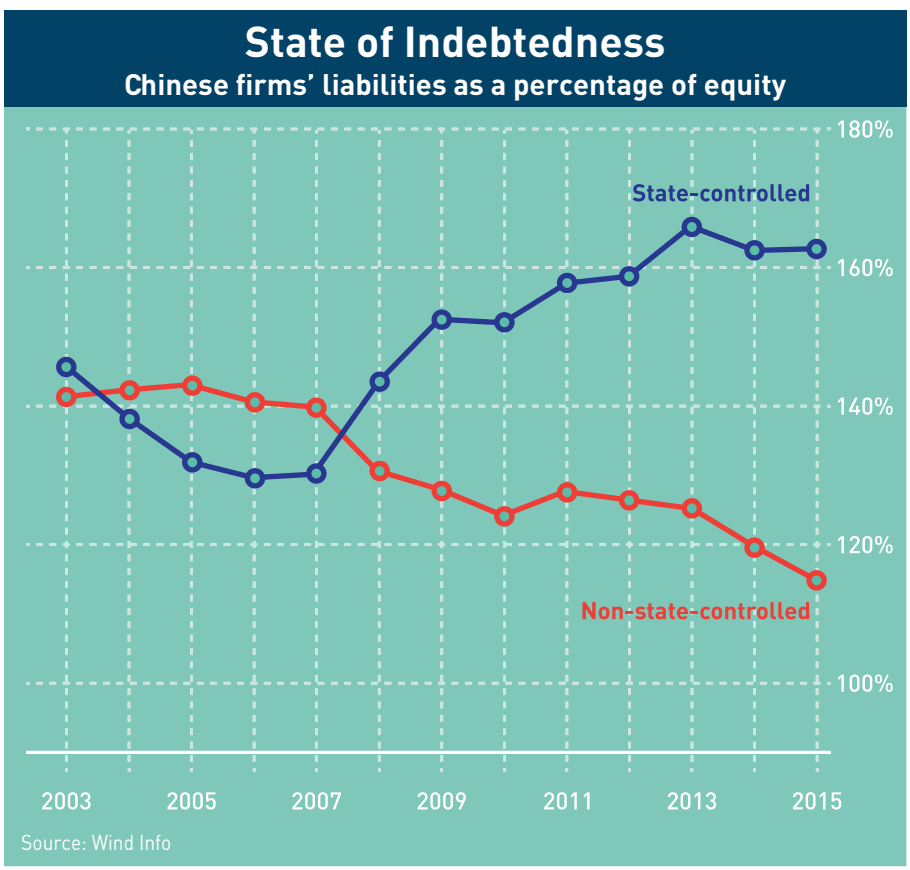
A more important trend is mega-mergers. According to Chinese state media reports from 2015, the 102 SOEs at the top level of SASAC control will be reduced to around 40. Significant mergers are seeing stronger SOEs absorbing smaller, weaker players.

This occurred last year when Baoshan Iron and Steel Group combined with the smaller Wuhan Iron and Steel to form Baowu Steel, now China's largest steel producer. This merger was about the stronger firm using its balance sheet to support the weaker. Similar mergers involve vertical integration, for example merging coal companies with power companies to enhance the cost position.

To outward appearance at least, some mergers aim to create more globally competitive companies. The banner case for this was the merger of China CNR Corporation and CSR Corporation to form CRRC, now the world's largest train manufacturer. Previously, the two were engaged in an export price war.

"The idea is to create national champions," says Ying. "Now that the price war is no longer there, the company can really leverage its technological expertise."

Yet, for all the fanfare, the area where the SOE mergers have had the most profound impact has been on company credit, says Ying. Larger scales have not translated into better firms. "We haven't really seen significant improvements in efficiency coming from the mergers," she says. Ying notes that recent SOE performance gains are due to a broad rally in commodities rather than an increase in efficiency and productivity.



Mixed Ownership, State Control

By design, the changes are concentrating state economic power in upstream industries. Their size and position in the economy reinforces their role as policy tools—especially in the event of another crisis.

"It makes perfect sense that the government would try to maintain control over the central SOEs," says Gao Song. "Economically they are a powerful, effective countercyclical policy tool."

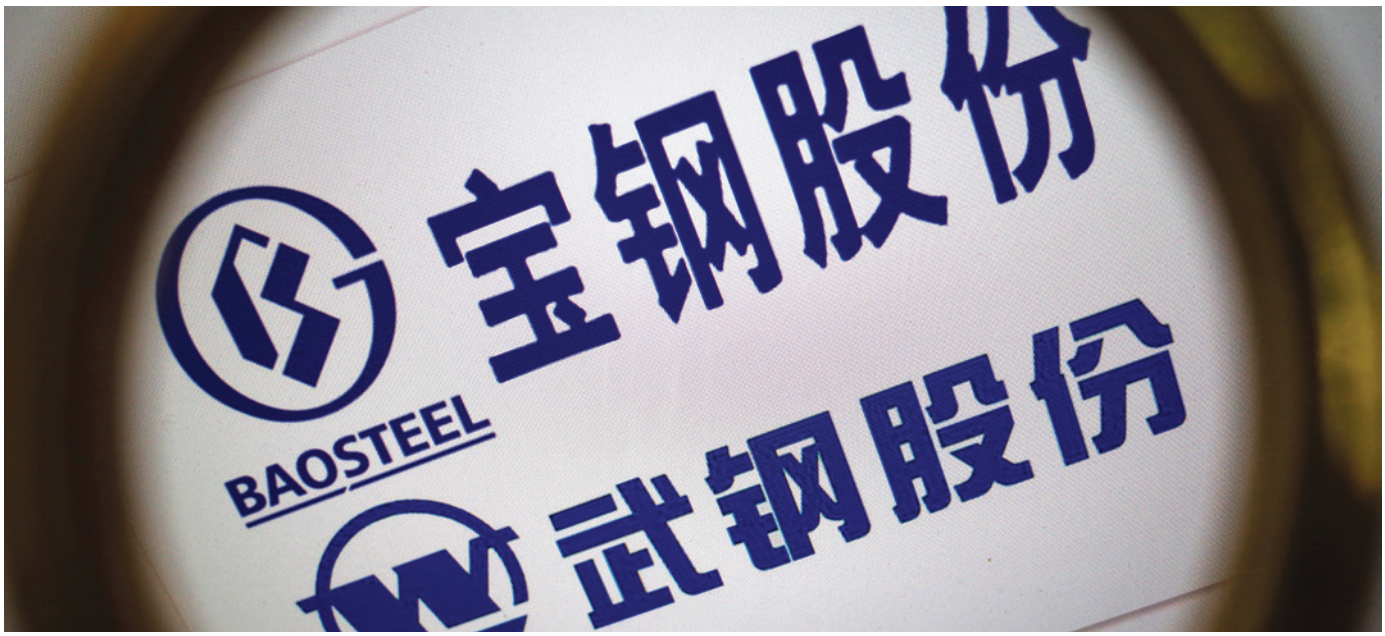
SOEs tend not to operate in the downstream economy, where the most value and innovation are being created today. In the middle, according to the government's plan, the giant SOEs will integrate with the private economy mainly through "mixed ownership" reform. This is at the heart of what Gao sees as China's new state-capitalist model.

The mixed ownership plan will see China's large SOEs sell significant minority stakes to large private companies and other SOEs. This will bring in fresh capital, fresh ideas, innovation and, most crucially, increased efficiency into the infamously fusty, slow-moving state sector.

But why would private Chinese firms buy big minority stakes in SOEs? "To pledge political loyalty," says Gao. If you are a private Chinese firm, "you know most of your business is in China."

The second reason is that the SOEs have for a long time consumed economic resources, particularly credit from the banking system. Access to credit has therefore always been a challenge for private companies and with the state-centric direction of the reforms, it seems set to remain that way. Tie-ins with state firms is a way around this problem.

"Resources are skewed toward SOEs," says Ying. "So, if you are affiliated with an



Bao Steel and Wuhan Iron and Steel merged to become giant Baowu

SOE, you probably enjoy some benefits in terms of financial resources and market resources."

Finally, as oligopolies, some SOEs do generate significant profit, so it makes business sense to buy into assets paying dividends. "When private firms make these investments, most are still driven by commercial motives," says Ying.

But there is an inherent contradiction in the plan. SOEs that need private capital and outside expertise the most tend to be the poor performers. "When it comes to the more indebted companies… you could have real problems finding genuine meaningful companies with real expertise [willing to buy in]," says Fraser Howie, author of *Red Capitalism*.

Yet, even a minority stake in the best run, most strategically positioned SOEs, is still a minority stake. A 10% stock purchase is unlikely to translate into sweeping institutional change. "I highly doubt [the private minority stakeholders] will be able to exert significant influence over key matters in these companies," says Ying.

Howie points out that selling minority stakes is reminiscent of SOE listings 20 years ago during the Zhu Rongji reforms. "Part of the argument in the 1990s for listing SOEs overseas was to bring in foreign institutional investors to help the corporate governance of these companies," he says. "That completely failed to happen."

Howie believes that the real game-changing reform would be to allow foreign companies to buy majority stakes in Chinese state companies, or allow China's own entrepreneurs to compete in protected sectors. "Let Alibaba set up its own [telecom] network," he says.

If all this uncertainty wasn't enough, the announcement of China Unicom's $11.7 billion mixed ownership deal was followed one day later by market confusion as the SOE's shares failed to resume trading as expected. The issue got sorted rather quickly, but mistakes on the flagship rollout of historic reforms do not seem to augur well for the future.

Frame of Mind

Gao Song believes rebalancing the economy toward consumption will continue. So, while SOEs become stronger in upstream sectors, their economic significance will shrink as the consumer and service sectors grow, though he views the process as cyclical.

"If Beijing successfully pulls off this reform in the next decade, we are going to see positive results in productivity growth," he says. "But maybe ten years later we will see SOEs grow into another type of monster again."

Andrew Batson of Gavekal Dragonomics is a bit more skeptical. Economically, he sees evidence that SOEs are crowding out private sector investment, which is contributing to the gradual decline in the growth potential of the economy overall. Batson also warns that the renewed focus on SOEs may come with additional consequences.

"Having a large share of economic activity controlled by state-owned enterprises means larger potential for corruption, lower potential for innovation and a smaller range of opportunities for people to pursue different careers and lifestyles," says Batson. "There are a lot of effects on how the economy is structured that make a difference to people aside from the effects on the growth rate."

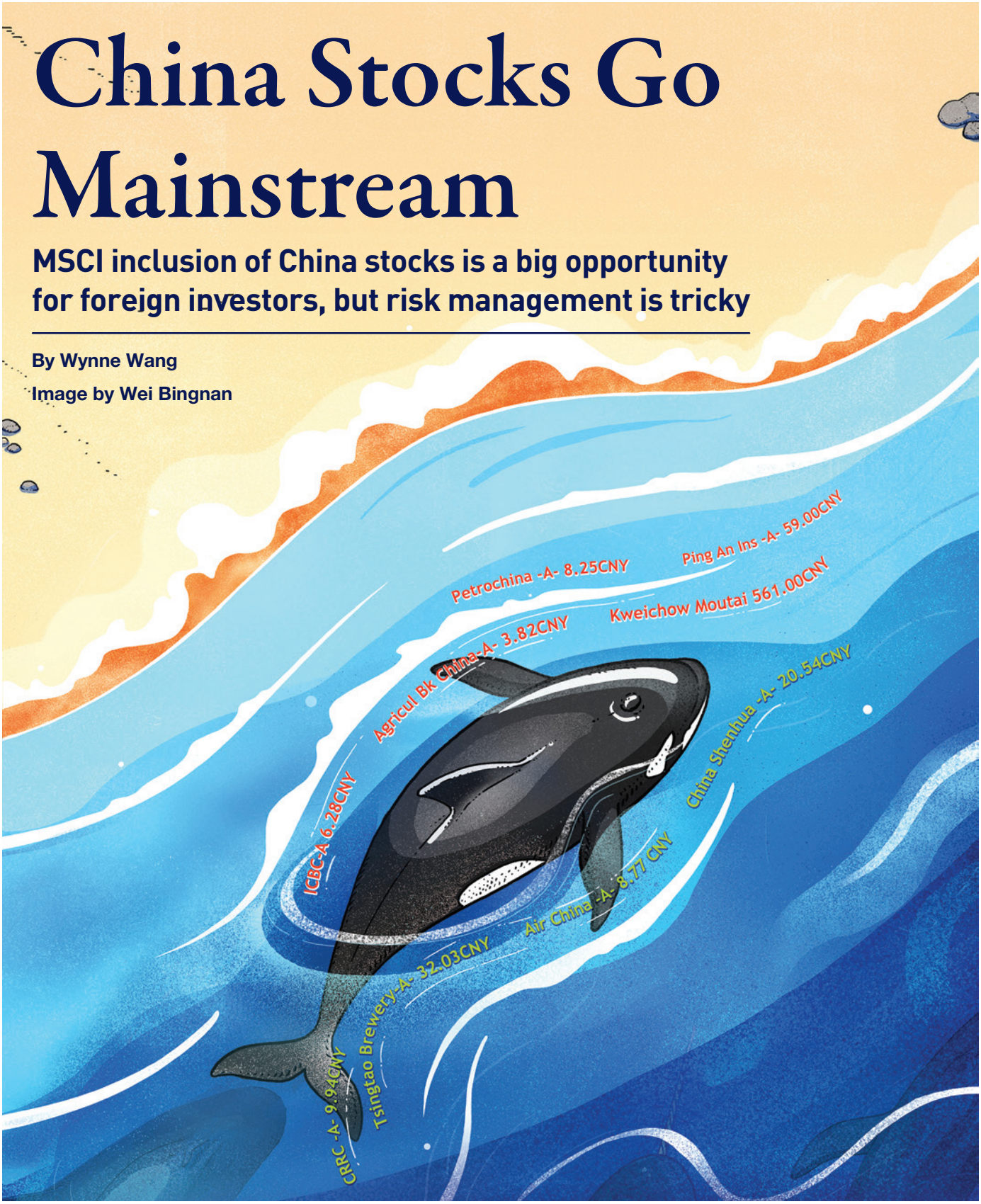
Fraser Howie has the bleakest view. He believes true reform is distant and that everything may be headed in the opposite direction: "mixed ownership" may not in the end mean private stakes in state companies, but increasing state control over private companies. "The idea of the private sector in China is a fluid concept," he says. "Everything is at the dispersion of the [government]."

China Stocks Go Mainstream

MSCI inclusion of China stocks is a big opportunity for foreign investors, but risk management is tricky

By Wynne Wang

Image by Wei Bingnan



In June, MSCI announced that it would include select mainland China stocks in its indices. The move, although initially small, gives a big legitimacy boost to Chinese markets—but how do the markets work and what risks do they entail?

After years of hesitation, MSCI finally agreed in June to include mainland China stocks in its global benchmark equities indices. The decision means Chinese stocks will become an increasingly important part of many investor's portfolios in the future, and on the news, China stocks immediately soared to an 18-month high.

MCSI creates the stock indices behind some of the world's largest exchange-traded funds (ETFs). With the investment world increasingly moving toward ETFs, every passive asset manager pegged to an MCSI index where China is included will now be obliged to buy mainland equities, known as A-shares.

"We believe its strategic importance (MSCI's decision) lies in the fact that it will likely transform China A from a 'nice to have' to a 'have to have' market, and redefine how global equity investors think about their opportunity set and capital allocation over time," Goldman Sachs wrote in a July report.

For Beijing, the decision marks a milestone in efforts to draw international funds into the world's second-largest market, but also indicates how much more regulators need to do to open the country to the world. MSCI will take only 222 of the largest and most liquid mainland-listed companies starting from May next year. These stocks will account for less than one percent of the market capitalization of the MSCI Emerging Markets Index.

MSCI's caution is not without basis—China's currency is not fully convertible and mainland markets are a long way from being market-driven. This means investors who track the indices must factor in extra risks.

Taking Stock of the Market

China's equities market was re-established in 1990 with the founding of the Shanghai Stock Exchange and Shenzhen Stock Exchange. Today, the Chinese stock and bond markets are now the second and third-largest in the world, respectively.

China now has more than 3,000 listed A-share (RMB-denominated) companies, and 100 B-share companies (denominated in dollars), more than double the number in 2007. China's market capitalization totaled RMB 39.9 trillion ($6.2 trillion) as of May 28, up from RMB 5.9 trillion ($915 million) in May 2007. For comparison, the New York Stock Exchange's market cap was $21.3 trillion in June, and the Hong Kong Stock Exchange HKD 30.7 trillion ($3.9 trillion) in early September.

Trading on the two mainland stock markets is dominated by "retail investors," speculative mom-and-pop players notorious for get-rich-quick and in-and-out trading habits that drive market volatility. This makes China different from developed markets where professional institutional investors play the leading role.

"If you look at market cap, retail investors own around 50%," says Amy Lin, Senior Strategist of Capital Securities, the first Taiwanese securities firm to open an office in mainland China. She notes that in the past few years, the balance has been shifting toward institutional investors. "But retail investors may still make up 70% of daily trading as institutional investors don't trade so actively."

The details are more complex. Goldman Sachs's research shows 69% of shares on the Shenzhen Stock Exchange are owned by retail investors. In Shanghai, it is only 45%. On the Hong Kong Stock Exchange, for comparison, local retail investors constitute 20% of daily market turnover, according to the stock exchange itself.

In other major markets, trading largely results from investors assessing the impact of economic trends and specific company results. Not so in China, where trading by retail investors tends to be driven by rumors and politics. The most important factor underpinning China's markets is the implicit guarantee that authorities will step in and resolve any major problems.

"Markets have a casino characteristic that has a lot of appeal to people, particularly when they see people getting rich around them," investment legend Warren Buffett told CNBC in May, referring to China's stock markets. "Those who haven't been through cycles before are more prone to speculate than people who have experienced the outcome of wild speculation."

For some astute traders, the disproportionate number of retail investors is a benefit. "In my experience, the strong retail participation is good for professional fund managers because it makes the market more inefficient," says Chris Ruffle, portfolio manager with Open Door Investment Management Ltd, who has more than 20 years' experience investing in China's stocks. "Retail investors read the newspaper, then they buy this and that. If I go out to visit the companies and really understand them, then I will be in a better position."

Inexperience, short-term mentality and "herd behavior" makes for dangerous markets—as seen in the harrowing crash of the Shanghai stock market. After several years of hovering above the 2,000-mark, the Shanghai Stock Exchange Composite Index began rising in December 2014, peaking and then crashing in June 2015.

The stunning surge was caused by several factors, including falling borrowing costs, a clampdown by the government on property investment (one of the few other investment options available in China), central support for stock investment and relaxed rules on margin trading (borrowing funds on margin from brokers to play the market). According to Goldman Sachs, formal margin lending alone accounted for 12% of the market float at the peak and 3.5% of China's gross domestic product.

By June 2015, the Shanghai market hit a seven-year high of over 5,100, more than double its value half a year previously. Observers voiced concerns that the rise was driven by speculation and not fundamentals, particularly given that the overall economy was slowing. Half of the companies on the exchange were priced at 85 times their earnings. The bubble burst on June 12, and in three weeks the market shed about 30% of its value. By early October the Shanghai Stock Exchange was down to 3,000.

The National Team

Such volatility spooks professional investors, but what is more concerning is the level of government intervention. As the market began to crumble, authorities embarked upon invasive measures to stop the slide. There was ban on selling by major corporate shareholders and an outright trading suspension of almost half of listed companies. The government also directed companies to buy back their own shares with finance provided by state banks whenever it was needed. Not long after, the Ministry of Public Security announced that it would arrest "malicious" short sellers.

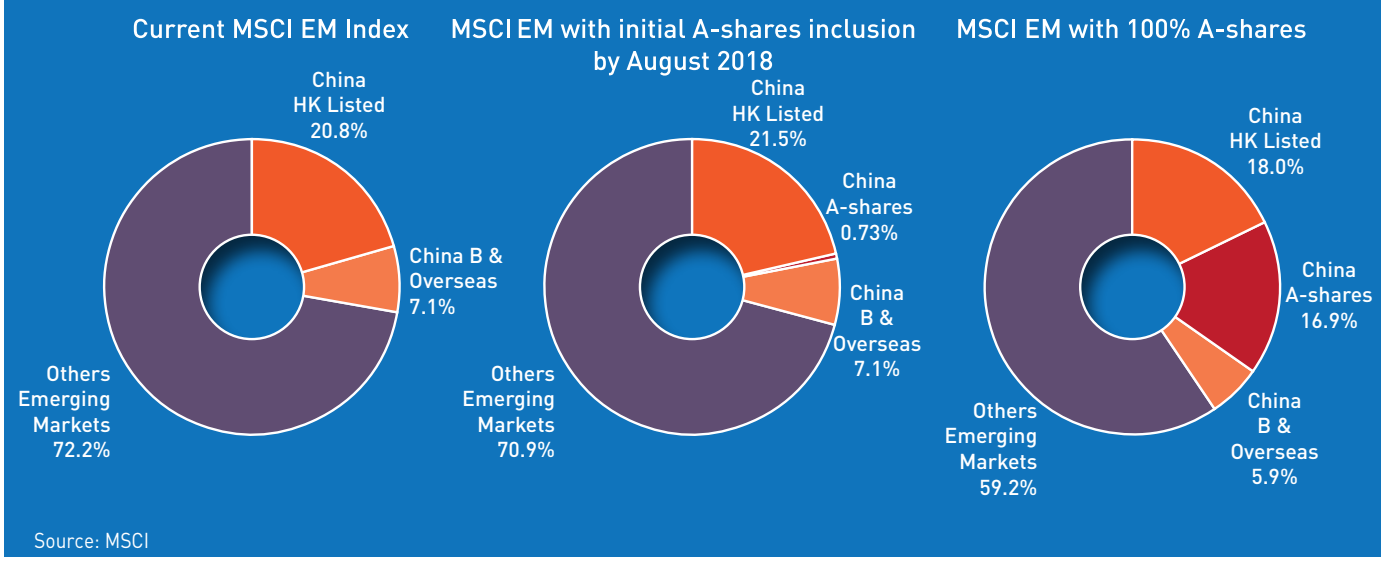
Billions of RMB were injected into markets, particularly through the "national team," a coalition of state-owned financial institutions—but almost to no effect. On August 23, more than two months in, the government announced that it would allow China's state pension fund to invest up to 30% of its RMB 3.5 trillion ($527 billion) into equities in another effort stop the bleeding. The market recovered slightly topping out at 3,600, but fell again in January 2016 to below 3,000. It has since then slowly climbed back to over 3,300.

Patrick Chovanec, Chief Strategist at Silvercrest Asset Management and former Professor at Tsinghua University, wrote in *Foreign Policy* in 2015 that, while the intervention may help to put the brakes on collapse, it undermined confidence in market principles. Echoing an infamous remark from the Vietnam War, the piece was titled, "China Destroyed its Stock Market in Order to Save It."

This August, the China Securities Regulatory Commission (CSRC) lifted many of the emergency measures in place since the crash, noting that the stock markets had "achieved smooth operation," after a "period of abnormal fluctuation." The long-term impact of state-backed investment funds, the National Team, in the stock market has, however, been profound.

A Share of A-shares

MSCI's initial inclusion of China's A-share is small



Source: MSCI

While some thought the National Team's participation might end after the market stabilized, it has become a major player and now holds an estimated 7% of the entire A-share market, according to Goldman Sachs. Indeed, the state bought so much stock that it became the majority shareholder of a number of private firms, effectively converting them to state assets.

And the National Team has developed its own patterns of investment. "The investments they hold are relatively long term, big cap and value-driven, which could serve to stabilize the market to some extent," said Hao Hong, Research Head with Bocom International Holding Co.

Although emergency restrictions are lifted, others remain. In major international markets, companies can conduct an initial public offerings (IPO) whenever they meet the exchange's conditions, but in China, the CSRC has strong grip over new share supplies.

Companies that want to go public need approval and may have to wait in line for years. In bad seasons, IPOs are stopped entirely to avoid weighing down the weak market. The CSRC then resumes approvals when the market recovers. It approved 225 initial public offerings in the first half of 2017, more than double the number of a year ago.

The CSRC also caps IPO prices at 23 times a given company's historical earnings, aiming to prevent more volatility in the secondary market. Taken together, these factors create unique conditions. "A-shares can be inscrutable, with a different trading environment that international fund managers will find hard to adapt to," says Hao Hong.

Gradual Opening

The China A-share market was first cautiously opened to outside investors in 2003. Under the Qualified Foreign Institutional Investor program (QFII), selected foreign institutional investors can invest in China's stock markets with significant restrictions. It was in effect an early effort at internationalizing the RMB. Early QFII players were big names such as UBS, Morgan Stanley and Goldman Sachs and the list has gradually expanded since.

> **MSCI have broken their own standards just to shoehorn China in, as the IMF did with the SDR**
>
> Michael Every
> Senior Asia-Pacific Strategist
> Rabobank Hong Kong

In late 2014, the door opened wider. The launch of the Shanghai-Hong Kong Stock Connect scheme allowed equities on the Shanghai Stock Exchange to be purchased through the Hong Kong Stock Exchange by foreign investors, and for mainlanders to buy stocks in Hong Kong. A total of $3.4 billion flows between the two exchanges each day, with no daily quota on individual accounts. Unlike QFII, the stock connect program requires no special license for trading and investors can repatriate funds without restraints.

In December 2016, China extended the program to the stock market in Shenzhen, again allowing $3.4 billion in daily trading. Currently, more than 1,400 A-shares can be accessed via the Stock Connect program of the 3,000 listed A-share companies. Trading volume through the scheme has picked up steadily with the volume from the mainland constituting 5% of the Hong Kong market's turnover in April, according to a Hong Kong Exchange report.

The real achievement of the Stock Connect was to lay the groundwork for MSCI's decision. MSCI will essentially be building on top of that. The A-share inclusion into MSCI will take place as a two-step process in May 2018 and then later in August. By August, China A-shares will account for 0.7% of the MSCI Emerging Markets Index.

The initial list of 222 comprises stable, large-cap companies are not dominated by China's infamous retail investors. They are some of China's most important names—China's "Big Four" banks, China Life Insurance, Petro China, distiller Kweichow Moutai, automaker BYD—and are also largely state-owned enterprises.

However, some of China's most familiar (and profitable) companies will not be included—such as the "BAT" tech trio of Baidu, Alibaba and Tencent. They are listed on the Nasdaq, the New York Stock Exchange and the Hong Kong Stock Exchange respectively.

This does not mean that there will be a lack of investment opportunity. "If you want to find the biggest industrial companies in their own markets, you can find several in China, like auto, wine and milk," says Amy Lin. She adds that these companies are offering generous dividends and stable growth.

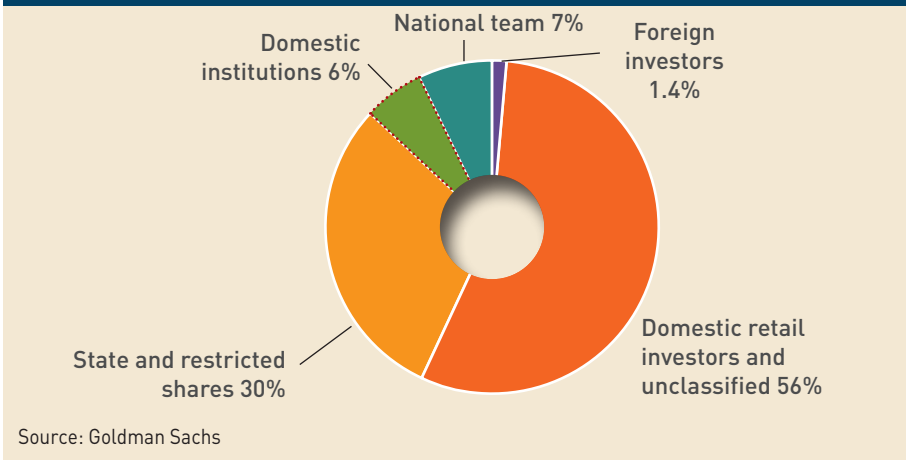
Right Choice?

MSCI's decision to include A-shares in its indices was the result of immense pressure applied by Beijing after the reforms of the Stock Connect program. But numerous problems remain, as does heavy state oversight of the market.

One issue is trading limits on A-shares, which are only allowed to rise or fall by 10% on a trading day. Not only are there restrictions on price fluctuations, but A-shares are suspended from trading far more often than on other global exchanges. *Reuters* reported that during the month of July this year, an average of 265, or one in every 13, listed companies in China suspended trading for some period, with the

Mom-and-Pop Market

China A-shares are dominated by retail investors



Source: Goldman Sachs

number of suspensions rising 30% from an average of 202 in January.

This prompted MSCI to issue a warning to China barely a month after the announcement of index inclusion. "If we find a company suspends for a long time, over 50 days, we will remove it from the index, and we will not bring it back to the index again for at least another 12 months," MSCI's Head of Research for Asia Pacific, Chin Ping Chia announced.

Some recent suspensions resulted from trading volatility—usually smaller companies hitting the pause button to avoid a price crash. But the number of suspensions of larger companies has also increased as Beijing steps up consolidation of state-owned enterprises. This hints at another problematic aspect of a state-controlled market.

State-owned enterprises are not purely profit-driven; they also have significant responsibility to support government policy (see article page 30). They ultimately answer to the Chinese Communist Party before they answer to any other shareholders, to say nothing of foreigners.

Another issue is China's capital controls and the ability of investors to get their money out of the country. Although investors can currently repatriate funds, there is no guarantee that will always be the case. In fact, there is precedent for the China rolling back promises.

Soon after the RMB was added to the basket of Special Drawing Rights currencies defined by the International Monetary Fund (IMF) in October last year, China tightened its capital controls, upping the scrutiny of companies and individuals moving money out of the country. The move was seen as an indication that the IMF had acted too soon, and some analysts expressed concern that the situation may be repeated in the stock market.

"MSCI have broken their own standards just to shoehorn China in, as the IMF did with the SDR," says Michael Every, Senior Asia-Pacific Strategist with Rabobank Hong Kong. "There are many things negative about the decision, because China has not met key criteria and there is no real evidence that it can avoid a future repeat of 2015's market drama going forward—to say nothing of its problems with debt, housing, capital controls and political risk."

> Over the next five to 10 years, China will emerge like a strict asset class, a bit like Japan in the 1980s
>
> Chris Ruffle
> Portfolio Manager
> Open Door Investment Management

New Era

China's inclusion into the MSCI indices marks a new era in China's emergence as an accepted part of global equities. Although the market capitalization weighting of each of the initial company stocks is only set to 5% of its market cap, MSCI will consider increasing all to 100% should market reforms continue. It will also consider including the remaining 226 or so companies in the future.

This is a huge carrot to dangle before Chinese authorities who desperately want their markets to be more widely owned outside the country. Global investors keen to get involved in China will, however, need to accept the local equities market for what it is—a highly speculative government-controlled but growing market.

The size of the money flows that follow the MSCI decision will reveal how acceptable that is. By MSCI estimates, $17 billion to $18 billion could initially flow into China from the initial inclusion of mainland China stocks.

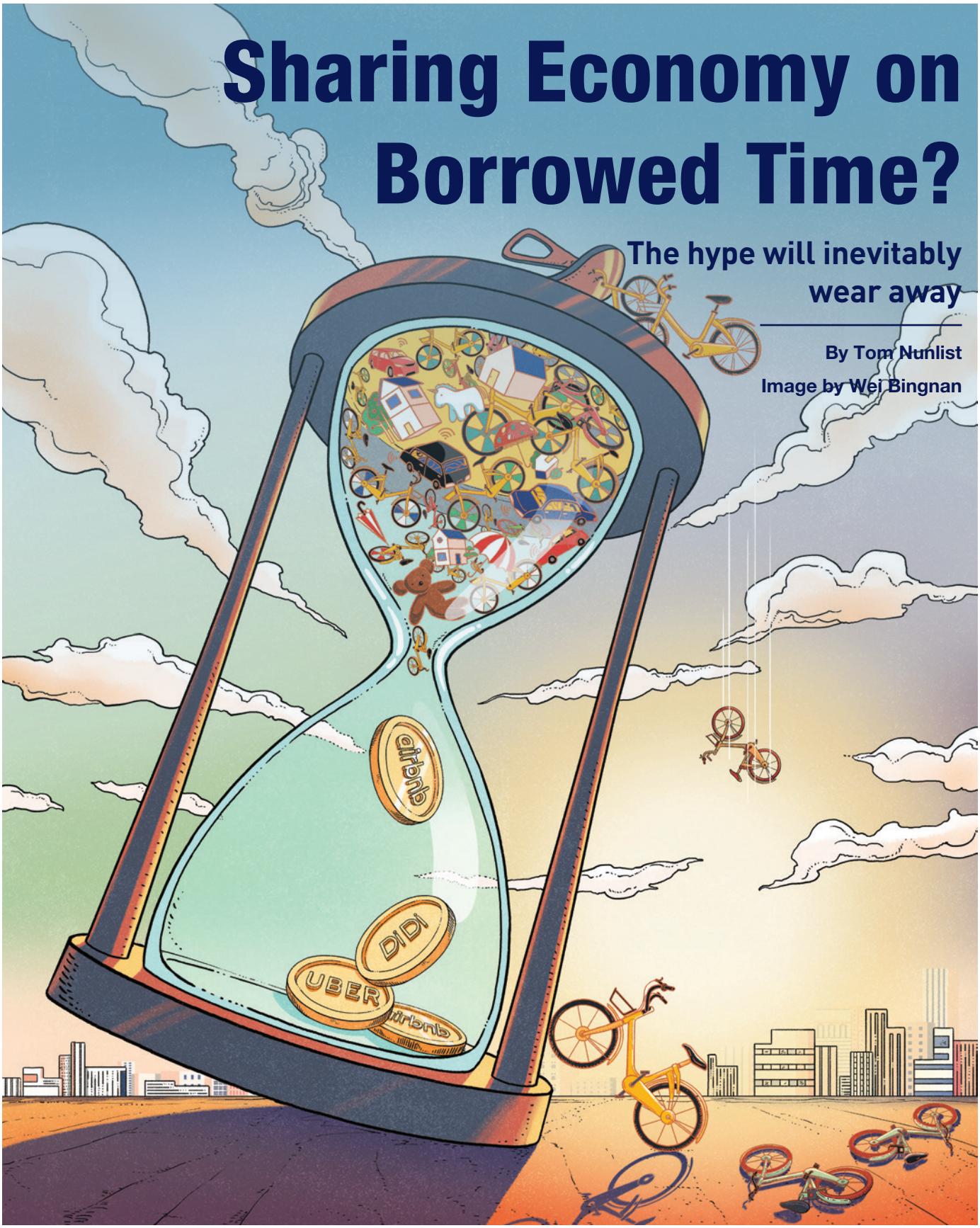
"I think anybody can see that… eventually China will be entirely included," says Ruffle, noting that when this occurs, China will be over 50% of the Emerging Markets Index. "My contention is, over the next five to 10 years, China will emerge like a strict asset class, a bit like Japan in the 1980s. It won't be a sub-sector of the emerging market, but a stand-alone sector like America and Europe."

Sharing Economy on Borrowed Time?

The hype will inevitably wear away

By Tom Nunlist

Image by Wei Bingnan



The sharing economy exploded in China this year, with companies for bikes, umbrellas, toys and more all taking part in the hype. But with the concept reaching fever pitch, sharing could be in for a reality check

In the 1960s and 1970s, the most popular wedding gift in China was a bicycle. By the end of the 1980s, there were 500 million bikes in China and Beijing had gained the title of "Bicycle Kingdom," with freeway-sized bike lanes accommodating millions of commuters.

Then things began to change. Bike lanes shrank as car lanes grew, bus routes and subway systems underwent massive expansion, taxi cabs became affordable and electric scooters pervasive. The humble bicycle never quite disappeared, but society moved on to bigger things.

But in 2016, a stroke of genius helped the bike stage an unlikely comeback as part of the "sharing economy." Bikes can now be rented via an app and you can park them anywhere on the street.

Such is the ubiquity, particularly of the two leading companies—Mobike (10 million orange-and-silver bikes) and Ofo (20 million canary-yellow bikes)—that the bicycle can be thought of as the two-wheeled flagship of sharing, spreading the gospel of the business model. In March, Shanghai was the most shared bike-heavy city in China, with 450,000 on the streets.

Since shared bikes hit the streets, the phrase "sharing economy" has gone from buzzword to boom market. But defining the sharing economy can be confusing. Uber and Didi, for example, are often referred to as "sharing economy" companies, but many disagree. The term usually covers businesses that share underutilized assets, like cars or spare rooms—but China's proliferation of the scheme has muddied the concept. While there are businesses familiar to Westerners—shared offices, cars and rides—there are also ideas that seem a little kooky: shared basketballs and umbrellas.

According to China's State Information Center, transactions in the country's sharing economy last year were worth more than $500 billion and involved more than 600 million people. The Center estimated that by 2020, the sector could account for 10% of GDP growth. Regardless of the numbers, it is clearly transforming the way people live.

"I think this is an evolution of society," says Bill Li Wenlei, founder of shared office space Mydream+. "As the technology evolves, we will have more areas covered by the shared economy."

Investors are naturally following the trend. Venture capitalists in China threw $31 billion at startups in 2016, an increase of nearly 20% from the previous year, according to KPMG. While it is unclear what proportion of that went into sharing economy startups, those businesses seemed to steal the show—according to Crunchbase, a database which keeps track of the tech startup industry, Mobike and Ofo have raised more than $2 billion collectively.

But there is a healthy degree of skepticism about whether it can all work. The sharing space is being sustained by hot money and a great deal of official support, or at least rhetoric. What will happen when the excitement dies, as it presumably will?

"I can't see why some of services won't succeed, and won't keep going," says Andrew Atkinson, Marketing Manager at brand consultancy China Skinny in Shanghai. "But I definitely feel some of the business models have not been fleshed out."

Terms and Limitations

One of the messiest things about the "sharing" space is the blizzard of terms surrounding the phenomenon: sharing economy, access economy, collaborative economy, on-demand economy, freelance economy, gig economy. According to April Rinne, a globe-trotting sharing economy consultant who, among many other things, sits on China's National Sharing Economy Committee, the public often assumes these are all the same when they are in fact different, although overlapping.

The definitions are fluid even for experts, but a few examples can help define the boundaries. Take Bla Bla Car, the $1.5 billion French ridesharing platform that connects drivers making long trips. Riders contribute to the cost of the trip, but the driver doesn't earn money, so it is truly shared—although the platform is monetized by taking a small cut. Bla Bla Car meets Rinne's three primary criteria of a sharing company: utilization of under-used assets, decentralization and an element of relationship/community building.

Now take Uber. The overlap with the Bla Bla Car model includes decentralization and shared use, but there are differences, the most important being that Uber drivers drive to make money. Some surveys find a third of them do it as a full-time job (Uber even offers drivers financing to purchase cars.)

Many other sharing economy businesses fall somewhere in between. Airbnb, like Uber, has also become professionalized, but retains a focus on relationships. Shared office spaces are centralized and often professional, but the community building aspect is extremely strong.

The Mobike and Ofo model is different again. The bikes are owned by the companies, so the focus is not on under-utilization and in practice there is little focus on social interaction. Rinne, however, notes it removes ownership from an object you once had to buy. This is the model of many of the businesses in the recent sharing explosion in China, and it may be spawning yet another term.

"It is really Renting 2.0," says Oscar Ramos, Program Director at Chinaccelerator, a startup accelerator in Shanghai.

Trail of Disruption

Renting 2.0—or whatever you choose to call it—is now everywhere you look in China, changing city life, upending businesses and sometimes just being in the way. That last factor has become a hallmark of shared bikes, especially as Mobike, Ofo and others compete to outspend each other for market share. The station-less nature that makes them so convenient also makes them inconvenient, as people often park them poorly, or that they tend to pile up in the hundreds at heavily trafficked spots. Some cities have begun wholesale impounding them to clear the way.

But this hints at a reason why sharing businesses have taken off in China: the country's dynamic nature at street level, both in terms of lifestyle and in testing out new ideas.

"It's the lawlessness of China that makes it possible," says Atkinson, observing that if the bikes were better policed, or people more careful about parking them, the convenience factor that makes them work would be eroded. The key innovation, after all, is their "anywhere" nature. "People just get out of the metro and jump on."

> **It's the lawlessness of China that makes [the sharing economy] possible**
>
> Andrew Atkinson
> Marketing Manager
> China Skinny

The second factor aiding the growing of sharing business in China is the mobile payments revolution driven by Alibaba's Alipay and Tencent's WeChat Pay, which allow consumers to painlessly spend even tiny amounts of money by simply scanning a QR code (an advanced barcode). "[The sharing economy] in China would not be what it is without mobile transactions," says Atkinson.

The rapid adoption of mobile payments in the past few years is itself driven by a third factor in China, which is the general openness of people to try out new things. "The first thing people think about consumers in China is volume," says Ramos. "But the best thing they have is an open mind, flexibility and lack of legacy."

These factors set the stage for the sharing economy invasion currently moving across the spectrum of personal goods. Some seem to be solid ideas. There is a basketball sharing startup, which works as an unmanned station near basketball courts, so you can go shoot hoops even if you didn't bring your own ball. There's also a suitcase sharing startup in tightly-packed Hong Kong where owning luggage means finding space in your tiny apartment for a big box you use only occasionally.

Others are less obvious. Several companies have popped up that rent power banks, so that users may charge their mobile phones for a small fee, for example at a bar or restaurant. But the project that has got the most giggles was an umbrella-sharing startup, Sharing E Umbrella. The company lost nearly all its initial 300,000 umbrellas just a few weeks after launching due to holes in the plan—people did what they do with their own umbrellas, left them haplessly at home, the office or on the train.

While it is easy to scoff, Ramos points out that these types of failures are a natural part of the business of innovation. "The truth is that there are a lot of inefficiencies in the world, and where these inefficiencies are, we don't know," he says. "Airbnb, which is probably the first large example of a sharing economy business, looks super crazy if you think about it. Even the investors that were backing the company weren't sure it would work."

Ramos believes all the firms launched so far have identified real problems. Getting caught with a dead phone battery really is a huge pain. And the way people use umbrellas really is wasteful—who doesn't have a half dozen lying around?

"In innovation, the difference between crazy and brilliant is just so fine that you can never tell the difference," says Ramos. "You just have to follow the customer."

Another unexpected idea to gain traction recently is shared toys. There are at least three companies in the space: Wanju Zuzu (Toy Rent Rent), Wan Duoduo (Play More) and Baobei Banjing (Baby Radius). Xie Wenting, a 31-year-old mother in Beijing, uses the latter to provide toys for her toddler. "In my experience the toys are

clean," she says. "RMB 469 ($71) per year is cheap… I recommend it!"

On closer analysis, the concept is a sensible solution to a practical problem: quality toys for children can be expensive and kids quickly outgrow them. Why not use them for a few months and exchange them for new toys?

Hot Money, Big Support

What Ramos does see as a problem is all the investment cash flying around. "A lot of cash kills startups," he says. "When you have too much money, you solve the problems with money, not creativity."

Ramos calls out E Umbrella specifically, and CEO Zhao Shuping's promise to carpet bomb cities with 30 million more umbrellas by the end of the year. Yet, there is still no clear plan to keep them from disappearing yet again.

At the same time, the emergence of the sharing economy has aligned with several of the government's goals, including finding ways to boost the economy, save resources and reduce pollution. Those attributes have garnered support from the highest levels.

"The country's sharing economy, enabled by the Internet Plus, has been instrumental in absorbing excess capacity and creating new jobs through its various new business models," said Premier Li Keqiang at a State Council meeting on the topic in June. "We should give credit to the sharing economy as a reinvigorating force in China's economic growth."

Also, innovations like station-less bike sharing are home-grown, at a time when China is hungry to stand out more as a global thought leader. "Any opportunity the government gets to push… something that puts China on the world map in terms of being a leader, it is going to receive a lot of support," Atkinson says.

All that support has a flipside, in that companies that are not really sharing are trying to elbow in on the buzz in what April Rinne calls "share washing."

"We have seen a lot of companies adopt sharing economy language when they are not sharing economy at all," says Rinne. She points to recently launched "shared gym pods" hitting the streets in Beijing. The "gym" consists of a treadmill in a tiny air-conditioned cube parked in a public location. And of course, gyms are already a community-accessed service, which makes the whole thing doubly strange.

Even more amusing is the "shared book store" launched earlier this year in the eastern province of Anhui. Some critics pointed out that it seemed scarcely different from video rental businesses, which disappeared long ago. But that of course ignores the fact a free "book sharing" program has existed for hundreds of years—it is called the "library."

One view is that these launches are cynical attempts to cash in on a buzzword. But Wei Wuhui, a popular tech business commentator and lecturer at Jiaotong University in Shanghai, says that Chinese entrepreneurs may just being doing what needs to be done in a moment when the government has seized upon the idea.

> In innovation, the difference between crazy and brilliant is just so fine that you can never tell the difference
>
> Oscar Ramos
> Program Director
> Chinaccelerator

"To do business in China, you must heed the call of the Party, the call of the government," he says.

Share Me the Money

But having the snappy idea and the right slogans in no way guarantees financial success. And in China's so-called sharing economy, there are few clearly workable business models. For starters, many businesses seem way too cheap. Shared bikes started out at only RMB 1 per half hour, which puts profitability into question given the initial cost of the bikes and upkeep. And the free-for-all market-share battle has devolved at times into a literal free-for-all with companies giving away rides at no cost.

But like other aspects of innovation, it may be a matter of toying with different models until something hits. Atkinson brings up the advertising potential of these companies—already companies are parasitizing bike sharing by slapping them with sticker advertisements and tying small business cards to the handlebars. The umbrellas, too, may be monetized this way, he says.

But he says that for some investors, profit may not even be the goal. "I feel like a lot of incredibly wealthy Chinese investors are starting these things because it is cool, and it is a trophy, a pinup sharing brand on the internet of things," says Atkinson.

Wei Wuhui has a different take on the question of profitability. He says that the most popular of these companies in fact function as proxy battle space for the competing payment systems, Tencent (WeChat Pay) and Alibaba (Alipay). Such was the case with ride-hailing companies Didi Dache, backed by Tencent, and Kuadi Dache, backed by Alibaba, as they each burned hundreds of millions of dollars in competition before finally merging to form Didi Chuxing. Alibaba lost and now Didi uses only WeChat Pay.

"[For them] losing money is really no problem," says Wei. It's about dominance in the payment market. Mobike and Ofo, he says, are a continuation of that battle, as they are backed by Tencent and Alibaba respectively.

Only the biggest of the sharing operations fall into this category—basketball and power bank sharing are too niche. But another important consequence of these businesses and the scan-to-pay functionality is what Wei calls the "data-izing" of everything they touch, and every user they touch. That can, for example, be leveraged to serve up advertisements. It's worth noting that model has long been proven by titans like Facebook.

Permanently Borrowing

Unproven though the business models may be, the concept of "sharing" seems here to stay. Oscar Ramos compares the situation to the Groupon copycat craze that blew up around 2010—the innovative model requires a threshold of customers to commit to purchase before a coupon deal is activated.

At one point, there were hundreds of such companies in China, which led to a predictable meltdown. Fast-forward to 2017 and there are only a few survivors, but they have healthy businesses. That does not dampen Ramos's enthusiasm. "What is exciting about this whole thing is that we will probably see another [sharing company] that in six months becomes indispensable," he says. It is impossible to say what that might be until it appears.

> **We have seen a lot of companies adopt sharing economy language when they are not sharing economy at all**
>
> April Rinne
> China National Sharing Economy Committee Member

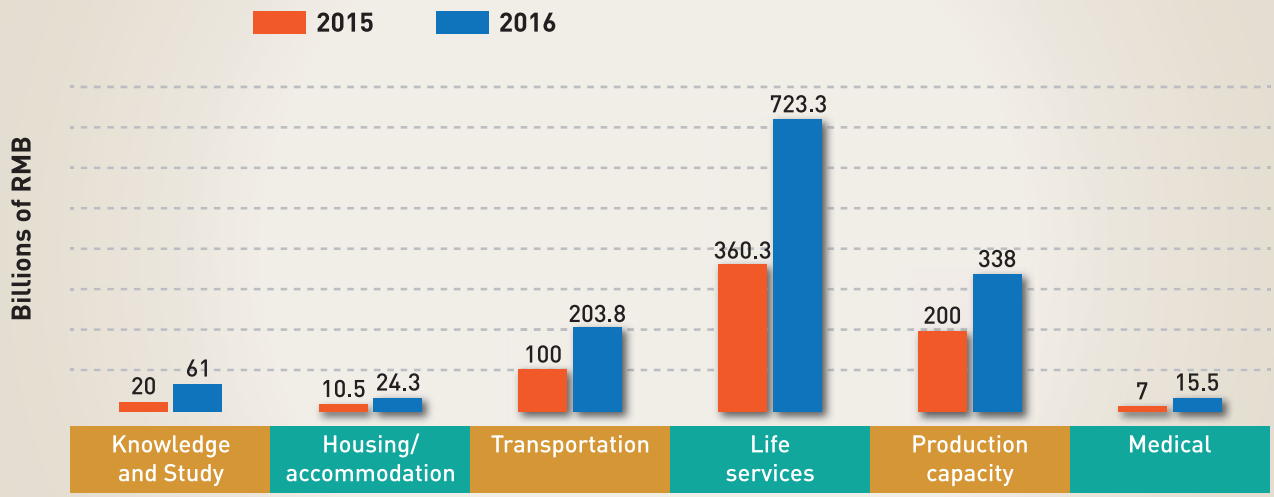
For both China and wider world, April Rinne believes that we are at the beginning of a new lifestyle in an age of mass consumer marketing that has, up until now, made ownership something sacred. "I have to say we have barely touched the tip of the iceberg in terms of the kinds of ways we can rethink whether you access something or you own," says Rinne. In the future "when somebody takes a snapshot of their lifestyle they will see many more things that they access or subscribe to."

Such a change may be far, far more important in China than anywhere else, simply because of scale. The new "middle class" is still a minority, and it is easy to see how the ascendance of hundreds of millions of more people can create real strain. Ramos notes that the compound where he lives in Shanghai has eight towers of about 40 stories each and no parking. If access to a car is a hallmark of the middle class, where will you put them all?

The sharing economy, he thinks, has an answer, particularly if it ends up looking like Mobike, but for vehicles—that is, by removing actual ownership while at the same time maximizing access. "It is a more efficient way to roll out ownership," he says. "And a faster way to give people a better quality of life."

More Pie to Share

Revenue from the sharing economy is expanding



Source: The Sharing Economy Research Center of the State Information Center

CKGSB BUSINESS CONDITIONS INDEX

Smooth Sailing in 2017

But rising prices are cause for concern

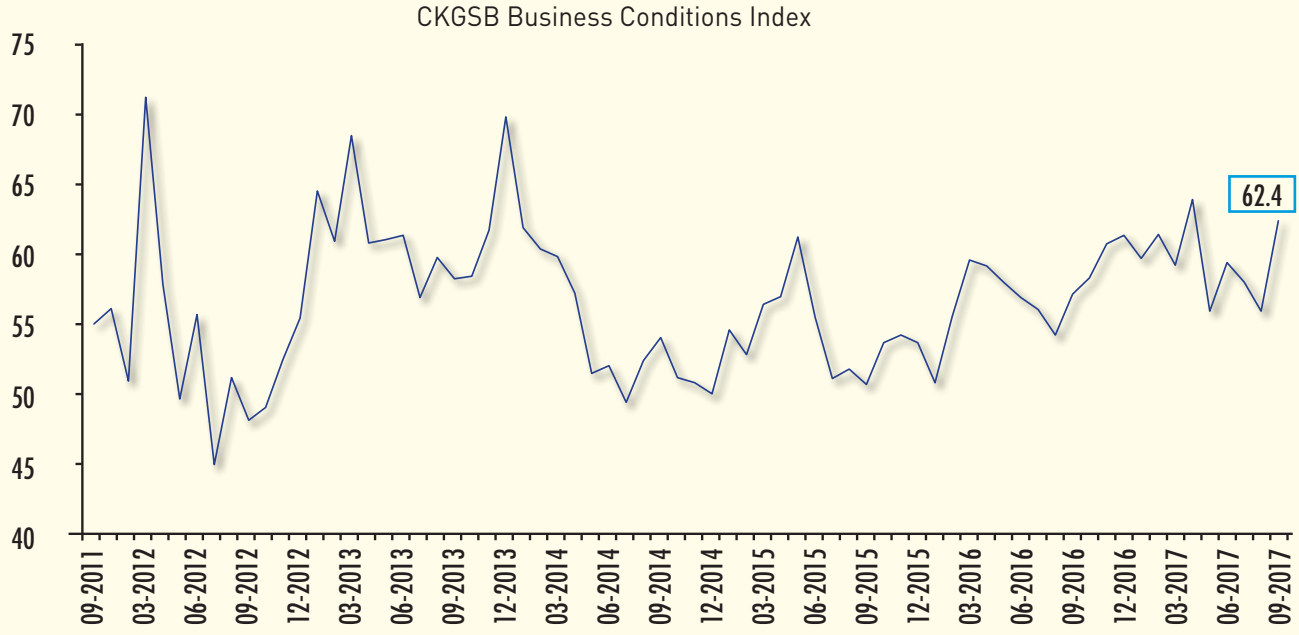
In September 2017, the CKGSB Business Conditions Index (BCI) stood at 62.4, a significant rise from last month's figure of 56.1. This is the second highest value of the BCI in 2017, second only to 63.9 in April. Among the sub-indices constituting the BCI, those representing sales and profits have risen greatly, while the corporate financing environment has improved slightly and the inventory status remains unchanged. This shows that demand in the economy has risen significantly and that the prospects for economic growth are rosy.

China's economic growth this year should be smooth. Three-quarters of the year have already passed, with GDP year-on-year growth for the first half year reaching 6.9%. Because the BCI is a predictive index, and its outlook period is half a year, we think that China's economic development will comfortably realize the growth goal set by the government for 2017.

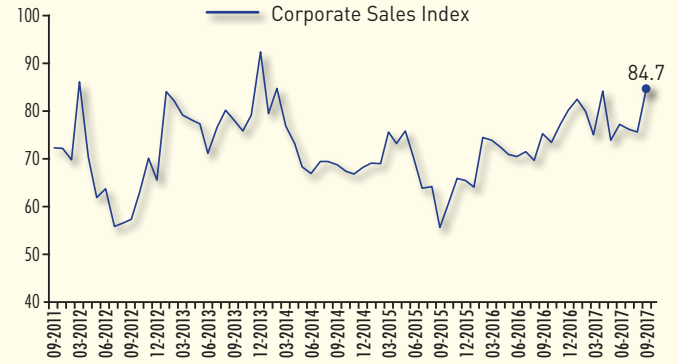
The BCI asks respondents to indicate whether their firm is more, the same, or less competitive than the industry average (50).

The BCI is directed by Li Wei, Professor of Economics at the Cheung Kong Graduate School of Business

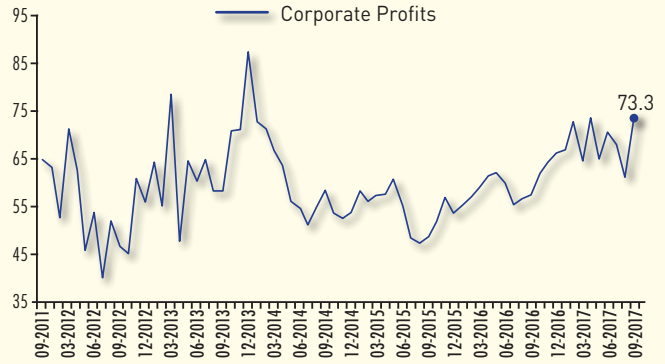
The BCI hit its second-highest mark this year



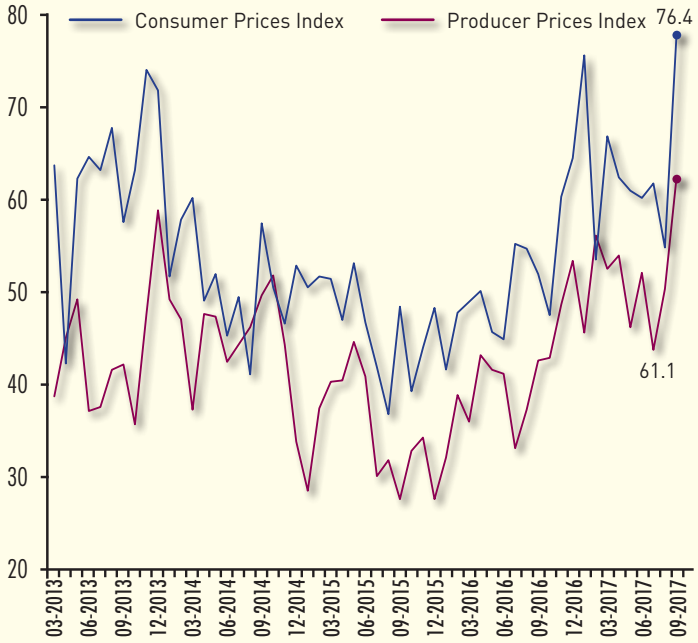
Corporate sales are up...



...along with corporate profits

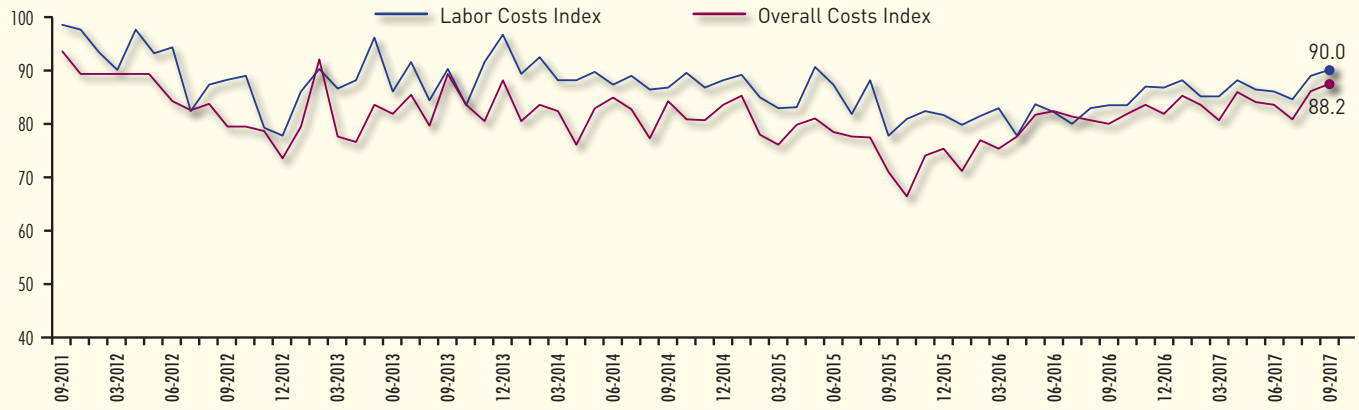


Rising consumer and producer prices may signal trouble



This month, the consumer and producer prices indices (at left) increased greatly, which is significant. Although it is unclear whether this trend will continue, it needs to be carefully watched. Since the period of reform and opening-up, China's economy has suffered several large challenges, often related to high inflation. Given that China's economic growth has been rapid, the rise in prices can be understood to a certain degree, but the question is how much is acceptable? Except for consumer goods and intermediate goods, we also need to consider that if these items all see large price increases, the prices of other things, such as property, may also rise. When we consider these factors collectively, then the damage to the economy caused by the rise in prices may be underestimated.

Neither labor costs nor overall costs have ever been low in BCI history



CKGSB BUSINESS SENTIMENT INDEX

Economic Structural Problems Persist

Although China's official GDP for the first two quarters, both at 6.9% year-over-year, and industrial growth exceeded expectations, China's industrial economy has not yet bottomed out. The CKGSB Business Sentiment Index in the second quarter stood at 46, down from 47 in the previous quarter, but still indicating a slight contraction. Moreover, overcapacity remained at a historical high, both in terms of its prevalence and severity, and product and cost prices continued to rise, while production stayed flat. At the same time, the gap between the BSI of state-owned enterprises and that of private enterprises widened a bit—they are 61 and 51 respectively. All these findings suggest that the structural problems of China's industrial economy remain a significant concern.

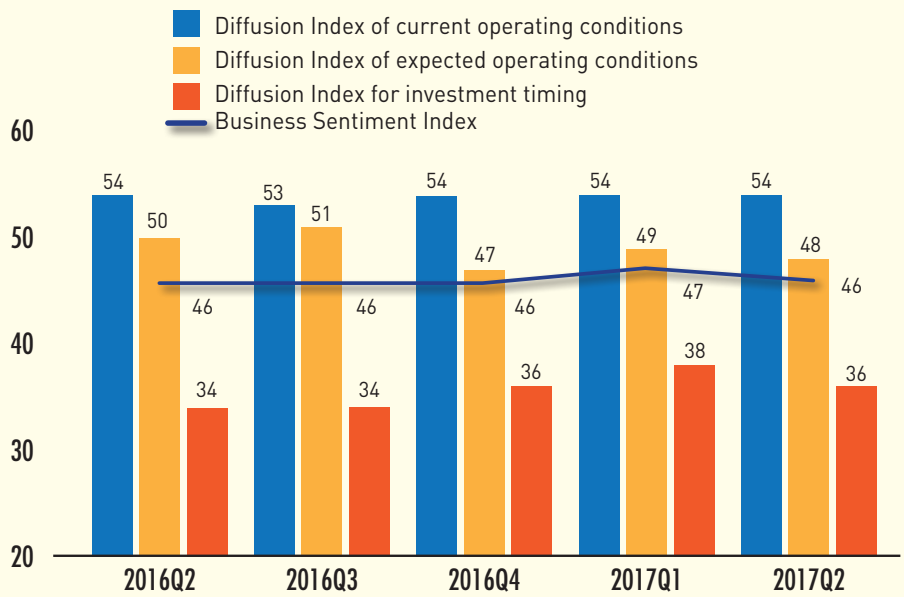
The CKGSB BSI is based on data collected from our quarterly surveys of around 2,000 industrial firms in China. A total of 2,050 firms surveyed for the 2017 Q2 report, of which 1,670 firms were also polled in the 2017 Q1 survey. The survey design ensures that our sample fully represents industry, region and company size.

The BSI is directed by Gan Jie, Professor of Finance at the Cheung Kong Graduate School of Business

Key Findings

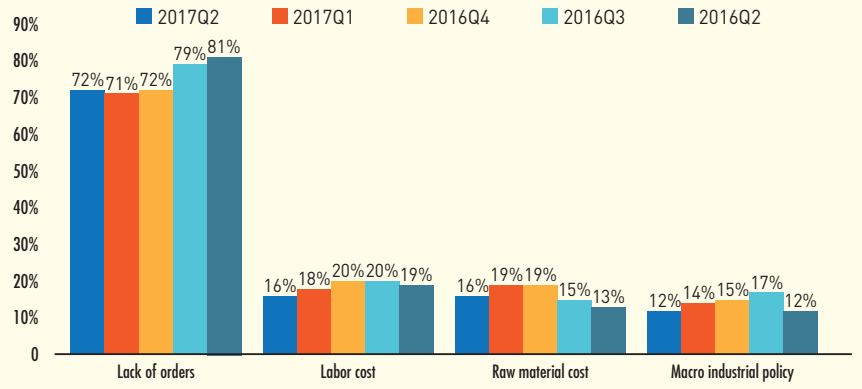
- The low BSI in Q2 was, as in previous quarters, a result of weak investment
- Only 1% of the firms considered it to be a "good" time to make fixed-asset investments
- 71% and 28% replied "average" and "bad" respectively

Business Sentiment Index



The BSI is the simple average of three diffusion indices: current operating conditions, expected change in operating conditions and investment timing. A reading above 50 indicates expansion, while a reading a below 50 indicates contraction.

Lack of Demand is a Big Issue

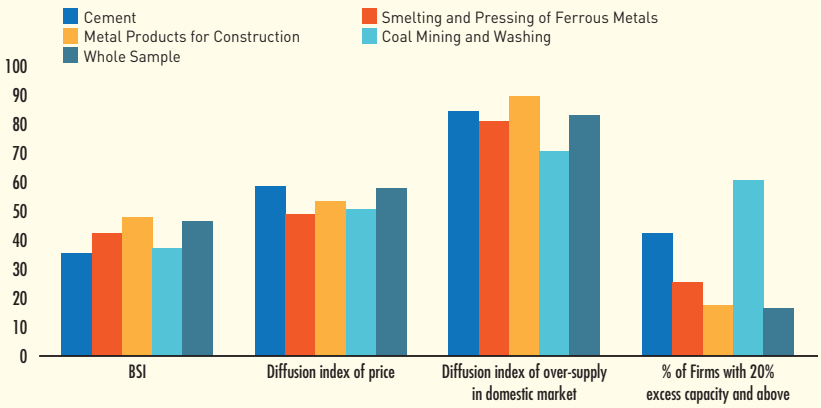


- Weak demand is still by far the biggest challenge for the industrial economy
- 72% of the firms surveyed in Q2 indicated lack of orders
- Costs were listed as the second largest issue, particularly labor and raw material costs

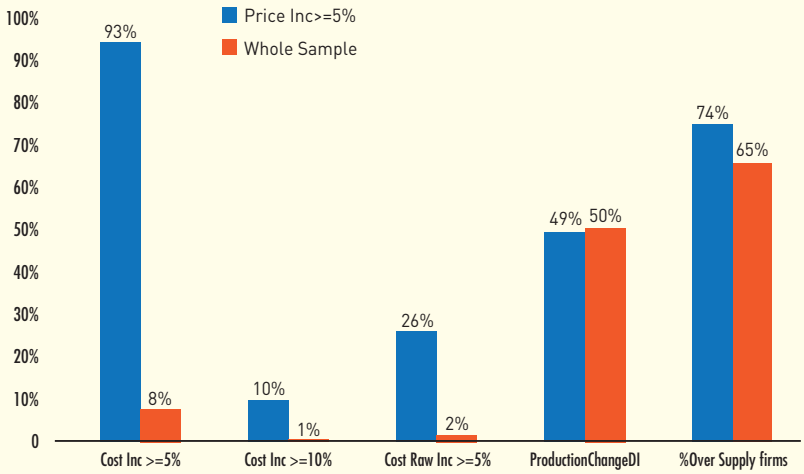
- Contrary to the media discussion, the survey did not find the real estate sector to have an outsized influence on industrial growth

- With the exception of construction-related metal products, the business sentiment, operating conditions and production indices of real estate-related industries were below that of the the whole sample

Influence of Real Estate Overplayed



Price Rises are Driven by Cost Rises



- Among firms with product cost inflation above 5%, cost rises were the most prominent
- The proportion of firms with unit cost increases above 5% and 10% were 93% and 10%, respectively
- Unit cost increases are mostly related to raw material costs—26% of these firms reported raw material cost rises above 5%

Conclusion

- The biggest challenge facing the industrial economy is still overcapacity. Both its prevalence and severity remain at close to historically high levels
- Supply-side reform this year should focus on the reduction of overcapacity, while facilitating industrial consolidation to improve overall competitiveness

Staying Legal in China

Dan Harris, attorney and co-author of China Law Blog, discusses the evolution of China's legal landscape

By George Wihelm

There are few, if any, aspects of doing business as a foreigner in China that are easy, but understanding local law can be the most difficult. Beyond the challenge of legal compliance, one must also understand local regulations well enough to proactively protect operations and assets—for example, through effective use of copyrights.

Dan Harris, an attorney at his Seattle-based law firm Harris Bricken, has been helping clients navigate China's legal landscape for almost 15 years. Since 2006, he has co-authored the China Law Blog, which delivers practical knowledge of Chinese law as it impacts on business. In this interview, Harris discusses legal issues important to companies doing business in China, including compliance, corruption and IP protection.

Q: There are important changes occurring in China's legal landscape, both in terms of the laws and in enforcement. There is increased anti-corruption oversight, stricter employment laws, the new cybersecurity law and so on. What is the main theme you see?

A: If you go back to when we first started the blog, we have been calling the same trend every single year: China is moving more and more towards enforcing its laws. There are a few things to be aware of. One area where you really see increased enforcement is in laws that generate revenue—tax laws and customs laws, which have been very sophisticated for years now. The word is not going out enough that you do not mess with China on customs, that you do not mess with China on taxes and you do not mess with China on employment law. These are being vigorously enforced. And when I say employment law, I'm not talking about if you don't pay overtime the government will come and fine you. No—if you don't pay overtime, then the person affected will sue you.

As the rules have become more numerous and more strict, I am sometimes asked, "Has China gotten so difficult for foreigners that they shouldn't go there?" For a lot of firms, the answer is "yes"

As the rules have become more numerous and strict, I am sometimes asked, "Has China gotten so difficult for foreigners that they shouldn't go there?" For a lot of firms, the answer is "yes." Year after year we seem to grow about 20% in revenue, but we probably shrink in the number of clients by 10% or 20%. We have fewer clients, but each client is paying more. The reason is because you need to be bigger than you used to be to survive in China, and there are many more laws you need to be on top of.

Q: The foreign business community sometimes complains that laws are not fairly enforced in China. What is your view?

A: If you're a foreign company, you need to comply with China's laws. That you see some Chinese company down the street getting away with something, you should not for a minute think that you can also get away with it. China always tests out its laws and enforcement on foreign companies and, to be fair, the United States tends to do that as well. But there are certain things that are troubling about China when it comes to how foreign firms get treated.

We had a client that wanted to buy a factory and asked us to do an analysis. We told them that, although the factory is making $1 million a year, if you buy it, it's going to lose $2 million a year. Of course, they asked us how that could be. The factory was illegally located, half their employees were not on the grid and a foreign owner is not going to be able to get away with these things. When you get into compliance, the costs for the foreign company will usually go way up as compared to your typical Chinese company. But for a high-profile company like Alibaba or Tencent, enforcement is pretty similar as for foreigners.

Q: IP law covers everything from counterfeit bags to theft of trade secrets. Considering that diversity, how has IP protection and enforcement progressed in China in the past few years?

A: I speak on China IP about 25 times a year. What I can speak to best is what I call "private IP law," meaning registering trademarks, copyrights, patents and trying to enforce those things with the appropriate authorities. This is 99% of what our law firm does when it comes to China IP. I would say that it has always been better in China than the media makes it out to be and it has gotten better every single year. Often when you read about a problem, it's because the foreign company messed up, not because China is a bad place to do business.

There are many things you can do to protect your IP, but unfortunately foreign companies often don't. Companies will hire a factory to manufacture their widgets and won't do a thing to try to protect themselves. Six months later they've learned that their factory is selling their widgets all around the world. Then they call us up and say, "Stop these people. They're counterfeiting!" But legally speaking, they are not because you don't have any contract with them saying they can't do that, you haven't registered your trademark in China and you haven't registered your trademark in any of the countries where they're selling your widgets. There is nothing you can do. If you had a good contract from the beginning, there is a good chance your Chinese factory wouldn't have done that.

Q: So counterfeit goods are no longer a problem?

A: No, there are still huge amounts of counterfeit goods coming out of China and it's hard to stop. The problem is not with the law itself. Say someone is putting your registered trademark on basketball hoops, we could sue them in China and the odds are overwhelming that we will win. But then the question becomes whether there is a company that we can go after or is this just somebody in a small town making basketball hoops? If it is the latter and you do shut them down, they can just open somewhere else. That is a tough issue.

But things are getting better. China, like every other country, is going to start caring about intellectual property when it makes sense from a domestic perspective to do so. That occurs when there are companies with money and power who want a good IP system. China has pretty much reached this point. There is proof of that in the number of trademark filings, copyright filings and patent filings, which are increasing every year in China. The number of IP lawsuits keeps increasing as well. Why would Chinese companies spend their money on these things if there were no benefits? They're not just throwing money away—companies don't do that—so those numbers are evidence of improvement.

Q: The new cybersecurity law appears to have important IP implications and some multinationals have voiced concerns. What is the relationship between IP law and the new cybersecurity law?

A: People love to say, "China's laws are vague." In fact, a lot of times the laws are clear and that's their excuse for having messed up. In this case, the laws are vague and I think the government wants to be vague as they test them out. I'm not sure how it's going to impact IP, but one aspect of the law is that it requires data storage to be in China and the issue is that the Chinese government potentially has access to that.

People are afraid of this, but I think only a small percentage of all companies should be really afraid. Is China going to go in, steal the secret for Nike's new shoe sole and give it to some Chinese sneaker company? Probably not. But if some company has computer technology that could make China's missiles go faster, then yeah, they just might. But if your company makes next-generation rubber duckies, I don't think it is a big risk.

Q: What about IP protection as it relates to partnerships with Chinese companies and technology transfer?

A: What we do for our clients is to look out for "fake deals," meaning a Chinese company proposes a joint venture (JV), but in reality wants to learn about your capabilities, then boot you out and steal your technology. We have a test to see if they want to do a joint venture with you for the long term. If the Chinese partner asks to do the JV and have ownership of the intellectual property, we say, no, we are going to license the intellectual property to the joint venture. That's a good way to tell whether they want to steal your technology or just use it and make money off it. If it was the former they would likely reject the deal.

Interestingly, the past few times this has happened, we thought the Chinese partners were up to stealing and we were proven wrong. I have a friend who is a technology consultant in China and he has noticed that Chinese companies are much more focused now on the finances and the money of the deal, rather than just the technology. The difference is that these companies are starting to be run by more sophisticated business people with MBAs and finance degrees, instead of by engineers. Their goal is not just to grab the technology and figure out what to do with it. Their goal is to make money by building up a relationship with the other company. Yes, they want to do business with our clients because our clients have technology, but they want to exploit the technology together to make money.

Q: Another significant change has been increased enforcement of anti-corruption laws. What is there to look out for in this area?

A: China is stepping up enforcement, but is it based on the heinousness or the level of the crime, or is it based on who's committing it and where they are politically? That's the big question. In terms of foreign companies, we tell our clients: you need to think not only about the US anti-corruption laws, but also China's anti-corruption laws. And we have always told our clients this: do not bribe anybody. It's a bad idea on about 100 different levels.

To put things in perspective, China's about in the middle in the world in terms of corruption. It's not that bad. My law firm has filed thousands of trademarks and copyrights in China and we've formed hundreds of companies and nobody has ever once hinted at a bribe. We used to do a lot of work in Russia. We would file a trademark and an official would ask, "Do you want us to expedite this?" and then point to the dusty pile of paperwork from 1959 that had not been expedited. That does not happen in China.

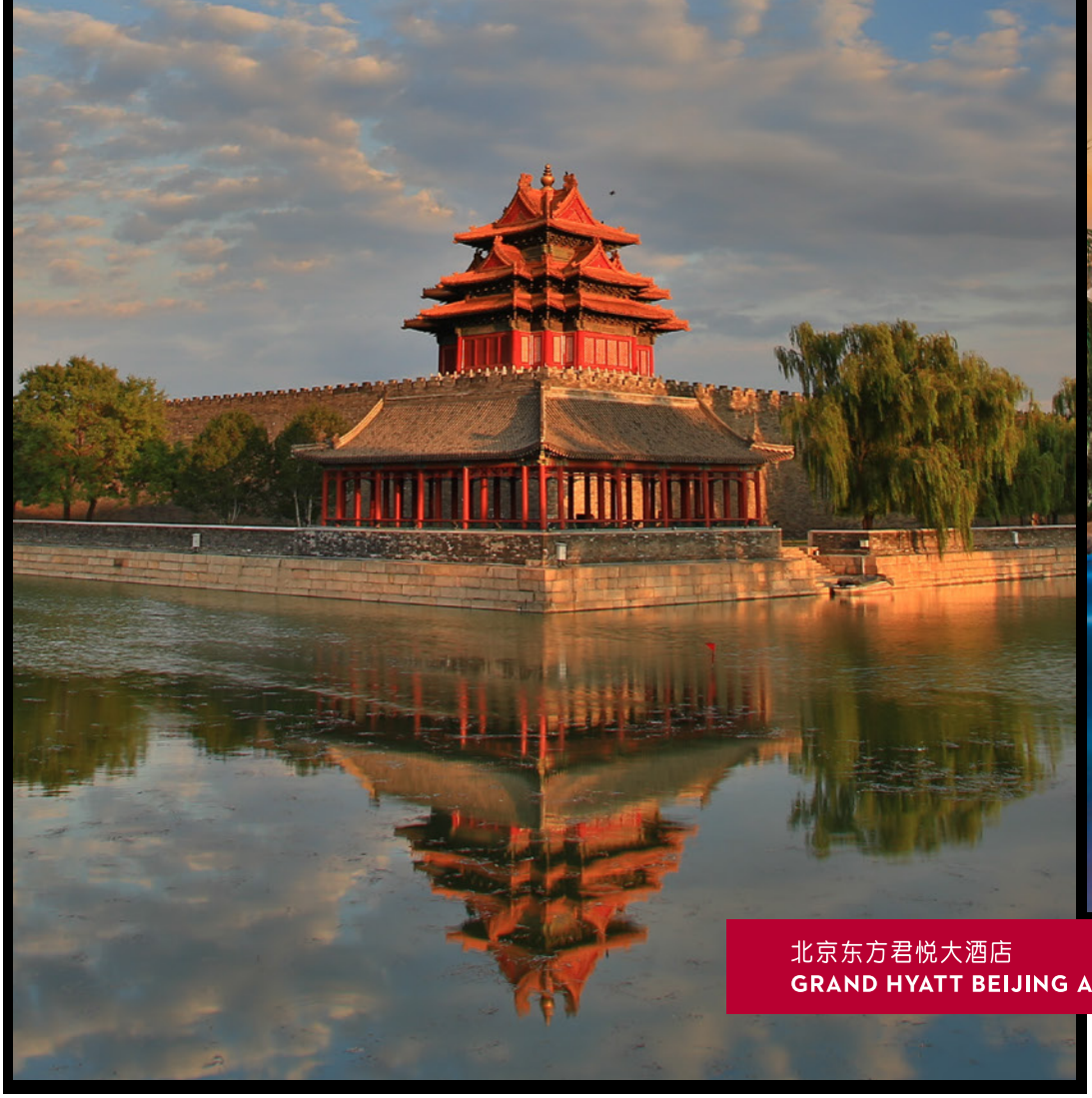
> Countries start caring about intellectual property when it makes sense from a domestic perspective for them to do so. China has reached this point

One change we have seen is increased enforcement of tax laws. We received three phone calls last Christmas from people who said they were outside China, that their taxes were being audited in China and the Chinese government had discovered all sorts of irregularities. All these people said things like, "My accountant told me that everybody's doing this in China." I have no sympathy. What they are saying is that they knew that what they were doing was illegal, but they thought they would get away with it.

Q: What should companies do to keep up with changes in the law in China?

A: Let's say you are a real estate developer in the United States, you've got to keep up on all the local construction laws. How do you do that? You join associations and you make sure your own employees do whatever they can to keep up. You can't pay your lawyers to do that because it would cost way too much money.

China is the same. We know the big picture laws and, if you want, you can pay us to figure out what it's going to take to bring your specific electronics widget through customs. But you probably have people who know electronics better than we do, and so I would urge you to go talk to the government, to go find the right association. This is not easy. But the good news is, a lot of times those are smaller laws and if you mess up it's not as big a deal as, say, not having contracts with your employees.



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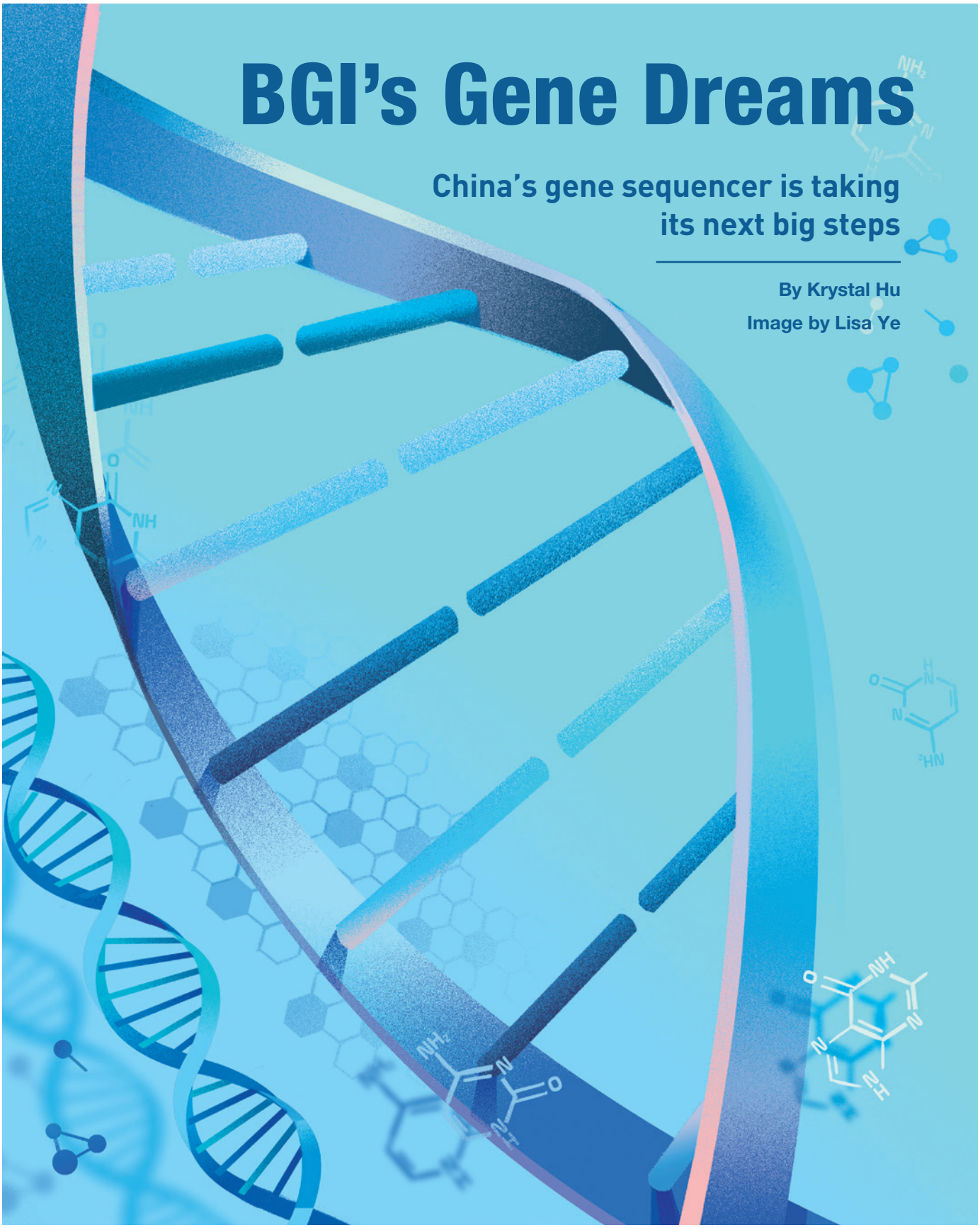
BGI's Gene Dreams

China's gene sequencer is taking its next big steps

By Krystal Hu

Image by Lisa Ye



China's biggest genetics company, BGI, is a darling of the Chinese tech and healthcare industries. After almost two decades of history, the company finally did an IPO this year, and is looking toward a bright future

When the opening bell peeled at the Shenzhen Stock Exchange on July 14, it heralded a breakthrough for the Chinese biotech industry. BGI, a pioneering gene-sequencing firm, had become the first genomics company listed in China, raising RMB 547 million ($80.6 million).

A good listing quickly became great for BGI, which specializes in human, plant and animal genomics research. Initially valued at RMB 13.64 ($2.11) per share, BGI's stock price skyrocketed tenfold in the first trading month, hitting RMB 131.63 ($20.36) by mid-August. Its shares soared by the maximum daily increase of 10% (China's stock markets have government-set limits designed to curb volatility) for 19 straight sessions after the trading debut, making it one of the hottest Chinese stocks of 2017. The net worth of Wang Jian, the 63-year-old co-founder and chairman who holds 32.5% of BGI shares, reached nearly RMB 14 billion ($2.1 billion).

Fueling investor confidence is BGI's top position in a cutting-edge industry with enormous potential. According to Grand View Research, a US-based market research company, the global genomics market will be worth an estimated $22.1 billion by 2020. Venture capital has been pouring into genetics companies with $1.3 billion raised globally in 2016. CB Insights, a Venture capital database service, estimates it was the third consecutive year where more than $1 billion had been invested.

BGI offers genetic testing services around the world and boasts a list of big-name clients, including the University of Oxford and the state-owned China National Tobacco Corp. Last year, it recorded revenues of RMB 1.7 billion ($261 million), with a net profit of RMB 350 million ($54 million), an increase of 28% over the previous year, according to its IPO prospectus. It employs over 5,000 people.

As one of the largest players worldwide in genetics, and with a successful IPO behind it, BGI is expected to put more resources into research to strengthen its position.

"BGI is the leader of China's genomics industry. With a strong genome data analysis team, it has established the world's largest genome sequencing platform," says Zhou Rongjia, Genetics Professor at Wuhan University, one of BGI's partner schools for talent recruitment and development. "It has initiated and participated in a number of major international scientific research projects and achieved remarkable results."

However, in a country prone to market hype, there are those who view BGI's dramatic stock performance with a dash of skepticism.

"The market valuation of BGI is high, mainly because there is much room to imagine future developments in the genomics industry," says Zheng Wei, Biotech Analyst at TF Securities, a Chinese venture capital firm. She believes BGI's soaring stock price may be a bubble. "A large portion of BGI's revenue comes from scientific research [funding]. But its ability to make [future] profits will lie in new product development and commercialization."

This is the area where competition is heating up, which will push down the costs of genetics services—as well as revenues. BGI's future success will hinge on its ability to lead the technology change, and that is no small challenge.

DNA Superpower

BGI is short for Beijing Genomics Institute, the original name of what was a completely state-funded national institute at Peking University. Founded in 1999, it led China's portion of the Human Genome Project, an international scientific research effort to map, for the first time, the complete genetic makeup of a human being. BGI made only a modest contribution of 1% to the massive workload, but it provided a jump-start for the future company.

As funding dried up at the end of the Human Genome Project, the operation moved to Hangzhou in 2001 where it began to rack up solo achievements. In 2002, BGI published the first draft of the genome of a rice variety grown widely in Asia. During the 2003 SARS epidemic, BGI quickly sequenced the virus and developed a test kit for fast diagnosis. The company finished the first complete sequence of an Asian person in 2007, and then a panda bear in 2009. In 2010, it sequenced the genome of

a 4,000-year-old man, dubbed Inuk, whose hair had been preserved in the permafrost of northwestern Greenland.

Perhaps most impressively, BGI has helped lower the cost of sequencing a human genome from $100 million in 2001 to $1,000 in 2015. This promises to transform medicine. "We want to sequence more, and understand more about our genome," Zhang Gengyun, a BGI Vice President told *The Sydney Morning Herald* in 2015. "That would give us a lot of new knowledge about our health and more insight about other species. The real idea [is] to expand knowledge, that's our top target."

The company moved to an eight-story former shoe factory in Shenzhen in 2007, and the following year the name officially changed to BGI. The move to one of the world's most dynamic economic zones was part of the effort to reduce government influence and help the company become more market-oriented. Since then, BGI has become one of the largest genetic testing firms in the world with its businesses covering sequencing for laboratories in institutions, as well as genetic sequencing service solutions for hospitals.

BGI's academic origins give it cachet as a private company as it has been able to publish research results in the world's leading scientific journals, such as *Nature* and *Science*. In 2010, *Nature* even referred to the company as a "DNA superpower."

But the company's hybrid background has also drawn criticism. For instance, Rao Yi, a prominent biologist and Dean at the Peking University School of Life Sciences questioned the business ethics of BGI's leadership. From 2003 to 2007, a key stage of BGI's expansion, co-founder Yang Huanming ran the company while simultaneously heading the prestigious Chinese Academy of Sciences in Beijing.

"If one person runs two organizations at the same time, who represents the institution's interests, and who stands for the company profits when there is a conflict?" Rao Yi wrote on his blog in 2012. "From the 1990s, the government has been pouring money into Yang's gene sequencing project, did they realize they're investing in Yang's private [business]?"

BGI has never responded to the questions of conflict of interest. Indeed, government support still plays a role in the company's development. Last year, it received subsidies of RMB 34.4 million ($5.3 million), up 64% from 2015. The company has calculated these subsidies as profits, according to filings with China Securities Regulatory Commission (CSRC). However, the importance of government support goes beyond the monetary.

"[BGI is] the first company in this industry to receive government support," says Zheng Wei. "In such a regulated industry, this is a major advantage for BGI, because it became an early pilot for government programs."

Supported or not, BGI is now one of the world's leading providers of gene sequencing services and owns about half of the world's gene sequencing machines. In 2010, BGI bought 128 of the world's fastest machines from Illumina, a California-based genomic device developer.

BGI is also accelerating the process of commercializing research findings and developing other new growth areas. In 2012, the company set up BGI Tech, a commercial arm that conducts DNA sequencing and protein studies for clients using proprietary technology. Clients include drugmakers seeking cures for diseases and agricultural companies engineering new plant varieties and cloning livestock.

Another landmark—and profitable—product is BGI's Non-Invasive Prenatal Testing (NIPT). NIPT screens unborn babies for genetic disorders by using fetal DNA found in the mother's bloodstream, unlike previous tests that required the risky direct sampling of fetal tissue.

IPO and Beyond

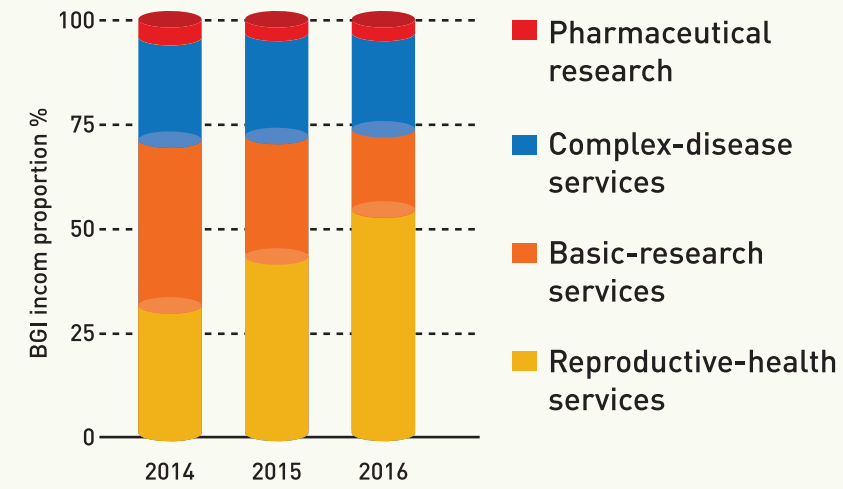
As early as 2014, BGI Tech was reported to be planning to raise $400 million from an initial public offering (IPO) in Hong Kong. The plan failed as China's foreign-investment regulations forbid the use of foreign capital in "applications and research in human stem cells, gene diagnosis and treatment," according to the Catalogue for the Guidance of Industries for Foreign Investment released by the State Council.

An IPO was considered essential to provide funding for ambitious future projects, including the development of cloud service ecosystems and medical service platforms. In July, BGI finally got it right and the shares were publicly listed. The funds raised will now help BGI Tech expand in the market for providing gene sequencing to large customers.

The successful IPO did not come a moment too soon, as official filings cite fierce

Reproductive Revenue

A growing proportion of BGI's revenue is reproductive services



Source: BGI IPO prospectus

> BGI has built a group of top-notch talents who analyze the data from gene sequencing results
>
> Zhou Rongjia
> Genetics Professor
> Wuhan University

competition as one of the company's major challenges. A new wave of Chinese companies is looking to follow the lead of BGI to become global providers of genetics services—ironically, many of them have roots in BGI.

One example is Wang Jun, the beloved former CEO who quit in 2015 to establish iCarbonX, a Shenzhen-based medical technology company. Wang, who originally trained in artificial intelligence, is using AI techniques in genetic data analysis.

In more direct competition is Beijing-based Novogene, led by BGI's former Vice President and bioinformatics expert Li Ruiqiang, which claims to have overtaken BGI in gene sequencing capacity. In 2015, Illumina, an equipment supplier to BGI, chose to partner with Novogene to develop advanced clinical applications in the fields of reproductive health and cancer research based on next-generation sequencing technology. The move was a blow to BGI.

There are other newer and scrappier competitors as well. Direct Genomics, a Shenzhen-based startup, released a third-generation DNA sequencer, GenoCare, this August. CEO He Jiankui, a Biology Professor at South University of Science and Technology of China, says the third-generation device will drive human sequencing costs down to $100 a head. He plans to produce about 1,000 GenoCare units per year.

Professor He said the machine can sequence samples of human genomes in less than 30 minutes with an accuracy up to 99.7%, making it one of the fastest and most precise DNA sequencers in the world. "We are different from BGI because we focus more on developing our instruments and equipment," He says. "We aim to provide more cost-effective and accurate DNA sequencing services to hospitals and testers, including BGI."

On the other hand, it is important to put these advancements into perspective. "Third-generation sequencers… have advantages in clinical uses, but it will take a while before it's been applied on a large scale," says Zhou from Wuhan University.

For investors in BGI, the deeper concern may be the company's reliance on foreign equipment suppliers. When Illumina raised its product price last year, BGI's profit margin shrank 10%. In response, BGI boosted efforts to develop its own DNA sequencing device.

"BGI took a bold step a few years ago when it bought the American firm Complete Genomics [for $108 million], which had developed its own DNA sequencing technology," says Kevin Davies, a geneticist and author of several genomics books. "But the first instrument BGI tried to build from that technology—the Revolocity—was a failure."

The rollout of the Revolocity was halted in November 2015, a move accompanied by substantial staff cuts at the US subsidiary. "The extreme complexities of melding physical, biological and data sciences is the reason it has been so difficult for companies to compete with Illumina's high-throughput innovations," Wells Fargo analyst Tim Evans wrote in a note to investors. "We think the Revolocity's demise supports that reasoning."

But the BGISEQ-500, a smaller benchtop instrument introduced to the market in 2016, has been well-received by experts. It is running inside BGI's labs and organizations like China National GeneBank, a nonprofit founded by the Chinese government and BGI in 2016.

Advantage of Experience

As BGI tries to build an image (read: attract investment) as an innovation-driven company dedicated to scientific research, some argue that sequencing is not cutting-edge enough. A Chinese biochemist Fang Shimin, also known as Fang Zhouzi, said in an interview with the *South China Morning Post* that BGI's large-scale sequencing resembled a labor-intensive Henry Ford assembly line.

"Although the determination of the human genome can become a powerful tool for genetic research, it doesn't have much academic significance," Fang wrote in a WeChat post in September. "This is not a creative technology at all. The basic work is done through the instrument automatically."

The factory comparison, and implication of somewhat low-skilled work, holds when examining BGI's employment practices. In fact, founder Wang Jian deliberately modeled his labs on other factories in the Pearl River Delta where Shenzhen is located. The average age of workers is just 27, and data from Jobui, a job search website, shows 40% of them make less than RMB 8,000 ($1,231) per month, a far cry from their counterparts in the US.

BGI's facility physically resembles a Chinese factory campus in some ways as well. Beside the office buildings are dormitories with two bunk beds in each room. Four people live together, hanging clothes on the balcony and playing basketball in the court after work.

But what those young "factory workers" have built by using the gene sequencing machines has become BGI's trump card: a massive database containing all the genetic information they have collected and deciphered over the years.

"Since participating in the Human Gene Project, BGI has built a group of top-notch

talents who analyze the data from gene sequencing results. And now it's the largest gene sequencing platform," says Biology Professor Zhou.

This database is where BGI outclasses its newly-founded rivals, and could yield enormous returns in the future as a pool of "Big Data." Gene sequencing results are not that helpful until there is a database to compare them with. In the Non-Invasive Prenatal Testing, for example, BGI owns more than two million samples, and it claims an accuracy of 99% in identifying Down Syndrome in unborn children.

BGI is also trying to boost innovation by partnering with global institutions and building international research centers. BGI's services are now available in more than 60 countries and regions, according to its website, and global expansion is expected to accelerate in the wake of the IPO. Last December, a new division, BGI Groups USA, was formed and is based in Seattle.

"The new office will help us connect those resources with BGI's international capabilities and scale to accelerate global innovation for human health," said He Yiwu, CEO of BGI Groups USA and BGI's Global Head of Research and Development, in a press release.

BGI now has offices in Denmark, Hong Kong, Japan and the US. It also has a long-term partnership with the Bill & Melinda Gates Foundation focused on projects and strategies to apply genomic tools to improve global health and agricultural development.

> **The market valuation of BGI is high, mainly because there is much room to imagine future developments in the genomics industry**
>
> Zheng Wei
> Biotech Analyst, TF Securities

Fearless Ambition

China's genetics testing is one of the fastest growing markets in the world and is expected to expand at a compound annual growth rate of 37% in the next five years through to 2021, according to a report by China Investment Consulting Corp. earlier this year. The market size should increase from RMB 13.3 billion ($2 billion) in 2017 to RMB 42 billion ($6.5 billion) by 2021, the firm forecasts.

Although BGI may no longer have the uncontested dominance it once held, it still has one of the largest sequencing capacities in the world as well as major scientific ambitions—including to sequence the genomes of one million people, one million plants and animals and one million microbial ecosystems. With its capabilities, BGI is in a position to forge the future of DNA applications.

"I think BGI has a bright future, particularly as it pushes into the huge medical and diagnostics market in China," said Kevin Davies. "As it grows, however, BGI must retain the fearless spirit and ambition that it has displayed throughout its history."

A researcher in BGI's plant breeding laboratory

Big Blue Dances in the Digital Era

Gill Zhou, CMO of IBM Greater China, discusses how marketing has changed in the digital era

By Liu Sha

Companies are dying fast these days, killed off by merciless tech disruption, the fast-paced evolution of consumer taste and, to an extent, a trend toward industrial consolidation. In the 1950s, the average age of a company on the Standard & Poor's 500 index was 60 years, now it is less than 20.

In particular, the technology industry is riddled with stars that once shined bright, but failed to keep up. Hewlett-Packard, still among the world's largest PC makers, was dropped from the Dow Jones Industrial Average in 2013. Compaq, which became the youngest-ever firm to reach the Fortune 500 in 1986 no longer exists. And how long has it been since you saw a Nokia phone?

International Business Machines (IBM), on the other hand, is still going strong. "Big Blue," as it's famously known, has undertaken many successful transformations in its history, with its latest focus on cognitive solutions and cloud platforms.

According to Gill Zhou, Vice President and Chief Marketing Officer (CMO) of IBM's Greater China Group, now is the worst of times because disruptive innovation and crossover competition have caused unprecedented challenges, but conversely it is also best of times in that great opportunities have been generated in this new era of the digital economy.

The key to survival has been innovation and transformation. While technological developments may spring to mind, transformation and innovation in marketing should be regarded as equally important.

Gill has worked at IBM for over 16 years, and experienced three different CEOs while being at the center of marketing innovation. She discusses how a marketing team should coordinate with the company's overall strategic shifts and how the old ways of marketing are no longer viable.

Q: IBM breaks the stereotype of tech firms all being young companies. What has changed for IBM all through these years?

A: IBM's 106 years of pushing the tech industry forward can be summed up in a few keywords: history, innovation, transformation, and industry. The first keyword

is history, because IBM played an important part in the early development of information technology. Many industry players such as Nokia (founded in 1865) and Compaq (founded in 1982), have stumbled hard, but IBM is still going strong. Transformation and innovation have been embedded into the genes of the company.

The last one, a strong distinguishing feature of IBM, is industry expertise. It's often the case that IBM starts applying new technologies to real-world problems while others are still experimenting. For example, Alpha-Go made its appearance at the go board only recently, while IBM had aligned artificial intelligence (AI) to strategy games, specifically chess, way back in 1997. Chess is not as complicated as go, but we nevertheless transitioned through that stage long ago. Now what we do is apply the latest AI technologies to industry and real-life uses. We are using Watson, IBM's AI computer, to help advance the healthcare industry, assist in the development of blockchain and a variety of Fintech (Financial Technology) applications. What IBM focuses on now is using these technologies to service people and industries.

Q: In recent years, IBM has changed from a supplier of physical IT equipment, to a supplier of digital solutions for companies, which are often hosted in the cloud. How has the marketing department coordinated with that strategy shift?

A: Reinvention is rooted in IBM's genes. IBM was formerly considered as selling systems hardware. In the past, the company focused heavily on hardware products which contributed 60% of IBM's revenue. Over the past 10 years, the company has changed from an IT hardware supplier to a cognitive solutions and cloud platform company. This is a change of business portfolio, and the marketing department is a pioneer in this transition, because we stand close to the market and the clients. When the whole company started to transition, our target audiences also had to change. Our client profiling would change as well. Previously, CIOs would be recognized as key buyer of our products, but now executives, representing a range of C-suites, including CEO, CMO, CFO, and CHRO, are targets of marketing because they are all key stakeholders in the wave of transformation and digitalization of the corporations within which they operate. Executives have different pain points and require specific solutions to solve their business problems, which brings great challenges to marketers, but of course also great opportunities.

Over the past 10 years, the company has changed from an IT hardware supplier to a cognitive solutions and cloud platform company

The other swift action has been moving to digital platforms, which are leading the customer journey, so we have become more customer-centric. The diversity of the target audience has widened, and the customer journey has fundamentally changed in terms of information gathering and purchasing behavior. To find new clients, we have to go online, to social networking sites and into WeChat groups. We've moved our information sharing platform from our official website onto WeChat in fact.

And for a complete picture, we need online records integrated with offline information. For example, at an offline event, every potential client wears a wristband that monitors where they go, at what booth they stand, and what questions they put to our sales people, and so on. All this behavioral information can be recorded and sent to a real-time dashboard.

So now the campaign design is fully based on the customer journey. We know what customers are thinking, where they are going, and what information they need. We're now better able to help customers make the right decision at the right time. Simple product ads aren't enough to attract prospects—we present not only product features, but also tailored digital solutions to respond to their industry challenges.

But our journey with the customer doesn't stop at the purchase stage. We transform our customer into an IBM advocate, even going so far as to co-brand with them to create additional potential in the relationship.

Q: Could you explain the changes further? What is the difference between IBM's marketing work and that of other tech firms?

A: Many internet firms or startups were born in the digital era. However, being born in the digital era does not mean you are data-driven. So, the point is not when you start, but whether the way you do your job adapts to current market shifts and the latest data technologies. The biggest transition for the marketing function of IBM is becoming completely data-driven.

For example, one of the teams within our organization is called Product Marketing. It focuses on client needs. It was formerly known as "Marketing Segment Management" (MSM). It's obvious that before the name change, it divided our clients into different segments and industries—very rough divisions. Now we focus on the benefits for each client—not only the functions and features required by their positions and/or job responsibilities, but also exactly who they are and what they like. We have to know our clients based on data collected online and offline. This team has totally changed

the way they work. We used to make guesses about our clients, but now our decisions and conclusions are all based on data analytics.

Another team, Performance Marketing, is measured by the return on marketing investment. Every general manager wants to know the ROI of the company's marketing investment. It is very challenging for a CMO to prove that their marketing investment has not been wasted. Now with a data-driven strategy, everything from online clicks and page views to offline behavioral data at events are recorded in the marketing data warehouse and reported to the company. Now general managers know how much the marketing team has contributed to actual business. It's kind of merciless because the marketing team's performance is immediately evident and there's no room for excuses and no place to hide, but on the other hand the value of marketing also becomes clearer and more self-evident

The changes to how the business operates have a huge impact on the marketing function positioned in the company. For many years the marketing function was considered a "cost center," giving the impression that we marketing people only spend money and don't make any. The marketing job itself was process-driven—marketers were measured by the number of news stories published, events hosted and advertisements placed. This no longer works. Now it is all about outcome-driven—that is, marketers are measured by how much they contribute to the company's business revenue.

Q: Most of IBM's business is targeted at organizations and companies, or B2B, but you've been advocating what you call B2B2P (business to business to people). What exactly is that strategy?

A: Marketing is about winning people. No matter what your model is, directed at businesses or consumers, successful marketing means you've managed to touch people. So, don't forget, no matter which industry you're in, manufacturing, retailing or healthcare, the ultimate goal is to win people's hearts. In the digital era, we're equipped with data tools to help us know what people want. But now we also need to grab their attention in just a few seconds. IBM is a company that sells solutions to organizations. To that end, we used to talk to our customers about how advanced our products are, about specific product features—that's necessary, but nothing that either surprises or delights our clients. So, we forged some new connections.

When people see IBM Watson and Grammy award winner Alex Da Kid collaborate on the song "Not Easy," and Watson editing the trailer of the thriller movie "Morgan," it makes them wonder, "Wow, how can AI be connected with the entertainment industry?" These fresh marketing angles make people think, "What's going on? Why IBM?" Then they start to dig into more about IBM and Watson—what AI can really do to help make the world work better. For marketers, this is a moment of truth, because we are developing content that is attractive and relevant to end users.

Q: On many occasions, you've talked about "crossover" in both work and personal life. How is crossover related to your personal experience?

A: Crossover means change, exploration and progression. I've been used to changes all my life. I used to be in a military school. People thought I would stay in that system, but I left. I studied English literature and love Shakespeare, but I joined the ICT [information communication technology] industry, and worked with engineers and scientists day-in and day-out.

No matter what your model is, to businesses or to consumers, successful marketing means you managed to touch people

I firmly believe that those who are not adaptive to change and transition will not succeed in either life or work. IBM is 106 years old and still very innovative and competitive, and a key reason for that is it embraces change. IBM Chairman and CEO Ginni Rometty once said that "Comfort and growth do not coexist." In my career, I've experienced challenges and ups and downs, yet I still feel very happy and fulfilled every day.

Q: You're hailed on Chinese social media as a model of a working mother with a happy family. How do you balance life and work?

A: Well, balance is never easy, I would rather say "work and life integration." In fact, the emerging digital technologies such as mobile and social have made this integration possible for working mothers like myself and many others. For example, I can do my online grocery shopping for the family while taking conference calls at the same time. Technologies have made our lives, private and professional, much easier these days.

I also spend quality time with my loved ones, even if I can't afford being available all the time. Quality time means whenever they need you most—for example, during the first week of my son's college life in the US. I stayed close to him, taking care of all his needs, small or big, but more to encourage him to build his confidence in starting a brand-new life of his own in a brand-new country. To him, I am his mother, but also like a friend or "soul mate" who he can always go to for advice and support whenever he needs to.

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China Moves to the Beat

China's popular music industry may finally be poised to break through internationally

By Erica Martin

Image by AMAO

There is no definitive answer to the question, "Which is China's most popular band?" But TF Boys are a solid candidate.

The wholesome trio of teenagers have garnered legions of fans—over 60 million across several official accounts on Weibo, China's Twitter. And with their squeaky-clean aesthetic and pro-Communist Party lyrics, they have earned approval from the Ministry of Culture in the form of both funding and sanctioned appearances on state television.

But despite their popularity at home, TFBoys—meaning "The Fighting Boys", as from a "Fight! Fight! Fight!" chant one might cheer at an American football match—would seem to have little chance of winning over international audiences. Their sugary-sweet personas and willingness to pander to the state clash with Western associations between music and rebellion or counterculture, as evidenced by the bemused tone with which publications like the *New York Times* write about the band: "TFBoys display no signs of youthful rebellion. They decidedly do not walk on the wild side."

However, other Chinese acts are emerging which, while much smaller than mainstream performers, are knocking on the door of international fame. ACrush, a band of five androgynous women with a devoted female fanbase who refer to the boyish stars adoringly and ironically as "husbands," has far greater crossover appeal—and are generating more interest internationally than domestically, at least in terms of media coverage.

Another is Higher Brothers, a rap group out of Chengdu in China's southwest. Over the past year, this intense-but-humorous bunch has seized the attention of rappers in Korea and the United States resulting in several collaborations, in addition to gaining a devoted following in China.

Stream On

In theory, the world's most populous country has the potential to become the world's most profitable music market—and yet it is far away from that. According to a report by the International Federation of the Phonographic Industry (IFPI), China was the 12th largest market in 2016, with $202 million in revenue compared to the US's number-one ranking of $5.3 billion. The figures include physical sales, digital sales, performance rights and licensing, but not concert ticket sales.

But there are important differences in the way music is consumed that may give China a business edge. Combined with the growing popularity of some up-and-coming stars, China may soon be on the international music map.

One of the most interesting divergences between China and the three highest-ranking countries in terms of global music revenue in 2016, is the way that revenue is split between digital and physical releases. Despite seeming an underdeveloped music market, China stands out in terms of how money is generated compared to the top three. IFPI reports that in the US, digital releases account for a healthy 70% revenue, versus 18% for physical records. The UK in the third spot is 47% digital and 32% physical. Japan has higher revenue of physical releases at 73%.

China, on the other hand, reaps a whopping 96% of its music revenue from digital releases, with over 75% of that number coming from streaming sales. While still only a sliver of the global market, China has adjusted to the digital future of music more quickly than other countries.

The campaign toward digitalization is being led by internet giant Tencent, which dominates the market with a 70% share, according to *The Economist*. Owner of streaming service QQ Music, which has 400 million daily active users, Tencent has tightened its grip this past year by acquiring competitors Kuwo and Kugou, and inked licensing deals with Universal Music Group, Sony Music and Warner Music Group for exclusive streaming rights.

With this power, Tencent is pouring resources into combating music piracy and conditioning the Chinese public to pay for digital tunes. QQ Music's number of paying monthly subscribers is relatively low at 10 million, but an increasing number of users are paying to stream individual tracks. Other users listen for free but are exposed to ads, which ensures that Tencent continues to rake in profits. Apple Music, by comparison, claims upwards of 17 million subscribers, but has yet to turn a profit. Spotify lost $581.4 million in 2016—more than double the losses of $241.6 million in the previous year—despite its 140 million active users, of which more than 50 million are paid subscribers.

"We are educating people to accept that content has a value and we are making progress," Andy Ng, Tencent Music Entertainment Group Vice President, told IFPI. "Young people are in particular more willing to pay for a music service; they are happy to spend a few dollars supporting the artists they truly admire."

Shifting Chinese music consumers away from piracy has been a tough task, as it is baked into the modern culture in China—which is one of the reasons the world's most populous nation still has a comparatively small music market. In the late 1980s and early 1990s when the mainland pop music scene was born, there were no labels to speak of and bootleg tapes ruled the scene. Then came the MP3—music as digital files—revolution and China embraced the change faster and more thoroughly than anywhere else on the planet.

But against the odds two major homegrown labels emerged: Modern Sky, who manage the likes of Edison Chen, a Hong Kong actor, musician and entrepreneur, and Maybe Mars, who have classic Beijing bands like indie rock trio Carsick Cars on their roster. The exploding popularity of streaming has been both a blessing and a curse for Chinese record labels.

"Streaming affected many parts of Maybe Mars," says Yang Haisong, the label's CEO and the frontman of the highly influential Chinese post-punk band P.K.14, formed in 1997. "The good part is that the bands and musicians can easily gain more fans and audiences, but the bad part is we have to work much harder on physical sales."

Labels have instead turned to tours and festival shows to promote the acts and gain an audience, which in turn leads young people to seek the bands out via streaming. And those live performances have them-

Concert goers at Ultra Music Festival in Shanghai this year

selves become a major revenue source.

"Most of the revenue generated by any artist in China is from live performances," says Dave Luce, founder of SHFT, a Shanghai-based music promotion company focused on hip-hop.

There were over 200 domestic pop music festivals across China in 2016. One of the biggest and most longstanding is Modern Sky's Strawberry Festival, which annually brings a mix of high profile Western and Chinese rock and electronic music acts to 12 cities across the nation. With ticket prices of RMB 599 ($91) and up, it is easy to understand how it is making money.

Support with Strings Attached

A special feature of the mainland China music scene is that the government has a substantial stake in it—not for money, but for soft power. The 13th Five Year Plan, with goals set for 2020, vows to make cultural exports a pillar of the national economy. But it is tough to say what exactly that means for Chinese music.

"I'm all for it in principle," says Jonathan Campbell, who chronicled the birth of Chinese popular music in the book *Red Rock: The Long, Strange March of Chinese Rock & Roll*, citing the positive effects of government funding for the arts in Western nations such as Canada. For China, however, he thinks support will be carefully limited to certain acts. "In recent years, the direction that things are taking generally in China signals a shift far from anything remotely oppositional or non-mainstream."

In such an atmosphere, individual artists must be cautious. The State Administration of Press, Publication, Radio, Film and Television (SARFT) studies the lyrics of songs and approves every record before it receives distribution rights. Those who toe the line make it on state-sanctioned talent shows and other televised performances, and so get an undeniable edge from the visibility. A band that causes too much controversy can see their distribution rights lost and performance permits revoked.

"We've never had a problem with [censorship]," says Luce, "but the artists that I'm working with are careful about what they're saying. Nobody's rapping about politics or drug use."

What happens far more often than lyric censorship is rejected permits and cancellations of live shows, especially large-scale festivals. Campbell points out this has been occurring with increased frequency over the last five years. The Strawberry Festival was pushed out of its original home in Beijing, while Phoenix Burn, China's answer to Burning Man, was canceled outright in 2016—only a week in advance.

Rejection can cut both ways, however, especially in youth-oriented popular music. "I don't like Maybe Mars to be part of any government plan," Yang says firmly. "To my understanding, the policy of the underground scene is that if you stay independent longer, you'll stay stronger to face the mainstream scene in the future."

Poised for a Breakthrough

For independent acts that may not adhere to the party line enough to receive the government support reserved for the likes of TF Boys, international markets are a natural alternative. Modern Sky, for instance, has been putting on a Modern Sky Festival in Central Park in New York City since 2014. It has recently begun collaborating with other major festivals across the US and Europe.

"A main goal with overseas festivals from the beginning was to provide a larger platform for our bands to reach Western music fans," says Michael LoJudice, the head of Modern Sky's US operation. "I do feel, at our end, that a few artists are being provided with the right resources to reach a wider audience."

At the same time, Western labels are beginning to sign Chinese acts and market them overseas. The most notable example is 88rising, which was founded in 2015 by Sean Miyashiro, co-founder of Vice Media's electronic music platform Thump, with the specific goal of giving Asian hip-hop artists a Western platform. The label is behind Indonesian viral rap sensation Rich Chigga, and more recently has cultivated a healthy online following for its rap act, Higher Brothers.

The ascent is still gradual, however: Miyashiro asserts that he's putting together a US tour for Higher Brothers, but for the moment, they've never played outside of China.

Campbell agrees that the crossover potential lies in the indie/underground sector. "They are playing music with clear roots outside China," he says. "They are eager to engage with artists and audiences in the West."

The differences between TF Boys and more underground bands reflects this. While TF Boys enjoy mainstream mega-stardom by embodying uniquely Chinese values and pandering to the state, more underground musicians are making the effort to gain an overseas following. If anyone can achieve both domestic and international fame, it may be an act like Higher Brothers—their lyrics can be anti-establishment, but in a tongue-in-cheek manner, such as in tracks like "Made in China," in which they simultaneously mock and honor their heritage.

"Higher Brothers is representing China, and we want to continue putting Asia on the map," MasiWei of Higher Brothers told *Paper* magazine. "Our focus is to make music for the world."

data CHINA

The stats you need to know

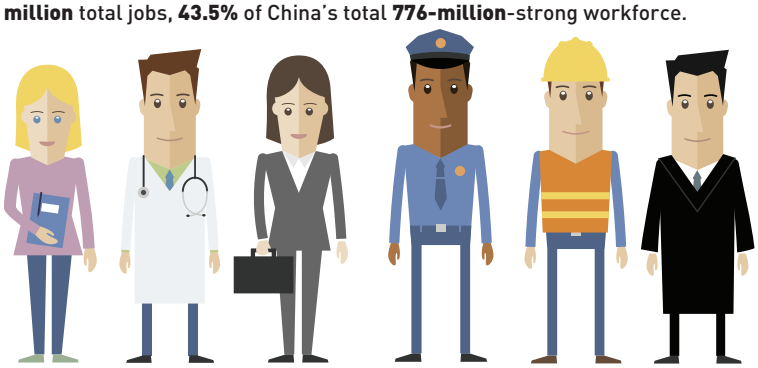
Sofa Sportsmen

About **560 million** people in China play online games, and of those an elite **1,001** have become professional "e-sports" players. China makes up **57%** of the global e-sports audience, viewing **3.5 billion** hours of e-sports videos last years. At **$24.4 billion**, China's video game market is the world's largest.

Source: South China Morning Post

At Your Service

From 2012 to 2016, China's service sector employment grew by **60.67 million**, while employment in agriculture and in the secondary sector fell by **42.8 million** and **8.91 million** respectively. In 2016 the service sector accounted for **337.6 million** total jobs, **43.5%** of China's total **776-million**-strong workforce.



Source: Caixin

Virtual Venture

In the first half of the year, **65** "initial coin offerings," that is sales of cryptocurrency by firms for the purpose of fundraising, attracted **$396** million from **105,000** investors in China. However, China banned the practice in September amid a wider cryptocurrency crackdown and has required many companies to refund investments.

Source: Caixin

Core Technology

Scientists at China's fusion reactor, the Experimental Advanced Superconducting Tokamak facility, in the central city of Hefei set a new fusion record in July. The team generated temperatures more than three times that of the sun's core for more than **100** seconds, more than double the previous time at the facility.

Source: South China Morning Post

Stalled Migration

After a battle against capital flight, China's capital flows ran a **$16 billion** surplus in the first half of the year, as compared with a **$417 billion** deficit in 2016. Foreign exchange reserves rose for a sixth straight month in July, up **$80 billion** from January's five-year low.

Source: Financial Times

Investing in Children

Chinese online English learning company VIPKid, which connects Chinese students with teachers in North America, was valued at more than **$1.5 billion** in a round of funding from investors including Sequoia Capital China, Tencent and Jack Ma's Yunfeng Capital.

Source: Bloomberg

Dirty Money

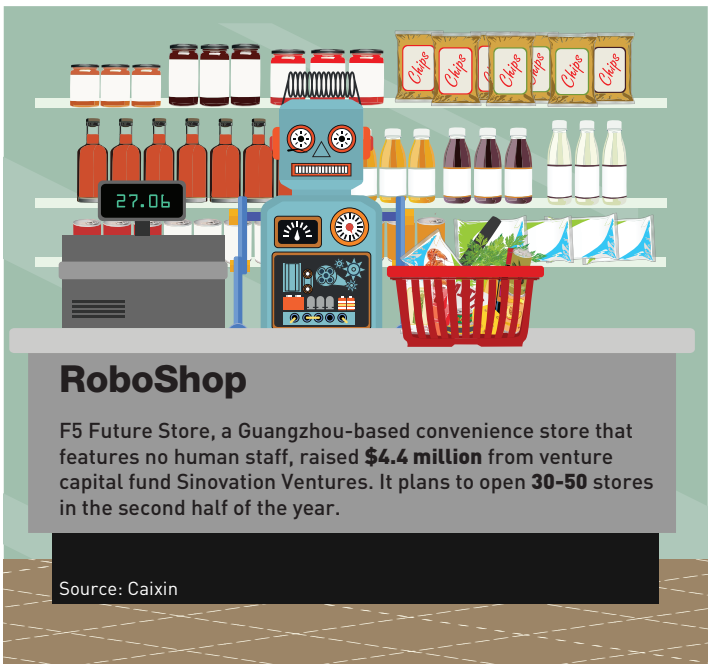
International sewage and water treatment firms are set to chase big opportunities in environmental cleanup in China. China pledged to lay **126,000** kilometers of new sewage pipes by 2020, enough to circle the globe three times, and raise urban wastewater treatment by **50 million** cubic meters a day, equal to **20,000** Olympic-size pools. China's annual environmental spend is estimated at **RMB 3 trillion** (**$441 billion**) over the next five years.

Source: Reuters

Building an Economy

Fixed-asset investment contributed **45%** to China's GDP last year, by far the highest share of any major economy. (For comparison, the US share is **22%**, while Japan's is **30%**.) The infrastructure share of overall fixed-asset investment hit **21.4%** in the year to July, the highest on record.

Source: Financial Times



RoboShop

F5 Future Store, a Guangzhou-based convenience store that features no human staff, raised **$4.4 million** from venture capital fund Sinovation Ventures. It plans to open **30-50** stores in the second half of the year.

Source: Caixin

Green Dragon

According to China's National Bureau of Statistics, the Middle Kingdom accounts for about half of world's legal cannabis cultivation, which is used in textiles and pharmaceuticals. For farmers, the famed cash crop can bring in more than **RMB 10,000 ($1,500)** per hectare, as compared to just a few thousand RMB for common grains.

Source: South China Morning Post

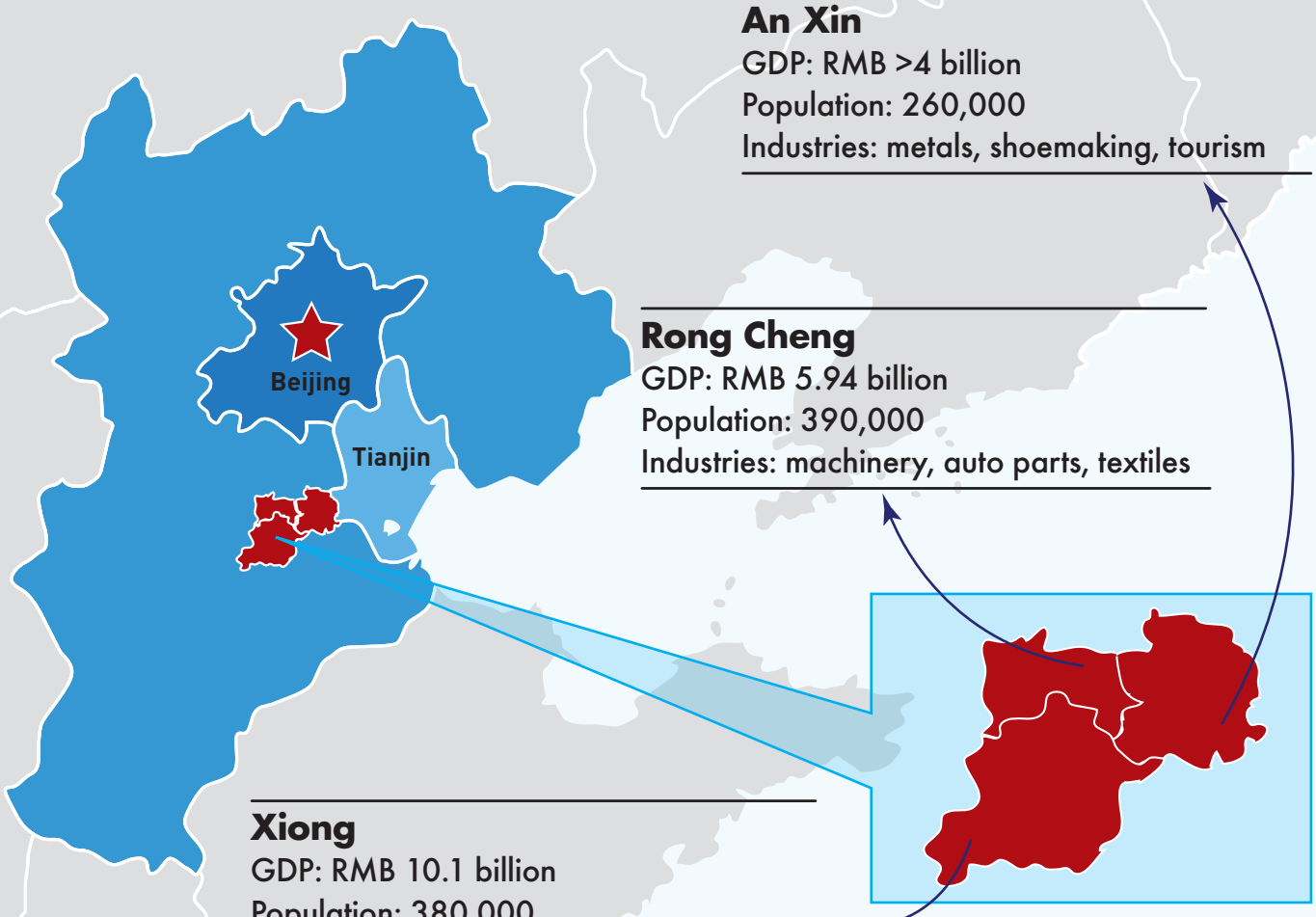
Snapshot

Xiong'an New Area

What is China's newest special economic zone?

On April 1st, 2017, the Chinese government surprise announced the formation of a new special economic and development zone: the Xiong'an New Area. About 60 miles southwest of Beijing, in Hebei province, the area will combine the now relatively rural counties of Rongcheng, Anxin and Xiong. With an expected investment of $583 billion over the next 20 years in infrastructure alone (according to UBS), Xiong'an is set to transform from a largely agricultural and low-tech manufacturing region, into a high-tech, environmentally sustainable modern metropolis. It will also, according to the plan, alleviate some population pressures from Beijing while serving as a destination for some administrative departments, logistics bases and so on. Although still early days, there are big hopes for the project, which has attracted much attention, including property speculation.

The Region Before Xiong'an



An Xin
GDP: RMB >4 billion
Population: 260,000
Industries: metals, shoemaking, tourism

Rong Cheng
GDP: RMB 5.94 billion
Population: 390,000
Industries: machinery, auto parts, textiles

Xiong
GDP: RMB 10.1 billion
Population: 380,000
Industries: plastic, latex, electrical cables

Source: China Daily, The Guardian, South China Morning Post, Caixin

Xiong'an Planned Development

Science

A science and technology park is planned to be constructed in the New Area, and 300,000-500,000 of Beijing's most talented residents will be relocated.

5G

China Mobile, Unicom, and Telecom will test a new generation of mobile internet service in Xiong'an. Beijing University of Posts and Telecommunications will build a 5G telecom network research center.

Ship building

China Shipbuilding Industry Corporation, China's largest shipbuilding company, will move their headquarters to Xiong'an.

Medicine

Peking University is planning a medical research center in Xiong'an that will specialize in integrated teaching, scientific research and medical services.

Transportation

Hebei provincial authorities will spend RMB 600 billion ($91 billion) on transportation infrastructure by 2020. Four high-speed train lines will run through the New Area, including one that already connects Xiong'an to Beijing. Nearby Shijiazhuang Zhengding International Airport plans to build a Xiong'an terminal, where passengers will have shuttle access to the airport. Two canals may also connect Xiong'an to Beijing and Tianjin.

Education

Elite institutions are flocking to Xiong'an. Peking University will build a campus of the Guanghua School of Management there, and Tsinghua's Science and Engineering School has announced intentions to invest. Beihai Kindergarten and other top public schools from Beijing will open campuses in Xiong'an.

Green Development

Xiong'an is planned to be a "green city," powered predominately by renewable and lower-carbon energy sources. Xiong'an already uses local geothermal resources, and surveys indicate an energy equivalent to 2.2 million tons of coal can be extracted annually. Sinopec is also investing RMB 34.4 billion ($5.2 billion) in a gas pipeline project that will power Xiong'an with natural gas.

Differing Views

The announcement of Xiong'an created instant excitement, prompting a horde of speculators to descend on the area, causing property prices to triple overnight. But the key word is "speculate"—Xiong'an is intended to be a replication of Shenzhen, which went from fishing village to high-tech megacity, but there are many sceptics.

"Whether the zone will work depends on the purpose of setting it [up]... If the purpose is related to innovation or the creation of a new type of economy, then from the experience and lessons all over the world we know that... only emerges through market mechanisms, not planning."

- Xu Chenggang, Professor of Economics at CKGSB, and winner of the 2016 China Economics Prize

"The government has pointed to Shenzhen [as a success case]... Yet there are also plenty of new areas—notably, Binhai in Tianjin, just east of Xiongan—that have failed to take root."

– The Economist

"It is easy to set up new area, but tough to sustain its growth."

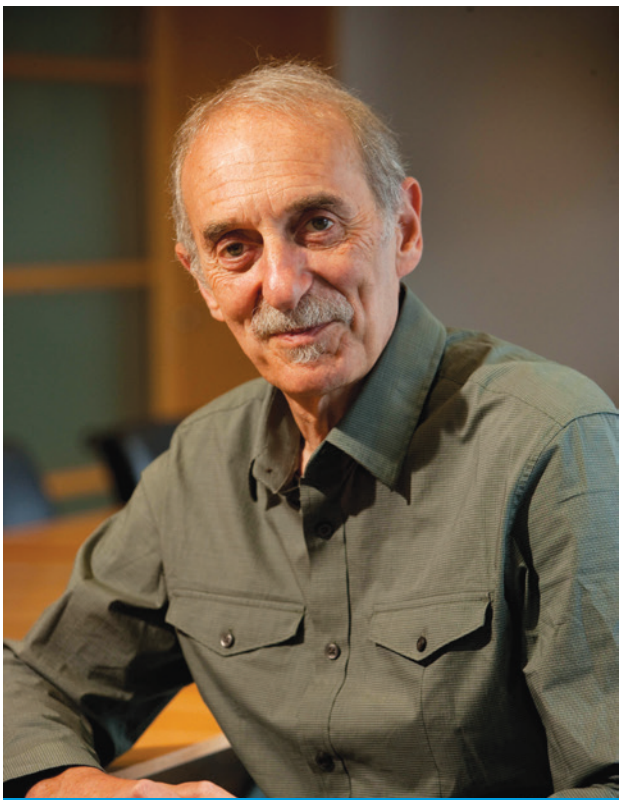
– Li Zuojun, Fellow, Development Research Center of the State Council

"In our view, the Xiong'an New Area is designed to address some specific issues that Beijing faces and it does not herald another round of massive infrastructure build out in China."

- Bank of America Merrill Lynch

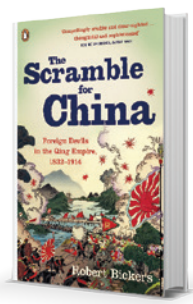
Reading China's Economy

George Magnus shares his favorite books on China



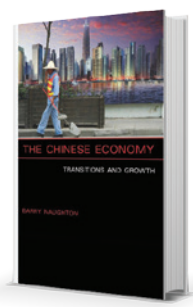
George Magnus is an economist and commentator, as well as an Associate at the China Centre, Oxford University. He formerly worked at UBS Investment Bank, as Chief Economist, and then later as Senior Economic Advisor. He is author of The Age of Ageing, *on the global influence of demographic change, and* Uprising, *on the impact of emerging markets in the world economy. He is currently working on a third book on China's debt problems.*

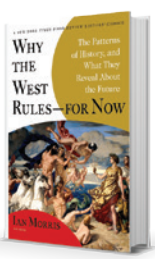
My first recommendation is **The Scramble for China: Foreign Devils in the Qing Empire, 1832-1914**, by Robert Bickers. The book is about how foreigners carved China up in the 19th century, the previous period of globalization. I like it because there is a resonance with today's globalization, which has a very different context in that China is beneficiary and instigator. It helps you understand China's view on the world.



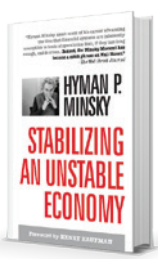
Unlikely Partners, by Julian Gewirtz, details how China opened up intellectually to foreign economic thinking, which is a story that is not understood well. Even before Deng Xiaoping came to power, there was a new willingness to look at what other countries were doing. After the Berlin Wall fell, the engagement deepened, and people like Milton Frieman and Walter Mandell, were welcomed to China. China didn't copy everything, but took what they thought would work for them.

For those newer to China, **The Chinese Economy: Transitions and Growth**, by Barry Naughton, is a classic book for anyone that wants to get to grips with the Chinese economy as it evolved and developed during the early days of People's Republic. It covers it very well, and the narrative to reform and opening up is essential reading for any economics or finance student.

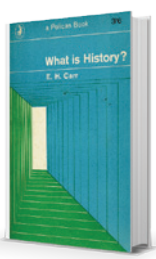




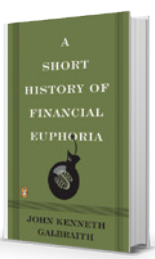
Why the West Rules—For Now
by Ian Morris



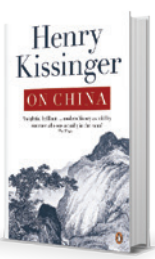
Stabilizing an Unstable Economy
by Hyman Minsky



What is History?
by E.H. Carr



A Short History of Financial Euphoria
by John Kenneth Galbraith



On China
by Henry Kissinger

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