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A View of China's Prospects, Obstacles, and Contradictions

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Abstract

If China can emerge from its current recession and complete its ongoing transition to technology-leader status, it will be an ever more dominant force in Asia and worldwide. Years spent living in Asia have spurred the co-Editor-in-Chief of this journal to offer informal comments on the status and prospects of China's socio-technical situation.

Keywords

China; Environmentalism; Education; Technology; Automation; Demographics


1. INTRODUCTION

The author's periods of living in Japan, South Korea, and Taiwan – plus many trips to these and other East and Southeast Asian nations – have straddled the “opening” and the “awakening” of China. China's development now influences the further development of Asia and the world. The author's recent experience as Visiting Scientist at the Chinese Academy of Sciences firmed up the views expressed here, and spurred the writing of them.

A country's prospects depend not just on technology transfer processes and research infrastructure, but on the country's culture, social norms, educational and health systems, government, and many other factors. This essay suggests how several of these factors interact to shape China's socio-technical future and, by implication, the futures of surrounding countries.

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2. ENVIRONMENT

China's huge size and rapid economic development mean its actions are critical for saving our planet from ecological breakdown. China's government has taken the responsibility seriously. The revised Environmental Protection Law of the People's Republic, enacted in 2015, has been called “the most stringent environmental law in history” (Wang et al., 2016).

Countrywide reductions in chemical oxygen demand, sulfur dioxide, and nitrous oxide are documented on the order of 10% from 2010 to 2015, and air quality has generally, if incrementally, improved (ibid.). Yet Wang et al. (2016) are frank that in China's current stage of development “economic structure is irrational, pollution and energy consumption are high, and [polluting] enterprises make up a large proportion of total enterprises.” Moreover, they continue, environmental oversight systems, connections, and implementation are “imperfect.” The systems do, however, include “severe punishment” for environmental offenders.

Taking the lead in electric and other “new energy” vehicles and urban car traffic restrictions, Beijing has improved its air quality. The national government sponsors research into the

environmental resilience of belt-and-road countries, ostensibly in order to minimize the environmental impact of new investment in those countries.

Notwithstanding, problems remain. Urban air quality still needs much improvement. It's small exaggeration to say Beijing residents know just two weather conditions: Stagnant and polluted air, or clear blue skies on days with uncomfortably high winds.

Environmental improvement still involves some sleight-of-hand. Factories shut down their emissions on days when important government meetings occur. Some of these factories have been relocated to the countryside, simply exporting the pollution away from urban areas.

Worse, local officials are known to accept bribes in order to overlook manufacturer's violations of environmental laws. Many such officials are found out, and prosecuted under new and tougher anti-corruption drives. University researchers want to factor this corruption into their models, but find it hard to get the needed data. There seems not to be a tradition of data-sharing between the legal and academic communities.

Despite every indication that the central government takes very seriously its responsibility for environmentalism, some fear that the belt-and-road initiative will serve to export polluting activities farther afield, to the countries newly connected to China by the belt and road.

The Chinese Academy of Sciences has shared (at data.cas.earth.cn) five million gigabytes of data on earth sciences, biology, and global ecology. The open data set eases monitoring of crop disease, disaster recovery, and other areas.

These signs are mostly encouraging. But in a country where image is sometimes as important as action, one must look below the surface to discern what is really happening on the environmental front.

3. EDUCATION

220,000,000 Chinese are studying English at this moment, and are starting their study now early in primary school, rather than later, as before. Aside from the usual business advantages of multilingualism, knowing two languages with such different written forms is surely beneficial for children's cognitive development.

In America, a tiny fraction of this number are studying Chi-

nese language, Advantage China, on this dimension.

On the other hand, China is desirous of homegrown innovation and technological advance. The country is known for its "competitive" schooling. The word "compete" implies that all participants are playing the same game, under more or less the same rules.

In the West, we call a radical innovation a "game-changer." This phrase illustrates how difficult it can be for students in a competitive school system, forced to play the school's game, to break out of the game's boundaries and become true innovators. Advantage America on this dimension, where the top US schools (though certainly not all of America's schools) encourage boundary-breaking behavior.

China has 48 million "highly skilled" workers, including scientists, engineers, and specialty technicians. It has committed USD 15 billion to vocational training, especially for manufacturing. Though no longer the world's low-cost producer, China considers manufacturing a key economic growth driver.

China's fine universities aspire to world-class status. The primary strategy for achieving this consists of attracting the foremost faculty, including foreign faculty. The Thousand-Talents Program (controversial, due to allegations of illicit technology transfer), and the President's International Fellows Initiative under which I visited CAS, support the goal. University presidents are thinking creatively and anew about the role of universities in China's future (Sanders, 2014: pp. 4-9).

4. ECONOMY

China's economy has been in recession for many months, as of this writing. The country's press organs declare it is a temporary condition. The government is encouraging consumption, despite that workers' savings and inheritances are depleted, and more and more of each paycheck must go to rent in the coastal cities' inflated real estate markets.

High-rise construction continues apace in these cities, except in districts of Beijing where there are height restrictions. This construction is curious and probably deleterious, as government policy aims to depopulate the low-lying coastal cities (including Beijing and Shanghai) before rising sea levels inundate them.

"Expert" opinions on China's economic future are many and varied. See, for example, Fukuyama (2016) and Light (2019).

5. DEMOGRAPHICS AND WORKFORCE

The one-child policy has been relaxed, fertility is encouraged, and abortion services have been made more difficult to find. Yet two-worker families are reluctant to have a second child, due to small apartments, the high expense of raising a child, and fear that job pressures plus long commute times mean a child will be starved for parents' attention. Grandparents who traditionally care for grandchildren may have remained in country villages while their offspring have moved to the cities for employment.

This leaves traditional demographers and HR scholars at odds with technologists. The traditionalists publish articles claiming the future will suffer from insufficient workforce. The technologists write that the number of jobs turned over to robots will offset any shortage of human workers. The question will likely remain unresolved for some time to come.

6. SCIENCE/TECHNOLOGY POLICY

Since 2013, the Chinese government has established a scientific and technology (S&T) development program intended to reform the nation's research institutions to develop a broader innovation system. The Chinese government expects the outcome of their S&T powerhouse to produce results by 2050. China hopes its S&T reform will help transform their society from a labor, energy, and resource-intensive economic development model into a country that is dependent on technological innovation. The reform is projected to reshape the research environment in several areas including financial management, institutional structure, project management, and technology transfer (Cao and Suttmeier, 2017).

However, there are still challenges that the Chinese government has to deal with. For instance, the Chinese Academy of Sciences (CAS), one of their most prominent institutions, has been challenged to redefine its identity and mission. China has tried to follow the steps of the U.S. National Academies National Research Council (NRC) model, but so far they have not found the right formula for combining academician expertise in the way the NRC has. It is not clear to the Chinese Academy of Sciences how the new categories of the academician system will be applied. Additionally, there are several ways in which the Chinese government needs to redefine its national labs under the new S&T reform program that would be differ-

ent from previous models, including size, broader interdisciplinary scope, and scale of investment.

Another challenge facing the Chinese government is its concern for professionalism. The meaning of the term of "professionalism" in Chinese context is quite different from the one that used in the West. In China the professional autonomy has been restricted and viewed as antithetical to the political formula of the Chinese Communist Party (CCP). Under the new Chinese reform, professionalization would be pursued through the modernization instruments of the political guidance only (Cao and Suttmeier, 2017).

All these challenges could impact the Chinese model of scientific development. However, China appears willing to restructure its government agencies and research institutions to further the cause of national innovation.

Recent new intellectual property policies seem designed to better protect homegrown innovations. The country now has nearly 43,000 qualified patent examiners. The Office of the State Council's "23 Measures," released in 2019, cover I.P. protection and patent insurance, commercialization, technological and financial innovation, "military-civilian integration," and management innovation. The measures will be implemented incrementally in selected provincial regions.

The Guangdong-HongKong-Macao Greater Bay Area and Nanjing-Jiangbei are two of the nineteen regional innovation cooperation areas the government has designated. China aims to perfect the inter-governmental agreements that permit adjoining metro areas to cooperate for technology and economic development. The Beijing-Tianjin-Hebei cooperation area will surely make slow progress due to the region's horrendous traffic congestion.

Guizhou, in southwest China, aims to become a "big data" hub, leading the digital transformation of industrial production and social governance.

7. TECHNOLOGY PROGRESS

China's government appears to resent bitterly the West's reluctance to buy Huawei equipment. The controversy rests on the West's suspicions that software backdoors in the equipment allow data harvesting, or more bluntly, spying. Judging from press stories, Huawei's CEO is a sincere man who wants to build a good company. Yet how could even a non-state-owned company in China resist the government's demand for

data access?

We read of instances of Apple and others in the USA refusing government requests to violate customers' privacy. This is to be applauded. One wonders, though, how many such requests are not refused in America, and that we therefore do not read about.

The Chinese press's claims that the West treats Huawei unfairly thus seem to be deliberate misdirection. No one disrespects Huawei, but many seem to fear what China's authoritarian government might have forced Huawei to do. In latest developments, a British investigation has shown "serious security flaws in Huawei equipment" (Corbett, 2019).

The successful *Chang'e 4* lunar mission has boosted China's commitment to space exploration.

China's subsidies toward, and production of, "new energy vehicles" is huge. I apologize for not being able to find numbers, but it seems hard to pin anyone down to a definition of "new energy." Does it include, e.g., liquefied natural gas cars? The vehicles are key to recently improved urban air quality, and spur local automotive industry sales at the expense of imports.

The high-speed rail network has changed China's society significantly. Spring festival trips to home villages now take hours instead of days. Commerce between Beijing and Shanghai has increased apace.

Chinese industries are depending more and more on artificial intelligence. A.I. practice is strong in China, but A.I. theory is weak. The country is likewise weak in quantum information processing. Both areas need more international research collaboration.

A new bourse specifically for hi tech companies opened in early 2019. China tech attracts investors because developers work extremely fast. Instead of the Western practice of weekly software builds, says one VC, Chinese startups fix bugs overnight. However, investors and startup employees alike complain that startups lack the kind of visionary and strategic leadership needed for competitiveness. Tech leadership is still a rare commodity in China.

In this vein, China has become the third locale of the World Economic Forum's Centre for the Fourth Industrial Revolution. The Centres "work together to design creative policy frameworks for improving the governance of emerging technologies, scale-up their projects worldwide, and share findings and best practices" (WEF 2018). Projects focus on A.I. and machine learning; autonomous and urban mobility; distributed ledger technology; data policy; digital trade; drones and tomorrow's airspace; IoT; and precision medicine (ibid.).

The government's swift and strict response to He Jiankui,

who brought gene-edited babies to term, was surprising. He has been censured not just on ethical grounds, but on matters of research procedure as well.

8. CREATIVE ECONOMY AND CULTURAL EXPORTS

As China loses its status as low-cost exporter of tangible items, it will try to grow cultural exports. The recent international hit sci-fi movie *The Wandering Earth* is a good start, as was the 2019 spring festival TV gala. How fast will China's new entertainment industries be able to follow up on these?

Meanwhile, traditional cultural items continue to gain foreign fans. Performing Shaolin monks, and traditional Chinese medicine ("TCM") are leading examples.

Connections between technology and the arts are recognized. There are 700 cultural and creative companies in Wuxi's national software park, for example, with the city declaring culture "a powerful driving force for economy and innovation."

9. AGRICULTURE

The USA has far more arable land per capita than China. On a resources-per-person basis (arable land, grain, forest, energy, fresh water, etc.), China ranks 126th of the roughly 200 countries in the world (Wang et al., 2016).

This has led to a heavy emphasis on agricultural research. Too, the belt-and-road initiative seems designed to carry needed resources from Eurasia into China.

The premier considers food security a critical issue for China's future, and speaks on the importance of preserving farmland. Yet, ordering more food than a guest could possibly eat remains a hallmark of Chinese hospitality.

10. TOURISM

This huge, varied, and fascinating country has enormous potential for growth in inward tourism. However, progress on tourism infrastructure and hospitality practices is slow. Even the government-obsequious *China Daily* newspaper wrote at

length on the “crisis in hotel hygiene.” The author’s experiences in this regard included an academic colleague’s advice to take my own cup to the hotel restaurant, rather than trust the cleanliness of the hotel’s cups.

A tourist will benefit from technological wonders not yet seen elsewhere - smart street lamps are an example – but other simple practices are unpracticed or unknown in China. The latter include traffic right-of-way, and plumbing traps to prevent reflux of sewer gas. These stand in the way of tourists’ enjoyment of China.

11. CROSS-STRAIT RELATIONS

The English edition of the *China Daily* regularly attacks persons and policies of Japan, Taiwan, and the USA, with particular vitriol reserved for the current president of Taiwan.

China’s efforts to persuade other countries to sever diplomatic ties with Taiwan and to prevent Taiwan’s recognition as an independent nation are well known. The current Chinese government claims Taiwan as a province of China. It reserves the option of military action should Taiwan declare itself independent. Of course, Taiwan acts as if independent, and is a significant trading partner of China. This, and the memory of China’s recent public-relations disasters in Hong Kong and the South China Sea, makes a military “solution” – or political union by any other means – unlikely in the short term, though very plausible in the longer term.

The same newspaper excoriates Japan for demanding that Russia return the Kurile Islands. Japan, says the newspaper, lost the islands to Russia in war, and that should be that. (This was before Donald Trump’s March, 2019 remarks on Israel and the Golan Heights.) I remarked to Chinese who are close to the government, “The Chinese emperor gave Taiwan to Japan. That Japan later lost the island in war should be irrelevant. Applying the *China Daily*’s logic on the Kuriles issue, on what historic grounds can China claim Taiwan?” The responses were just sheepish laughs and shrugs.

12. MORE ON THE PRESS

It is fun to search for real news items among the *China Daily*’s propaganda pieces. As one expects from a country where

image is as important as practice, the government appears hypersensitive to other countries’ opinions of China. The newspaper’s daily editorial attacks against Japan, Taiwan, and the United States seem perversely designed to harm those opinions.

The Chinese press’s incessant optimistic stories on “growth plans for region X” spur the same reader reaction as does CNN’s Richard Quest when he clams, “Airlines are making it easier for you to get from point A to point B”: namely, “That’ll be the day!”

China Daily’s headlines (e.g., “Xi supports private companies”) are entertaining and splendidly oxymoronic. *China Daily* claims Pakistan and China are in accord on the belt-and-road project, even as CNN says Pakistan is distancing itself from China.

13. FINAL REMARKS

Unlike the USA, which grew essentially in isolation prior to World War II, China’s post-Mao growth has taken place in an era of globalization and intense international scrutiny. America’s start as a new democracy was a bold but diffident experiment; China’s self-image as the Middle Kingdom has continued to inform policy even through the communist and reform eras. When other modern countries do not see themselves as tributaries to China, it causes cognitive dissonance in Beijing. International negotiators should be aware of this.

Westerners react with appropriate horror at China’s “social rating” program, but should not be surprised when the personal information collected by their home Internet of Things devices (not to mention credit rating agencies) are ultimately turned against them in a similar way. China is still in catch-up mode in many ways, but non-Chinese may take other aspects of modern Chinese life, such as this one, as leading indicators for our own lives.

China’s authoritarian government is taking bolder steps than democratic governments elsewhere, to alleviate effects of climate change. China’s citizens are subject to an excess of rules, but manage nonetheless to enjoy happy everyday lives, with much improved material well-being. My personal preference for democratic governance does not allow me to approve of all of China’s recent tactics, but I must appreciate how its government has produced beneficial results. China’s development path may not be one that other nations can or should

emulate, but it provides ample case studies and food for thought, as others forge their own paths.

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