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CHINA STUDIES REVIEW

Featuring Articles by

Ned Collins-Chase
Amanda Van Gilder
Miaosu Li
Benjamin Pollok
Minh Joo Yi

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Letter from the Editors

China's evolving political and economic dynamics and international ambitions provide fertile ground for analysts in many sectors. China's economic growth rate has moderated to a "new normal" of 6.5 percent, putting pressure on Beijing as the country prepares to reshuffle its leaders at this fall's upcoming 19th Party Congress. Meanwhile, a range of new policy initiatives, from the Cybersecurity Law to the Made in China 2025 Plan, find China vigilantly monitoring "hostile foreign elements." Despite these anxieties at home, China projects growing confidence and leadership abroad. Over the past year, President Xi Jinping emerged as an unexpected champion of globalization at the World Economic Forum in Davos against the backdrop of a new American administration bearing a more inward-looking populist mandate. China has also accelerated its ambitious Belt and Road Initiative, made progress toward concluding a binding code of conduct with ASEAN, and affirmed the leading role it can play in implementing the Paris Climate Agreement.

Amid China's dynamic transformations, we are excited to present the third edition of the *China Studies Review* as a platform to highlight the contributions of students at the Johns Hopkins School of Advanced International Studies toward better understandings of China, its relationships, and its evolving role on the world stage.

The first section of this issue features two brief issue papers. Ned Collins-Chase examines the Qianhai Free Trade Zone and considers its prospects as a tool for Chinese capital account liberalization. Minh Joo Yi surveys China's foreign policy calculus under President Xi Jinping and notes Beijing's growing assertiveness in foreign affairs.

In the second section of this issue, we present three research articles spanning China's environment, nuclear weapons strategy, and economy. Miaosu Li analyzes a little understood aspect of China's wind energy development - the associated environmental costs of rare-earth metal processing - and calls for a more nuanced assessment of Chinese energy policy and implementation. Amanda Van Gilder provides a comprehensive analysis of the nuclear balance between the United States and China. She concludes that while the United States will maintain nuclear superiority for the next one to two decades, the gap will close as China gradually attains doctrinal and technological parity. Benjamin Pollok compares the homeward investment patterns of the diaspora populations of China and India. Pollok attributes China's greater success in attracting this investment to its active diaspora engagement policies – a strategy not yet meaningfully pursued by India.

We in the China Studies Program are excited to highlight the high quality of student scholarship at the Johns Hopkins School of Advanced International Studies in this publication. To provide a sense of the rich intellectual environment that fosters this work, we close this issue with a selected list of speakers and topics presented in the past year at our programs in Washington, D.C. and China.

We would like to extend our gratitude to the student authors and editors for their commitment and hard work in advancing this young publication, to the faculty and mentors who supported this work, and to our faculty advisors, Carla Freeman and Madelyn Ross, for their expertise, advice, and unyielding support for the *China Studies Review*.

Kaj N. Malden, Editor-in-Chief
Shanghai, China

Adam B. Lee, Executive Editor
Washington, D.C.

China's Challenges in Advancing Capital Account Liberalization: The Case of the Qianhai Free Trade Zone

Ned Collins-Chase

Introduction

As China attempts to engage in meaningful capital account liberalization, it faces a balancing act: implementing reforms to boost productivity, spurring development of its service industry, and enhancing renminbi (RMB) convertibility, while at the same time avoiding the risks of capital flight and threats to the viability of state-owned enterprises employing millions of workers. Pilot Free Trade Zones (FTZs) have become one of the tools China will use to implement capital account reforms, with the Qianhai FTZ focusing on broadening financial flows between Hong Kong and the Shenzhen Special Economic Zone. While the Qianhai FTZ offers new avenues for China to continue its experimentation with economic reforms and advance capital account liberalization, these avenues cannot be fully explored without appropriate parallel sequencing of macroeconomic policy reforms at the national level.

The role of FTZs in China's economic reform and the prospects for the Qianhai FTZ

The Shanghai FTZ, the first among the recent wave of FTZ announcements, was created as a testing ground for looser financial regulations and capital account liberalization.[1] The Chinese government disclosed plans for the zone to the public just two days before its official opening in late September 2013. The announcement was followed by a three-month silence by the government, and no official information about the zone was provided to potential investors. The three-month lag may have given officials time to win the support of skeptics within the government, as well as the opportunity to create further interest among investors by strategically releasing a series of information leaks regarding the FTZ.[2]

Salient policies implemented in the Shanghai pilot zone included fewer restrictions on foreign currency exchange; a "negative list" outlining industries in which foreign investment is still restricted, in order to facilitate the ease of investment in industries without these restrictions; and simplified company registration processes.[3] Some of the experiments from the Shanghai pilot zone have since been approved for nationwide implementation, including the use of a negative list and streamlined company registration procedures.[4] There are also early indications that the effects of China's efforts to liberalize capital controls can be seen in the Shanghai FTZ, with data showing that Chinese capital controls have had less impact since the FTZ's launch.[5] However, while there is a possible correlation between looser capital controls and implementation of the Shanghai FTZ, recent policy reversals have threatened progress, and the degree to which novel policies will be allowed remains uncertain.[6]

The Qianhai FTZ, part of the Guangdong FTZ group, is expected to officially open in 2020. It is different from the other FTZs in that it specifically seeks to leverage the offshore RMB market in Hong Kong. Hong Kong is already a major staging point for foreign firms seeking entry to China, and serves as a source for investment that can spur the development of more modernized industrial and services sectors. The Qianhai district will comprise 15 square kilometers of the total planned 28.2 square kilometers of the larger Guangdong Pilot FTZ in Shenzhen.[7] The stated purpose of the zone is to serve as a platform for modern service industry cooperation between Hong Kong and the mainland as a part of the Mainland and Hong Kong Closer Economic Partnership Arrangement (CEPA) and the broader "Belt and Road Initiative" introduced by Xi Jinping. The government seeks to capitalize on Qianhai's proximity to both Hong Kong's financial sector and Shenzhen's manufacturing sector to attract corporations seeking to develop a modernized service industry in the region.

To incentivize participation in this project, corporations and investors seeking to do business in Qianhai receive preferential treatment, including a steep reduction in the corporate income tax rate. There is some disagreement among sources as to exactly how much of a reduction this will be; some sources say the corporate tax rate will be 15 percent, while the official project website lists the reduction as a 15 percent decrease.[8] Both tax rates are lower than the 25 percent national rate and the 16.5 percent rate in Hong Kong. Qualified individuals within the zone will also receive tax subsidies. Qualified manufacturers can apply for financial support, and foreign-invested corporations will be able to avoid bureaucratic delays by utilizing one-stop administrative procedures established within Qianhai. The greater zone will, like Shanghai, also feature bonded ports outside of Chinese customs and value-added tax (VAT) exemptions. Moreover, to create a more level financial playing field for foreign corporations and investors, Qianhai will feature new judicial and arbitration reforms, which are touted as part of "a law-governed socialist demonstration zone with Chinese characteristics."[9]

A major factor determining the success of FTZs as a tool for capital account liberalization is China's commitment to actually implement policies allowing for looser capital controls. Because of the risks inherent in the liberalization process and recent economic difficulties, this commitment is far from given. As mentioned, recent developments in the Shanghai pilot zone give cause for concern that similar difficulties may impede the success of Qianhai. Further concerns arise from the poor performance of one of the FTZs' signature tools in promoting capital flows: RMB-denominated bonds issued outside of China, popularly referred to as "dim sum bonds." After a difficult year for dim sum bonds and offshore RMB markets in 2016, prospects continue to look bleak for their performance in 2017.[10] It will be difficult for Qianhai to be successful in broadening capital flows between the Hong Kong RMB market and Shenzhen if demand for dim sum bonds remains weak.

Beijing is truly walking a tightrope in its attempts at capital liberalization. On the one hand, China would like to see its currency attain greater weight in the global financial system, not only for the prestige it would bring, but also because of the belief that an increased proportion of trade financed by RMB would help China better withstand large-scale crises, such as the 2008 global financial crisis which threatened its export volume.[11] On the other hand, China's economy is still largely following a model of maintaining exports and financing investment through domestic savings, and abrupt liberalization of currency valuation and capital flows could make China vulnerable to maintaining a trade deficit and the risk of large-scale capital flight.[12] Fears of the latter seem confirmed in China's recent tightening of capital controls in response to the effects of a cheaper RMB, and the action's deleterious effects on dim sum bonds in 2016.[13] However, if China wants to succeed in its long-term aims of rebalancing its economy, it must liberalize. The necessity of this shift, coupled with the prospect of humiliating failure should the FTZ experiment prove to be a flop, gives Beijing a strong incentive to redouble its future efforts and to ensure Qianhai's success.

Conclusions and policy considerations

Physical spaces in which to implement capital account liberalization are neither intrinsically useful nor harmful in the effort to reform capital control systems, but they may have benefits in the Chinese context. The use of pilot FTZs is indicative of China's preference for gradualism in adopting economic liberalization, like the dual-track reforms created during the 1980s through Special Economic Zones (SEZs), and may reflect an effort to marshal support for these reforms by building on an existing, and popular, format. If China succeeds in this regard, the choice of using physical spaces to house FTZs is appropriate.

The formation of the Qianhai FTZ is a legitimate approach to capital account liberalization in theory, but in practice the zone will only be as successful as the overarching capital account liberalization that should accompany it. There are concerns regarding the function of the Shanghai Pilot Zone that represent real risks to the success or failure of the FTZ experiment. While the Shanghai Zone has already contributed to national economic policy reforms through the broader approval of a negative list, ambiguity remains regarding its possible contributions toward looser currency restriction and simplified corporate registration. Further, it remains questionable whether it can guarantee the implementation of meaningful reforms or create confidence among investors.

If China seeks to pursue internationalization of its currency, it must maintain a measure of caution, but also become more willing to accept levels of capital outflow. Without willingness to accept this risk, the tools at the disposal of FTZs will be considerably curtailed. Regardless of the type of currency convertibility and capital account liberalization China is willing to pursue, it must commit fully to these policies to maintain investor confidence, and to avoid retreating to tighter capital controls. Qianhai will be more likely to succeed if it demonstrates a credible guarantee by the government to pursue currency and financial liberalization, while assuaging fears of the growing pains of liberalization among local actors and domestic businesses.

About the Author

Edward (Ned) Collins-Chase is a rising second-year SAIS M.A. concentrating in China Studies. Ned previously served as Peace Corps Volunteer in Mozambique, and his research interests include China's economic development, Northeast Asian security, China's growing role in Africa, and U.S. grand strategy in the Asia-Pacific region.

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Evolutions in Chinese Foreign Policy Under Xi Jinping

Minh Joo Yi

Introduction

Since Xi Jinping's assumption of the presidency of the People's Republic of China (PRC) in late 2012, Chinese foreign policy-making processes have become noticeably more centralized. Increasingly confident of its national capabilities and elevated international stature, China now seems to have adopted a more assertive foreign policy stance in order to pursue its core national interests around the world and to reshape the Western-led global governance structure. This policy memorandum proceeds to outline evolutions in China's foreign policy-making processes and objectives, as well as their implications for China's relations with the U.S. and the world at large. This analysis closes with a consideration of the durability of China's foreign policy positioning under Xi Jinping.

Chinese foreign policy-making process from Mao to Xi

Shortly after the founding of the PRC in 1949, Mao Zedong and his cult of personality concentrated political power in one individual, resulting in top-down foreign policy decision-making. As a result, foreign policy formulation and implementation procedures throughout the Mao era were less a result of institutionalized and systematized processes than a direct reflection of Mao's own personality and idiosyncrasies.

Compared to his successor Deng Xiaoping, who studied in both France and the Soviet Union, Mao had little exposure to foreign culture and institutions. This background may explain China's relatively self-reliant foreign policy during the Mao era. Additionally, Mao readily mobilized a "century of humiliation" national narrative, emphasizing China's losses and concessions to foreign "imperialist aggressors." This deep-seated animosity toward foreign powers was reflected in China's severance of relations with the United States, and even in the deterioration of its relations with the Soviet Union, its fellow socialist comrade.

Chinese foreign policy positioning changed significantly after Deng Xiaoping became China's paramount leader in the late 1970s. One of the most prominent changes was the gradual emergence of rule by consensus, whereby Deng collaborated with colleagues in the Politburo Standing Committee to formulate and implement policy. This was a noted departure from Mao's leadership style, wherein policy decisions were perilously dependent on the actions and judgments of one individual. These new consensus-driven practices involved a "collective system of checks and balances that spanned a variety of bureaucratic institutions and included a substantial number of party elites," which "shunned Maoist cults of personality and embraced the studied staidness of leaders like Hu Jintao."[1]

Under the subsequent administrations led by Jiang Zemin and Hu Jintao, China's foreign policy-making process grew increasingly diffuse.[2] China's process of merging into the international political and economic order required the construction of new domestic agencies, as well as interagency groups ("Leading Small Groups") responsible for reconciling divergent interests among them.[3] As these new political actors became a part of the foreign policy-making nexus, coordination problems arose, most clearly illustrated by the extended negotiations over China's entry into the World Trade Organization from 1986 to 2001.

Xi Jinping's leadership style strives to consolidate decision-making power against this backdrop of a fragmented Chinese bureaucracy, and recent political trends in China suggest that Xi is likely to exert more influence over the country's foreign policy than either of his two predecessors. These trends include Xi's holding of top positions in "Central Leading Groups," supra-ministerial organs established by the party that "supersede all other government agencies in the power structure."[4] Since 2013, Xi has assumed leadership of the Central Leading Group for Comprehensively Deepening Reforms and the Central Leading Group for Internet Security and Informatization, and perhaps more importantly, the National Security Commission and the Central Military Commission. These positions ensure his ability to control internal security, foreign, and military policies to a degree that Hu Jintao did not enjoy.[5] The Chinese media and party officials' recent references to Xi as the "core (hexin 核心) leader" may also be an indication of his indisputable dominance in leadership.[6]

China's central foreign policy objectives

Since Xi Jinping's accession to power, China seems to have altered its principal foreign policy objective to take a more assertive stance in order to pursue its core national interests around the world. Scholars generally agree that the principles of "creating a good external environment to maintain development" and "keeping a low profile (tao guang yang hui 韬光养晦)" have guided Chinese foreign policy since the reform era, at least until the Hu Jintao administration.[7] However, Xi Jinping's bolder intentions were clearly articulated in his speech at the Conference of Diplomatic Work Toward Surrounding Countries on October 24, 2013, in which he formally presented the strategy of "striving for achievement (fen fa you wei 奋发有为)."[8] According to Blackwill and Campbell, Xi's assertive foreign policy has been carried out most explicitly in the South China Sea.[9] Chinese coast guard vessels' harassment of Philippine and Vietnamese fishermen and repeated encroachment into Malaysia's exclusive economic zone (EEZ) all illustrate China's determination to secure its claim to this maritime territory.[10]

As a part of this new active foreign policy strategy, China has also started to establish multilateral institutions and regimes excluding the U.S. in an attempt to inject Chinese elements into the existing international order. These include the Regional Comprehensive Economic Partnership (RCEP) and the New Development Bank – the Chinese equivalents of the Trans-Pacific Partnership (TPP) and the World Bank, respectively – as well as the Asian Infrastructure Investment Bank. China can utilize these multilateral organizations as a means of exerting political leverage on participating Asian countries, just as it did when it withdrew approval for a multilateral development plan for India because of its protracted territorial disputes with the country.[11]

Several factors account for this shift toward more audacious foreign policy behavior. Xi's own nationalistic inclinations are almost certainly one of them, and especially make sense in the context of his increased personal influence over China's foreign policy-making process. On the other hand, because China's economic growth has begun to slow down, the Chinese Communist Party seems to be relying more heavily on nationalism to preserve its political legitimacy. Moreover, the fact that China weathered the 2008 global financial crisis better than many other countries may have boosted its leaders' confidence in their country's potential and capabilities, convincing them that China is powerful enough to become the rule-maker, rather than a passive participant, of the international order.[12]

Implications for the United States, China, and the World

As China makes bolder attempts to protect its national interests and increase its political clout in Asia through its own multilateral institutions, one of the most viable and appropriate policy options for the U.S. would be to continue its "rebalance" to Asia. By strengthening its diplomatic, military, and economic relations with Asian countries, the U.S. should seek to prevent China from winning strategic ground and strive to maintain its primacy in the region.[13] Some may argue that this process would involve an escalation of conflict that would result in a major confrontation between the two countries, but this outcome is highly unlikely, given that the U.S. and China are highly dependent on each other for sustainable economic growth.[14]

This foreign policy shift also has implications for China. Unfortunately, the new assertive foreign policy does not seem to have generated favorable outcomes for China, as can be seen from: the nullification of Chinese "historical rights" within the "Nine-Dash Line" by the Permanent Court of Arbitration in The Hague; South Korea's decision to deploy the Terminal High Altitude Area Defense anti-ballistic missile system (THAAD); Japan's reinterpretation of its constitution to allow for collective self-defense; and the 2015 U.S.-Japan defense guidelines that assigned a wider regional security role to Japan.[15] These repeated foreign policy failures may prompt Chinese leaders to examine whether their assertive behavior is harming China's national interests by intimidating or provoking its neighbors, leading them to militarize and to align more closely to the U.S. Thus, the durability of this new policy stance remains to be seen.

About the Author

Minh Joo Yi is a rising second-year SAIS M.A. student concentrating in China Studies and Quantitative Methods and Economic Theory. Prior to enrolling at SAIS, she was an editor at the Institute of Foreign Affairs and National Security, a Seoul-based think tank affiliated with South Korea's Ministry of Foreign Affairs. In the summer of 2017, she interned at the New American Bretton Woods II program.

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Is the Wind Industry Helping China's Environment? A Preliminary Environmental Impact Report

Miaosu Li

Introduction

China has set ambitious goals for reducing its energy intensity, and has made renewable energy an important part of the plan. Over the last few years, China's installed capacity of renewable energy, especially wind power, has grown rapidly. China now has the world's largest installed capacity of wind power and plans further development of the industry.[1] However, looking at the bigger picture, we find that the whole industry is not as clean as first assumed: the production of neodymium magnets, a key component of wind turbines, involves substantial polluting activities through the extraction and processing of rare-earth metals. While it is generally understood that wind power is clean and rare-earth processing is dirty, few studies have linked them together. This report aims to establish the connection and provide a preliminary assessment of the wind industry's true impact on China's environment.[2]

Upstream pollution in the wind industry

Renewable energy has a reputation for being "green" because it transforms natural resources into electricity without greenhouse gas emissions. Wind power has minor negative environmental and ecological impacts, which include noise, land use, and limited electromagnetic radiation.[3] As a result, governments around the world are promoting wind power, together with other renewables, to curb fossil fuel emissions.

In 2012, wind surpassed nuclear to become the third largest source of China's electricity generation, following coal and hydropower. China has developed the world's largest wind power capacity, concomitantly building a supply chain to meet the demand for wind turbines both at home and abroad.[4] China's Thirteenth Five-Year Plan encourages this development by setting goals for a low-carbon economy, addressing pollution, and requiring structural adjustments for industry. In the eyes of the government, wind power is set to light up the future of China's electricity market because of its environment-friendly characteristics.

Nonetheless, if we calculate the environmental footprint of wind power including wind turbine production, we find that wind power makes significant if unseen contributions to environmental damage. The upstream production of wind turbines involves massive polluting activities in the construction of the turbines' magnetic core. When the blades of a turbine are driven by the wind, a shaft is turned and spins the magnet in the generator. An electric current is created through electromagnetism and sent to the transmission grid. The magnet in a permanent magnet direct-drive generator is made of a neodymium-iron-boron alloy. It is the most powerful magnet in the world and ensures the high efficiency of the aero generator. It is called a permanent magnet because its magnetism will never fade. The problem is that neodymium is a light rare-earth metal that requires an involved process of extraction and refining to produce. Massive polluting activities are a byproduct of the process.

According to a White Paper issued by China's State Council in 2012, the rare-earth industry causes severe damage to the environment:

Outdated production processes and techniques in the mining, dressing, smelting and separating of rare earth ores have severely damaged surface vegetation, caused soil erosion, pollution, and acidification, and reduced or even eliminated food crop output...Light rare earth mines usually contain many associated metals, and large quantities of toxic and hazardous gases, waste water with high concentration of ammonium nitrogen and radioactive residues are generated during the processes of smelting and separating. In some places, the excessive rare earth mining has resulted in landslides, clogged rivers, environmental pollution emergencies, and even major accidents and disasters, causing great damage to people's safety and health, and the ecological environment. At the same time, the restoration and improvement of the environment has also heavily burdened some rare-earth production areas.[5]

Pollution on what scale?

According to China's Ministry of Environmental Protection (MEP), in 2011 there were more than 300 enterprises in the rare-earth industry. Most firms are located in Inner Mongolia, Jiangxi, Guangdong, Jiangsu, Fujian, Hunan, Shandong, Guangxi, and Sichuan Provinces. Violations of environmental regulations have been common across the industry, including projects and operations without environmental protection permits, emissions of untreated solid, hazardous and/or radioactive waste, and ecological damage due to careless extraction. Starting in April 2011, provincial environmental protection departments investigated the industry and reported that just 84 companies passed their examination. The Ministry of Environmental Protection ran further assessments and found that only 15 enterprises met environmental protection standards.[6] While the industry has improved, with 87 enterprises meeting environmental standards in 2013, two out of three rare-earth enterprises continue to violate environmental regulations.[7]

Rare Earth Elements (REE) Distribution in China

Source: metalpedia.asianmetal.com

Due to a lack of comprehensive assessments of contamination in the rare-earth industry, a discussion of two representative cities where most rare-earth permanent magnet materials are manufactured, Ganzhou in Jiangxi Province and Baotou in Inner Mongolia, will serve to underscore the environmental impact of the industry.[8]

Ganzhou, the largest city in Jiangxi Province, is the southern center of China's rare-earth reserves. In 2011, over 70 percent of farmland in Ganzhou was polluted or damaged due to rare-earth extraction.[9] Ammonium sulfate fluids are directly poured into the rare-earth mines to replace rare-earth oxides (REOs). The production of one ton of REOs is associated with injecting seven to eight tons of ammonium sulfate fluids into the earth, which can easily mix with surrounding ground water. The method also causes 300 cubic meters of soil depletion and 2000 cubic meters of tailings, an industrial waste byproduct, to be created for every ton of REOs.[10]According to former Vice Minister Su Bo of the Ministry of Industry and Information Technology (MIIT), the pollution treatment budget for the Ganzhou area is 38 billion RMB. The annual profit of the rare-earth industry in Jiangxi Province was just 640 million RMB in 2011.[11]

The city of Baotou in Inner Mongolia, known as "the capital of rare-earths" in China, has the world's largest rare-earth reserves in its Bayan Obo mineral district. During decades of operation, the state-owned Baotou Iron and Steel company released a tailings pond into a ten square kilometer lake, containing many toxic chemicals and radioactive elements like thorium and uranium. The tailings lake is only about 12 kilometers away from Baotou and nine kilometers away from the Yellow River. It slowly trickles underground toward the Yellow River, and when the rainy season comes every July and August, pollutants quickly flood into the Yellow River through tributaries flowing from the lake. Various reports and official studies confirm unusually high rates of cancer, osteoporosis, and skin and respiratory diseases in villages surrounding Baotou.[12] Local governments have been forced to evacuate and resettle whole villages between the city of Baotou and the Yellow River as a result.[13]

While the precise share of rare-earth mining attributable to the wind industry is unavailable, a U.S. Geological Survey estimates neodymium ore accounts for around 20 percent of China's national rare-earth reserves.[14] Based on this estimate, roughly one-fifth of the pollution treatment costs from rare-earth mining are associated with neodymium permanent magnet production.

Rare-earth regulations and their effects

Severe and pervasive polluting activities in the rare-earth industry are the outcome of poor regulation. The Ministry of Land and Resources (MLR) has been responsible for developing production plans for the country's strategic commodities, including rare-earth metals. However, decentralization in regulating the rare-earth industry led to the MLR delegating authority to provincial governments to manage local production quota allocations and assign output quotas to individual mining companies. Overproduction and direct emissions from both licensed and unlicensed miners have resulted in disastrous pollution due to poorly implemented regulations.[15]

In 2008, the Rare-Earth Office was transferred out of the MLR and centralized in MIIT. After the MEP investigation in 2011, a series of regulatory actions were undertaken and policy documents were released. Most of the unlicensed mines were penalized and closed, despite some pushback from local interest groups. The MIIT also supervised a restructuring of the whole industry. Many inefficient small companies and other state-owned enterprises were integrated into a group of six major rare-earth firms, in the hope that consolidation would make it easier to regulate the contamination problem.[16] In 2012, the MIIT issued the country's first Rare-Earth Industry Entry Standards, in which sections five, seven, and eight state that all enterprises in the industry must comply with regulations in Emission Standards of Pollutants from the Rare-Earths Industry Guidance policy document and that related government branches must strictly enforce relevant environmental and security rules.[17] The MEP also conducted a three-year study on possible technological upgrades to reduce pollutant emissions from rare-earth mining and their economic feasibility. In 2014, the MEP released a draft regulation titled *Guidelines on Available Technologies of Pollution Prevention and Control for the Rare-Earth Metallurgical Industry*, and is still in the process of taking advice from the whole industry and concerned parties.[18] When and how these regulations will be implemented is still unclear.

The big question is how the government will next follow up after the major crackdown in 2011-12. Proposed reforms are attractive at the policy level, yet are unclear on implementation and enforcement mechanisms. Worse still is that existing enterprises, including some state-owned giants, continue to pollute and some previously eliminated producers have re-entered the market. According to the U.S. Geological Survey's 2016 Mineral Commodity Summaries, despite government efforts, illegal production of rare-earth materials in China is ongoing.[19] In January 2015, local villagers reported the Ganzhou Rare-Earth Mineral Corporation's Jibu Mine had re-opened after a four-year suspension, even though questionable mining activities had never stopped and the firm never passed an official environmental assessment.[20]

For the most part, large state-owned enterprises are rarely held responsible for violations of environmental regulations, and they continue to emit untreated pollutants despite repeated criticism. Since 2007, the Aluminum Corporation of China and its subsidiaries around the country have been named and condemned by the State Environmental Protection Administration (predecessor of the MEP) and many news agencies. In January 2015, residents in Buning, Jiangsu Province reported the company's pollution problem to the MEP.[21] In the case of the Ganzhou Rare-Earth Mineral Corporation, failure to obtain an entry permit from the MIIT quashed its plan to go public in 2015. But its manufacturing activities continue unchanged.[22] Senior executives claimed the financial burden imposed by environmental regulations was too large and required the company to go public in order to finance pollution treatment projects.[23]

Environmental benefits from wind power development

While the upstream industries are enmeshed in environmental damage, wind power generation itself is not contributing to clean energy consumption as expected. China has enjoyed the fastest pace of wind power development in the world over the last decade. However, skyrocketing installed capacity has done little to improve the industry's efficiency. The main cause has been the state development plan, which overlooked practical obstacles concerning market demand and technical shortcomings. Upstream polluting activities in wind turbine production have often ended up creating idle wind turbines. So far, the environmental impact of pursuing wind has been net negative.

The concept of curtailment refers to the problem that installed capacity cannot be fully connected to the power grid because of local market saturation or technical shortcomings in interconnecting power grids. In China, some 80 percent of onshore wind energy capacity is in the "Three Norths" region — an area ranging from Xinjiang to Heilongjiang (the north, northeast and northwest of China). Yet 70 percent of total demand lies in central and coastal China.

The distance between the best resources for renewable energy generation and the main areas of demand is a major obstacle since new transmission and distribution capacity entails a large upfront investment.[24] The power grid in the "Three Norths" is not sophisticated enough to dispatch large amounts of electricity through high-voltage, long-distance lines. Moreover, wind power competes with traditional fossil fuel-generated electricity for limited dispatch volume. In 2015, some wind power plants in the "Three Norths" had an average idle rate of up to 50 percent, which caused an annual loss of more than 43 million RMB.[25] Industry rumors have cradled an expectation that the government could order a guaranteed quota for wind power to be dispatched to eastern and southern markets through high-voltage transmission grids, yet interest groups have made it hard to reach an agreement on volume. In 2016, electricity demand dropped in large areas of China as the economy slowed down. Wind power plants around the country were ordered to halt production so that local fossil fuel plants could earn a guaranteed share. The practice of giving priority to the development and utilization of renewable energy in the Renewable Energy Law was ironically overlooked.[26] Although many wind power producers were running below their breakeven point, more than 31 million kilowatts of wind power capacity were brought online in 2015, exacerbating the situation even further.[27]

Conclusion and discussion

At this point, we should not diminish the contribution of wind power as a clean energy capable of carbon emission reduction and air pollution control. Nonetheless, the positive effects might not be as promising as originally expected. Despite China's ever-increasing wind power capacity, some wind-generated electricity has never successfully been connected to the transmission system. On the down side, we do not know the exact costs associated with managing pollution in neodymium magnet generator production. The Ganzhou case clearly shows short-term treatment costs easily surpass the profits of the whole rare-earth industry in Jiangxi Province. As most wind power plants are experiencing deficits, the pollution costs have so far not been balanced out by the usage of clean power. In the past few years, we have seen some policies launched to make the wind industry a net positive for China's environment, from both the upstream (rare-earth production) side and the downstream (market absorption) side. However, most of the major policies have had substantial implementation gaps.

There is additional bad news for the Chinese wind power industry's net environmental impact. In 2015, excess supply caused prices for rare-earth compounds and metals to decline significantly, with illegal production in China a major cause.[28] In addition, rare-earth reserves are not as rare as their name suggests. New mineral sites have been discovered around the globe and China's global share of rare-earth minerals has decreased after years of unrestrained production.[29] Future profits for China's rare-earth industry are likely to fall, making it even harder to cover environmental externalities. It is hard to estimate when China's wind power industry will start to make profits. At least in the short run, including environmental externalities in the calculation of environmental gains shows that wind power development is causing more losses than gains in China.

Importantly, this report does not recommend the end of wind power development in China. Despite upstream pollution, wind power generation is still a promising technology that can mitigate pollution caused by using traditional fossil fuels. It is the policy and implementation side that the Chinese government must improve so that this perverse shortcoming of the wind power industry can be solved.

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An Analysis of the U.S.-China Nuclear Balance

Amanda Van Gilder

Introduction

This analysis seeks to define and analyze the nuclear balance between the United States (U.S.) and the People's Republic of China (PRC) from the mid-1990s onward. Such an assessment is important given the increased capabilities of nuclear weapons systems and potential changes in the willingness to use them since the mid-1990s. The U.S.-China nuclear balance has long favored the U.S., which has almost 30 times the number of nuclear warheads of China.[1] However, a full analysis of the balance includes more than just the number of warheads. Other factors such as the effectiveness of weapons systems, nature of nuclear doctrine, and outside political factors also influence the nuclear balance. Given these factors, the nuclear balance will start to equalize over the next few decades as the superiority gap continues to narrow.

How to think about the balance

The nuclear balance is defined by nuclear weapons and doctrines. Nuclear weapons include both warheads and their delivery systems, while nuclear doctrine reflects each state's willingness to use these weapons. Both quantitative and qualitative factors therefore contextualize the balance. While primarily functional in nature, the nuclear balance also retains a geographic context given growing competition between the U.S. and China in East Asia. Although nuclear weapons have not been used since 1945, their ongoing presence serves as a means of strategic deterrence.

The U.S. has never held a doctrine of no-first-use (NFU). President Obama maintained the U.S. precedent of non-use against non-nuclear weapons states (NNWS) and against states party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in compliance with their non-proliferation obligations.[2] However, the U.S. has not specified the nature of these non-proliferation obligations.

China has held a policy of NFU and assured retaliation, which is a strategy of guaranteed response, since the development of its first nuclear bomb in 1964.[3] This commitment to NFU, however, has recently come into question. A 2013 White Paper published by China's Ministry of Defense failed to address NFU for the first time since the initiation of China's nuclear program. This omission of an explicit reference to NFU could signal the Chinese government's shift toward a more offensive doctrine that could eventually include first use. It also leaves open to interpretation whether any sort of attack or threat of attack, conventional or nuclear, could provoke a Chinese strike. This potential move toward a more offensive doctrine will shape the future of the nuclear balance, as it affects China's deterrent and coercive capacity.

In addition to nuclear doctrines, this assessment focuses on the modernization of weapons and delivery systems. The U.S. military plans to update and modernize all three legs of its nuclear triad, including ballistic missile submarines, strategic bombers, and land-based ballistic missiles over the next two to three decades. Most investments will be allocated to Minuteman intercontinental ballistic missiles (ICBMs), Ohio-class ballistic missile submarines (SSBNs), and long-range strike (LRS) bombers. The top priorities are to increase precision, create

more mobile missile platforms, and force life extension.[4]

The People's Liberation Army's (PLA) modernization efforts emphasize deliverability over effectiveness of warheads, as well as long-range capabilities. This has translated into an advancement in weapons mobility and fuel types as well as long/intercontinental-range and sea-based technology. In 2015, the PLA generated its first MIRV (multiple independently targetable reentry vehicle)-capable DF-5 ICBM. In 2016, it planned to deploy its new Jin-class JL-2 armed SSBN on its first credible deterrent patrol in the Pacific.[5] This deployment has yet to occur. Over the next 10 to 20 years, the PLA will continue to develop its long-range, MIRV, and sea-based capabilities. The U.S. military will meanwhile keep modernizing its current nuclear triad.

Comparing U.S.-China nuclear objectives

Both the U.S. and Chinese governments share the ultimate goal of deterring nuclear and conventional attacks. The PLA has typically followed a doctrine of "minimal deterrence." That is, with its smaller nuclear arsenal, its objective has been to deter regional attacks while upholding a policy of NFU.[6] The PLA's modernization of the range and capacity of its weapons systems, as well as the obfuscation of its policy of NFU, however, surpasses minimal deterrence. In order to have a more effective deterrent, the PLA continues to strive toward fortifying credible long-range/intercontinental means. For this reason, the PLA Rocket Force (PLARF) will maintain focus on developing SSBNs, SLBMs (submarine-launched ballistic missiles), and MIRV-capable ICBMs over the next 10 to 20 years. Combining these new long-range capabilities alongside its SRBMs and MRBMs will fortify the Chinese deterrent against a U.S. attack.

The U.S. operates under a strategy of extended deterrence, striving to deter attacks on the homeland as well as against allies. It must be able to provide the weapons, doctrine, and posturing to such regional partners as Japan, South Korea (ROK), and Australia. This has translated into the presence of military bases and SSBNs in the Pacific and NATO (North Atlantic Treaty Organization) missile bases throughout Europe. The U.S. must maintain forces that can project over medium and intercontinental ranges from land, sea, and air. Extended deterrence also requires the U.S. to keep open an option of first use.

In addition to deterrence, China and the U.S. view the nuclear balance as a way to gain or obstruct access to the Pacific.[7] In the context of East Asian competition, bolstering its nuclear deterrent could aid the PLA in staving off U.S. primacy. One of President Xi's primary interests is to assert Chinese sovereignty in the Pacific. This is especially pertinent to the U.S. presence and alliances in East Asia against the backdrop of island disputes in the South and East China Seas and the Taiwan issue. With more effective nuclear forces and a more offensive doctrine, the PLA could potentially impose this same nuclear-backed threat on Japan, Russia, India, and on China's Southeast Asian neighbors. Conversely, the U.S. strives to counter China's growing deterrent capacity and maintain a competitive advantage in the Pacific. Possessing both a qualitatively and quantitatively superior nuclear arsenal, as well as a doctrine reflecting the willingness to employ it, affords the U.S. more flexibility in pursuing its national interests. The 2009 U.S. "pivot" to Asia includes this U.S. goal of retaining a relative deterrent and coercive advantage in the Pacific in the wake of increasing Chinese assertiveness.

The nuclear balance is also a tool for China's larger objectives in line with its hegemonic ambitions. Garnering greater nuclear strength has become equated with national power and prestige. Under former statesman Deng Xiaoping, China operated under a national "hide and bide" strategy. Deng implemented internal economic reforms aimed at rapid growth without an emphasis on exerting external power. Xi has since emerged from and replaced this "hide and bide" strategy with that of the "China Dream." The PRC now seeks to translate its internal reforms and strong economic growth into global influence. Increasing economic strength and nationalist sentiments underpin a reinvigorated Chinese commitment to continue developing nuclear forces over the next 10 to 20 years.

The U.S. and Chinese objective – to survive an initial attack and retain the ability to launch a counterstrike – also highlights the emphasis on the deliverability, survivability, and long-range capacity of nuclear forces. China, with less advanced forces, is now starting to develop and modernize these capabilities. MIRV-capable ICBMs are both long-range and allow for multiple targets. SSBNs are more difficult to detect and can be deployed around the world. The PLA has an underground missile transfer system that is estimated to be around 3,000 miles long.[8] By assembling and transferring missiles underground, the PLA and PLARF can better ensure the survivability and retaliatory ability of their forces.

During the next 10 to 20 years, the U.S. will also continue to focus on long-range capabilities and force survivability as a means to ensure retaliation. The U.S. has possessed a relatively strong triad force since the Cold War, as it held this same objective against the USSR. Over the past few years, the U.S. has begun deploying Terminal High Altitude Area Defense (THAAD) anti-ballistic missile (ABM) systems alongside the ROK and NATO. These systems were originally created as a deterrent measure against Russia and North Korea (DPRK), but their range makes it possible to deploy them against a Chinese threat. If the PLARF were to launch a short- or medium-range ballistic missile at a U.S. base or ally, the U.S. could intercept the strike in its terminal phase.[9] This would also allow for extended U.S. radar capabilities against a Chinese threat and leave open the option for a retaliatory measure.

Measuring the balance

The nuclear balance must be measured both qualitatively and quantitatively. A quantitative approach includes the number of nuclear warheads and systems each side possesses. The qualitative aspect refers to the effectiveness of these weapons systems and nuclear doctrines. Effectiveness includes the deliverability and survivability of forces.

The U.S. has and will continue to have a vast superiority in number of nuclear warheads. The U.S. is estimated to have roughly 7,100 warheads while China has approximately 260.[10] This Chinese figure, however, is a U.S. Department of Defense (DOD) estimate. Lack of Chinese transparency makes it difficult to determine the exact size of its arsenal. It is unlikely that either country will manufacture more fissile material in the immediate future. China stopped producing highly enriched uranium (HEU) and plutonium in 1987 and 1989, and the U.S. ceased its own fissile material production in 1992.[11] While each military can adjust the number of warheads they possess by modifying warhead size, they are limited to their current stockpiles of fissile material.

The U.S. will work toward reducing its warhead stockpile through at least 2018 under the New START (Strategic Arms Reduction Treaty), which allows Russia and the U.S. only 1,550 deployed warheads and 800 total ICBMs, SLBMs, and bomber launchers each.[12] Only 700 of these platforms can carry warheads. As of 2016, the USAF had 440 ICBMs, each deployed with one warhead.[13] U.S. force size and composition have changed since 2010 under the New START, with an emphasis on retaining warheads for SSBNs

and ICBMs. By contrast, the DOD estimates that China has between 50 and 75 launchers for 75-100 ICBMs.[14] The U.S. military has a much more developed nuclear triad with a greater quantity of every type of launcher.[15]

The U.S. has focused on long-range capabilities since the initiation of its nuclear program during the Cold War, given the distance of the USSR from the U.S. The USAF first deployed MIRVs in 1970 on Minuteman III ICBMs, each outfitted with three warheads.[16] Mobile ICBM platforms would improve the survivability of forces by making missiles more difficult to find and destroy.[17] Existing silo-based Minutemen III ICBMs are unable to be supported on mobile platforms in their current form. The complete modernization of Minutemen III, including making them mobile-capable, would necessitate $62.3 billion over the next 30 years.[18] All USAF Minuteman ICBMs will need updates by 2030.[19]

The PLA acknowledges that it will not reach numerical superiority against the U.S. It therefore seeks technological equity. At the beginning of its modernization program in the mid-1990s, the PLA initially moved toward constructing smaller, tactical-use warheads.[20] These warheads have since been used alongside the PLARF's 2015 development of its first MIRV-capable ICBM. The ability to launch multiple targeted warheads at once increases the deliverability of Chinese weapons as well as their deterrent capacity. Although Chinese missiles and warheads remain unmated in times of peace, modernization of select forces has included a switch from liquid to solid fuels in order to decrease launch times.[21] The PLA has recently developed DF-41 and DF-5 missiles which use solid fuels, are precision-guided, and can be launched on a mobile rail car platform.[22]

Despite ongoing research and development (R&D) over the past few decades, the PLA Navy (PLAN) has yet to possess an operative SSBN fleet. It was expected to deploy its first credible deterrent patrol in 2016 with its new Jin-class SSBNs armed with JL-2 SLBMs, but has yet to do so.[23] Unlike current Chinese submarines, the Jin-class SSBNs possess advanced technology. The PLAN has six SSBNs in service with eight more planned over the next few years.[24] SSBNs are difficult to detect and have a greater chance of survivability compared to conventional submarines.[25]

The effectiveness of SSBNs is also crucial for the U.S. in determining the nuclear balance against China. In addition to their stealth, their long range and mobility assist the U.S. goal of extended deterrence. The U.S. Navy has 14 SSBNS, nine of which are currently deployed in the Pacific.[26] The Ohio-class SSBN fleet is set to begin retiring in 2027, thus requiring some sort of replacement over the next 10 to 20 years.[27] The Chinese will continue to push the development of long-range and sea-based platforms as U.S. systems start to retire.

Another effective measure of the balance over the next few decades is the ability of the U.S. and PRC governments to fund their nuclear programs. Both countries face different conditions restricting their abilities to fund nuclear and military initiatives. The table (shown on the right) gives an objective side-by-side comparison of some of the key macro-indicators in each country.[28]

U.S. nuclear spending primarily comes from the Department of Energy (DOE). The DOE requested $20.5 billion in FY17 for nuclear weapons modernization, research, development, and safety.[29] $674 million of this nuclear spending is mandatory, and not subject to Congressional approval.[30] The Office of Management and Budget (OMB) reports that U.S. nuclear spending is roughly 3.3 percent of total national defense spending. Overall U.S. defense spending constitutes around 3.4 percent of the federal budget.[31] Analyzing trends in the defense budget, the base budget (not including Overseas Contingency Operation war funds) has generally increased since the mid-1990s despite a decrease in the active

Comparative Macro-Indicators 2015

Macro-Indicators	U.S.	China
GDP (PPP)	$18 trillion	$19.4 trillion
Armed Forces	1.4 million	2.33 million
Defense Expenditures	$601 billion	≈$180 billion
Population	324 million	1.4 billion

duty force.[32] The U.S. military has therefore shown a willingness to augment spending in areas of R&D, technology, modernization, and weapons procurement. Former Secretary of Defense Ashton Carter estimated in 2016 that nuclear modernization costs over the next 20 to 30 years will amount to around $350-450 billion.[33] The U.S. has always held an advantage with its triad systems, which are all set to retire during the same 10 to 20-year period. Future triad investments will continue to remain competitive against Chinese efforts.

Chinese nuclear and defense spending is more complex. The Chinese government lacks transparency in its defense activities, including its nuclear force size and spending. The DOD therefore makes its own evaluations regarding Chinese weapons and fiscal means. The Chinese government purposely hides and releases false information to stymie the DOD's ability to measure capabilities, thus making it more difficult for the U.S. to plan and invest resources to counter China. The DOD estimated FY2015 Chinese military spending at $180 billion.[34] This constitutes 2.1 percent of Chinese GDP that year, compared to 3.4 percent in the U.S.[35] Although the U.S. and China have similar 2015 GDPs (in purchasing power parity/PPP terms), the U.S. continues to spend both a larger nominal amount and a larger percentage of GDP on defense. Due to a lack of transparency, there are no concrete figures on how much the Chinese government allocates to nuclear spending. Its budget could also be configured differently than the U.S., which divides spending between the DOD and DOE.

The process of appropriating nuclear and military funds could also differ. The Central Military Commission of the Communist Party of China (CMC), with President Xi as its Chairman, holds jurisdiction over the PLA. The military budget is created through a collaborative process between the PLA, the CMC, and the Ministry of Finance.[36] The president therefore has a more direct role in approving the budget. Trends in Chinese military spending also coincide with trends in national economic growth. 2016 marked a significantly lower increase in the Chinese military budget at 7.6 percent, compared to 10.7 percent growth in 2013, 12.4 percent in 2014, and 10 percent in 2015.[37] Since 2013, Chinese GDP growth has followed a similar trend, and recently slowed to less than 7 percent.[38] The future nuclear balance will depend on the ability of China and the U.S. to provide continuous funds for their respective projected modernization programs.

Finally, collective defense alliances are an additional consideration in measuring the nuclear balance. The U.S. has several

collective security agreements in the Pacific and is a member of NATO. It has bilateral collective security arrangements with Japan, the ROK, the Philippines, Australia, and Thailand. These agreements emphasize the geographical element of the balance as they extend U.S. deterrence. In addition, as a means to deter DPRK aggressions in the region, the U.S. deployed a THAAD ABM system within the ROK in 2016. The system can only intercept missiles in their terminal phase, meaning it cannot stop missiles launched from China to the U.S., but can prevent short- and mid-range strikes.[39]

NATO is another collective security alliance that emphasizes the geographic element of the nuclear balance. Under Article 5 of the NATO Treaty, NATO allies would be required to intervene should China attack the U.S. Seven NATO allies possess nuclear weapons either on their own or as a part of the NATO nuclear sharing program.[40] In July 2016, NATO declared its ballistic missile defense (BMD) shield operational. BMD radar and interceptors are based in Romania and Poland, respectively. The system is only able to intercept short- and mid-range threats coming from East Asia and the Middle East, before the missiles reenter the atmosphere.[41] While the NATO system was originally installed as a deterrent against Russia and Iran, like the ROK system, it also serves as a deterrent against possible Chinese short- or mid-range attacks against U.S. allies and regional military bases. China does not have this same alliance and organizational network and therefore does not have the ability to launch missiles from different global bases. It also cannot call upon the same system of allies for deterrence and to assist in a potential conflict.

With limited outside support in the face of an extended U.S. nuclear threat, China has turned to internal restructuring to improve the efficacy of its nuclear forces. At the end of 2015, Xi Jinping, as chairman of the CMC, officially inaugurated the creation of the PLARF to replace the Second Artillery Corps.[42] Establishing the PLARF as its own independent military service branch demonstrates a growing emphasis on upholding an effective and efficient missile force. Xi sees the PLARF as the core of China's deterrent strength, stating that "the PLA Rocket Force should strengthen… trustworthy and reliable nuclear deterrence and nuclear counter-attack capabilities, intensify the construction of medium and long range precision strike power, and reinforce the strategic check-and-balance capability."[43] Xi interprets U.S.-sponsored ABM systems in the region as a threat. He believes their radars will track Chinese military developments and further provoke DPRK aggression.[44] Xi has since partnered with President Vladimir Putin of Russia to announce a joint missile-defense test in 2017.[45] China acknowledges the advantage of the U.S.' allies in supplying nuclear weapons and interceptors as well as extending the geography of the U.S. nuclear presence. It will thus continue to try to counterbalance this superiority by increasing the efficiency of its own forces.

Trends and asymmetries

Since the mid-1990s, several trends have emerged that contextualize the current balance. Both the U.S. and China have moved toward modernizing their arsenals. However, during the past 20 years, the PLA has made relatively greater gains in the development of its platforms. Over the next 10 to 20 years, U.S. SSBNs and MIRV-capable ICBMs will face more numerically and qualitatively equal Chinese counterparts. Both countries have also exhibited an ongoing willingness to maintain funding for weapons development and modernization programs. Overall, examining trends and asymmetries in the balance starting in the mid-1990s, the future of the balance will most likely witness a growing parity. Although the U.S. will continue to have a numerically greater arsenal, Chinese technological advancements and willingness to allocate funds will start to close the superiority gap.

Chinese nuclear modernization started in the mid-1990s. The Taiwan Strait Crisis of 1995-1996 forced the Chinese government to acknowledge its inability to confront the U.S. given its forces at the time. Unable to compete with the quantitative and technical superiority of the U.S. and USSR, China's commencement of its nuclear modernization program in the 1990s emphasized compact, medium-range, and tactical-use warheads. Contemporary modernization efforts, such as the development of long-range missile and naval-based delivery systems, have since demonstrated China's vision of technological parity with the U.S. Since 1996, the U.S. and China have both had moratoriums on testing nuclear weapons under the guidance of the Comprehensive Nuclear Test Ban Treaty.[46] Maintaining this moratorium on testing could indicate the confidence of the PLARF in its new and modernized weapons and systems.

In terms of future weapons trends, the PLARF may increase its number of warheads over the next few decades. The initial focus of the PLA's modernization program in the 1990s was to create smaller, more tactical-use warheads. These smaller warheads have now been fitted for use on new, MIRV-capable ICBMs. Using the DOD's upper estimate that the PLARF has 100 ICBMs and assuming each ICBM could carry three warheads, the PLARF could potentially expand its warhead inventory by 300 over the next few decades.

Nuclear and military spending serve as both a way to measure the balance as well as to analyze its trends. Both DOD high and low estimates of Chinese defense spending from 1996-2007 far surpass PRC reports.[47] All figures indicate a steady increase in defense expenditures since 1996. While the exact amount of annual expenditures allotted to nuclear forces is unknown, this assessment assumes that nuclear funding follows the general trend of overall defense spending, as spending is highly correlated with Chinese economic growth over this period. This increase in spending has consisted mainly of R&D and restructuring the PLA, both of which are expected to continue through at least 2020.[48] Over the next 10 to 20 years, increases in China's nuclear and defense spending will be largely dependent on the rate of economic growth.

The Second Artillery Corps/PLARF has drastically improved missile capacity during the past 20 years.[49] Missiles such as the JL-2 and DF-31 deemed "developmental" and "becoming available" in 2007 are now in use. The CMC and the PLA will continue to emphasize long-range and sea-based means in order to increase deterrence against the U.S., expand theater-level military effectiveness, and achieve technological parity. The Chinese will keep working toward closing this technological and deployment gap. Closing this gap will give the Chinese greater deterrence capability against the U.S. and enable possible hegemonic ambitions in the region.

In addition, since the 1990s, U.S. deterrent SSBN patrols have decreased.[50] The size of the overall SSBN fleet has remained relatively constant since around 2001. With heightening competition and tension in East Asia and the deployment of China's Jin-class fleet, these U.S. Pacific deployments may increase in the future. The U.S. has shown a trend of continuous investment in the modernization of its already superior forces since the mid-1990s.

The nuclear balance is not experiencing a growing asymmetry, but rather an emerging parity. The U.S. possesses more than enough nuclear warheads and weapons to cause irreversible damage to China. Technicians at the Los Alamos National Laboratory estimate that between 10 and 100 "significant" thermonuclear weapons could destroy the entire world.[51] There are therefore diminishing returns within the U.S. arsenal. The USAF may have a substantially greater quantity of warheads and weapons, but only a small number is necessary to cause significant damage to

China. Having a numerical superiority is an important factor in assessing destructive capabilities, but the drastic difference between U.S. and Chinese arsenals is more symbolic than practical.

There is a significant asymmetry, however, in the imbalance of information. The Chinese government has purposely employed a strategy of concealing information.[52] It is difficult for the U.S. government and military to plan and invest resources without a concrete understanding of Chinese forces and probability of use.[53] Conversely, the U.S. has become more transparent with information since the end of the Cold War. Arms limitation and reduction treaties with the USSR forced the U.S. to start reporting on and opening up its nuclear forces for inspections. The DOD and DOE are relatively transparent when it comes to such metrics as force spending, weapons characteristics and locations, and doctrine.

The majority of U.S. nuclear R&D and manufacturing occurs at national laboratories, specifically the Sandia, Los Alamos, and Oak Ridge National Laboratories. Most of the silo-based Minuteman III ICBMs are known to be situated around Malmstrom, Minot, and Warren Air Force Bases. The exact locations of Chinese nuclear research and deployment sites are unknown, contributing to the large asymmetry in information. The best estimates of force positioning come from satellite imagery and intelligence.[54] The DOD postulates that eight of the PLARF's missile facilities can launch ICBMs. The majority of these sites are assumed to be located in the eastern portion of China, close to Taiwan and the DPRK border.[55]

All of the U.S.' SSBNs port in Washington, Georgia, or Virginia. They are deployed at sea for 77 days at a time, and then spend 35 days in port.[56] The position of SSBNs during their patrols is unknown. Their mobility and stealth is what increases their survivability and contributes to their deterrent capacity. The PLAN has three SSBN ports at Qingdao, Dalian, and Hainan. The location of these ports has been confirmed largely using satellite imagery.[57]

Strengths and weaknesses

The U.S. currently holds a relative strength in the U.S.-China nuclear balance. It has superior technology and experience using nuclear weapons and employing a strategy of deterrence. However, as seen in recent trends, China is beginning to have a competitive advantage in the temporal, economic, and political elements of the nuclear balance. Embedded in former leader Deng's "hide and bide" strategy, the Chinese government frequently puts its competitive goals in terms of its 5,000-year history.[58] The PLA sees time as a tool and an asset that it holds over its adversaries. It is willing to take as long as it needs to garner the necessary resources to achieve its objectives. Two or three more decades of weapons development seem minimal relative to the entire history and ascendancy of the Chinese empire. The centralized nature of the Chinese government also allots greater flexibility to Xi – as both the PRC President and Chairman of the CMC – in modifying nuclear doctrine and allocating economic resources. While the U.S. may have a greater military budget, the challenge of ensuring these funds on an annual basis fosters greater uncertainty.

A relative weakness of the PLA – and relative strength of the U.S. military – is the structure of their militaries and experiences with nuclear strategic competition. The USAF has better training and force planning than the PLARF. In addition to greater USAF experience from the Cold War, the relatively new PLARF is still reconfiguring its leadership and force hierarchy from that of the Second Artillery Corps.[59] The U.S. military and USAF also put a greater emphasis on confronting the "fog of war" in war planning. In its training exercises, the PLA tends to overemphasize formalism, making much of its training impractical.[60] Finally, in the PLA, military leaders are inherently Communist Party leaders as well.[61] While this strong connectivity between the regime and the military may lower bureaucratic barriers to taking action, it could also have negative side effects. Discontent among the Chinese people toward the government could translate into a distrust for the military.

Implications

The U.S. holds the current advantage in the nuclear balance against China. The U.S. has a precedent of an offensive nuclear doctrine and holds superiority in both the number and quality of warheads and systems. This gap, however, will continue to close as the PLA develops new weapons systems, such as MIRV-capable ICBMs and credible deterrent SSBNs. While the disparity in the number of warheads is the most drastic, the difference in weapons systems is the true source of measuring nuclear force effectiveness. Effectiveness comes from the deliverability and survivability of forces, especially over long ranges. While the U.S. currently holds the edge on this front, the implications of the factors discussed in this analysis all suggest that Chinese modernization efforts will increasingly move toward reaching parity over the next few decades.

The U.S. also has an advantage given its extensive network of allies, particularly in East Asia. While this is susceptible to China's expanding regional alliances, it is unlikely to change in the near future. These same alliances, however, will also continue to drive Chinese modernization efforts as well as raise the likelihood of a scenario involving indirect conflict. In the event of an adversarial confrontation, the U.S. and China will both likely be able to survive an initial attack as well as retaliate. Over the course of the fight – whether it be conventional or nuclear – however, the U.S. would still retain an advantage. The U.S. military has more experience dealing with deterrent and competitive strategies and has better overall training. The PLARF is still trying to reconfigure its command structure, duties, and relationships with other branches. However, this gap will increasingly narrow as the PLA garners greater, more educated force members, and as the PLARF matures.

The one major difficulty the U.S. will continue to face in assessing the nuclear balance is Chinese opacity. Almost all figures regarding spending, force size, and doctrinal characteristics have been purposely obfuscated by the Chinese government. This has forced the U.S. military and DOD to rely on intelligence, estimates, and satellite imagery for information. Meanwhile, China enjoys fairly open availability of U.S. nuclear data, including location, number, and types of forces. The unattainability of this information will continue to stymy U.S. attempts at analyzing the balance.

The nuclear balance is primarily assessed through the deterrent power it allots to each country. While the U.S. will uphold its deterrent superiority in the immediate future, China and the U.S. will gradually reach parity through changes to China's doctrine and immense developments in its systems technologies. It is unlikely that the U.S. and China will directly engage in a nuclear conflict in the future. The most probable scenario leading to a confrontation between the U.S. and China would come from the U.S. being drawn into a regional conflict based on its international obligations.

Looking toward the future, the U.S. has limited options. The U.S. already has an offensive doctrine and has continued modernizing its nuclear weapons systems and warheads. Moving away from either of these actions could potentially decrease tensions with the PRC, but would come at the expense of U.S. deterrent strength and primacy in East Asia. As the PLA strives toward parity with the U.S., the U.S.' main advantage will lie

with its extensive alliance network. Over the next 10 to 20 years, the U.S. will maintain superiority in the nuclear balance; this advantage, however, will gradually decrease as the PLA progresses toward doctrinal and technological parity with the U.S.

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Attracting Foreign Direct Investment through Diaspora Networks: A Comparative Review of China and India

Benjamin Pollok

Introduction

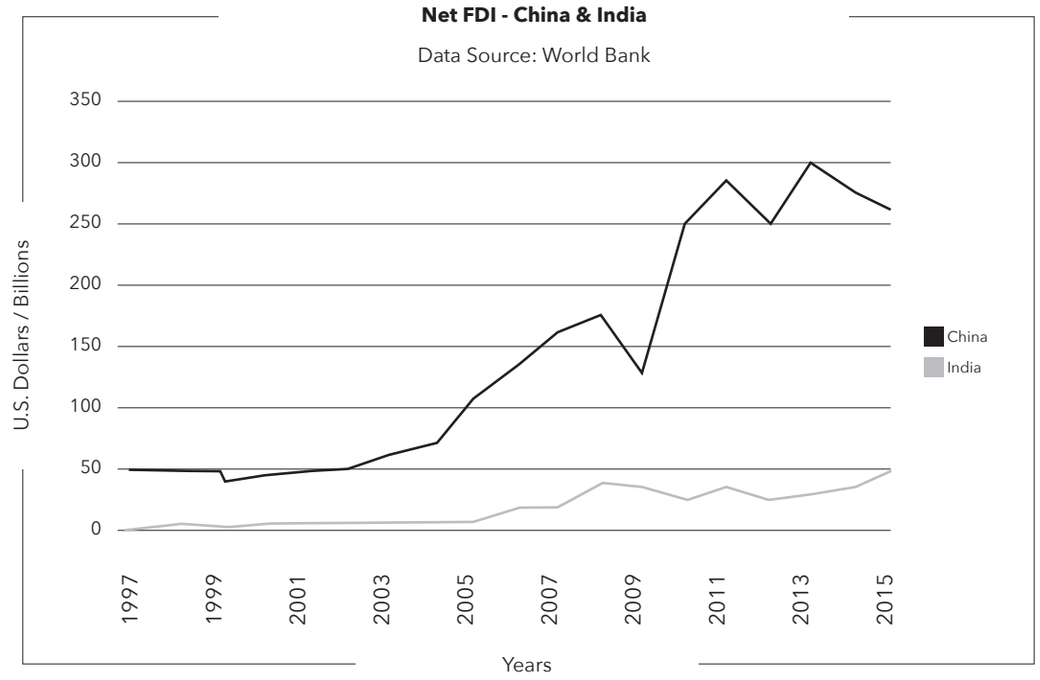
Given that China and India have the world's largest and second-largest populations respectively, it comes as little surprise that the two countries also possess the world's two largest diaspora networks. These networks are estimated at over 50 million overseas Chinese and over 25 million overseas Indians.[1] These estimates reflect the broad definition of a diaspora; that is, those who are ethnically Chinese or Indian but who were not necessarily born in China or India, including descendants of Chinese and Indian emigrants. The numerical difference between China and India's diaspora and the first-generation emigrants is vast; while China has a much larger multi-generation diaspora network, India has a larger emigrant population. UN data estimated this population at roughly 9.5 million for China and 15.5 million for India in 2015.[2] While first-generation emigrant networks are the basis of the flow of remittances, multi-generational diasporas are critical in generating formal foreign direct investment. This paper will rely on the broad, multi-generational definition of "diaspora" in comparing how China and India have engaged with their overseas communities at both the national and local levels.

Comparative trends in foreign direct investment

Since embarking on economic reforms to open its economy to foreign trade and investment in the late 1970s, China has attracted far more foreign direct investment (FDI) than India. Part of this discrepancy is due to the timeline of economic liberalization; China began the reform process more than a decade before India, particularly with respect to market entry for foreign investors. However, during the late 1980s and early 1990s, China's and India's economic reforms were "highly comparable," and China experienced a period of reform stagnation following the events of 1989 while India's reforms continued following its 1991 economic crisis.[3] Nevertheless, China became a larger destination for FDI, and this investment has created a snowball effect in China's development that has not been mirrored in India (with the exception of industry-specific FDI in IT and telecommunications).

Another explanation for the sustained gap in FDI inflows is the degree to which the Chinese government has courted diaspora investors, principally through the Chinese-speaking diaspora networks in Hong Kong, Taiwan, and North America. Until recently, the primary sources of FDI in Mainland China were Hong Kong, Taiwan, and Singapore.[4] FDI was a major factor in China's emergence as a manufacturing powerhouse in the 1990s and 2000s, and as much as half of that FDI was estimated to originate within the Chinese diaspora.[5]

In contrast, through the 1990s and 2000s India received less than one-tenth of China's FDI inflows, and in 2015 still received less than one-fifth of China's incoming FDI ($44 billion to $250 billion, respectively). Some of this difference can be attributed to the rate of liberalization; while both India and China continue to prohibit FDI in numerous sectors, market entry in China was comparatively faster due to the creation and proliferation of Special Economic Zones (SEZs) along the coast in the early 1980s. Equally important, however, is India's lack of national and local-level government initiatives to attract diaspora-led investment, compared to a much more robust set of diaspora-oriented initiatives in China.



China's diaspora investment strategy

Prior to 1978, China's Communist Party leadership made no attempt to utilize its overseas networks as a source of FDI. In the 1960s and 1970s, barriers to migration were imposed both locally and nationally. Private citizens were also unable to apply for passports, making legal emigration and outbound travel from China extremely limited in the 30 years prior to economic reform. The centrally-planned economy and extinction of private enterprise in Mainland China severed existing ties to overseas Chinese business and investment.

One important consequence of the liberalization policies of the 1980s was the increased mobility of China's workforce. In 1986, national ID cards were introduced, and individuals were able to apply for a personal passport (as opposed to military or diplomatic passports) for the first time since the establishment of the People's Republic of China (PRC).[6] In addition, contractual employment began to replace lifelong tenured positions in state-owned enterprises (SOEs), and the explosion of public, private, and mixed ownership businesses along the coastal provinces dramatically increased the flow of internal migration.

Under Deng Xiaoping, the PRC made a decisive shift in policy from ignoring and politically shaming overseas Chinese to actively engaging with China's diaspora.[7] The Ministry of Education signed bilateral initiatives with several countries (including the United States) to increase the number of Chinese students and researchers abroad. China intensified efforts to combine sentiment and incentives to attract investment from China's diaspora networks in other Asian countries (as well as Taiwan), stressing

patriotic duty while offering generous tax breaks to potential overseas Chinese investors. According to You-tien Hsing, diaspora FDI became an overwhelming source of foreign investment following the Tiananmen Square incident, after which China was subject to economic sanctions from Western nations and capital flight from Japanese and other investors.[8] In this sense, government initiatives to attract investment from overseas Chinese recognized the ability of diaspora members, despite political and bureaucratic difficulties, to operate within China with greater ease than foreign investors. Diaspora-led FDI is seen as reliable, sustainable, and long-term, whereas foreign investment is more contingent on current events and market fluctuations.[9]

Local-level networks and government initiatives may have been even more important than national policies in attracting diaspora investment. During periods of ongoing market liberalization in the 1980s and 1990s, provincial governments began utilizing diaspora networks to capture FDI, particularly in the construction of new factories and trade infrastructure. The most obvious examples are in China's southern provinces (most notably Guangdong Province), the origin of the majority of overseas Chinese prior to the beginning of the Cultural Revolution in 1966. When the Chinese economy opened in the late 1970s, these provinces were the first to attract overseas investment due to their preexisting diaspora networks in other Asian countries, as well as their proximity to Hong Kong.

The diaspora played a vocal role in the selection of China's first Special Economic Zones (SEZs): it was precisely due to the preexistence of local-level diaspora networks in Hong Kong, Taiwan, Singapore, and the U.S. that several cities in Guangdong were selected.[10] Entrepreneurial local officials in China reduced and streamlined regulations for foreign investment, and provided tax incentives at the city and province-level specifically for Taiwanese investors. This adaptability yielded results, as FDI from Taiwan soared in localities providing these incentives.[11] Compared to the national government, local officials were more effective in building on the ancestral links of diaspora members to attract FDI for development at the city or province level.

For the first two decades of liberalization, the principal source of incoming FDI in China was not the West, but rather industrialized Asian countries with large ethnic Chinese populations. Hong Kong and Taiwan are, of course, most evident in also being "Chinese," but Singapore, Australia, and South Korea also played significant roles in providing early investment to small and medium enterprises (SMEs) along China's coast. By 1994, roughly $69 billion USD had been invested in Mainland China by 167,000 foreign firms, but less than half of these companies were from Japan, Europe, or the United States.[12] Overseas Chinese communities in Asian countries, rather than diaspora networks in the West, provided the pivotal early FDI flows that led the PRC to further liberalize its capital markets and foreign ownership requirements. In this sense, the Asia-based Chinese diaspora was essential in changing international perceptions about China as an unsafe investment destination.[13]

In the late 1990s, Western FDI returned as China once again became a politically and economically "safe" investment destination. With the explosive growth of the country's middle class, foreign businesses sought to meet China's growing demand for more diverse products. This investment growth was still diaspora-led, with an estimated half of the $48 billion dollars in FDI that flowed into China in 2002 originating with the Chinese diaspora.[14] The Chinese government, as the result of its accession to the WTO, further reformed its trade and investment laws, creating tax incentives for FDI in specific provinces in the country. Local governments in major cities like Shanghai and Guangzhou offered further tax credits, reduced transaction costs, and streamlined regulations for foreign investors. The increased role of local governments in attracting FDI created competition among China's provinces, instigating a cycle of liberalizing reforms in which the country's largest cities contended for contracts with international investors.

In the past decade, China's efforts to benefit economically from its diaspora have included both transnational engagement initiatives and incentives for high-skill workers to return. Researcher Bo Xiang notes that new diaspora engagement initiatives were created at the national and local levels to target "new migrants," or those who had emigrated from China in the last twenty to thirty years.[15] For example, in the 2000s, the national government launched a program to attempt to shift labor-intensive manufacturing investment away from coastal provinces to its underdeveloped western provinces. Simultaneously, coastal provinces and autonomous cities have leaned on their diaspora networks to spur investment and technology transfer for capital-intensive manufacturing. The national government also encourages temporary visits from diaspora members by creating visa categories for Chinese emigrants and their descendants (something India has also done), and by organizing conferences to connect overseas Chinese with employment and investment opportunities. The "Thousand Talents Program" is one of several government initiatives that seek to bring overseas academics and researchers back to China.[16] The initiatives are part of a much larger strategy (at both national and local levels) to reverse China's "brain drain" and incentivize the return of China's most educated and entrepreneurial diaspora members.

India's absence of diaspora investment strategy

Much like China, the Indian government did not see its global diaspora as an asset until after it began the process of market liberalization. According to a 2004 Migration Policy Institute (MPI) report, "Well within the past decade, the government of India has moved from a position of somewhat disapproving indifference toward the worldwide Indian diaspora to one of actively seeking their involvement in India's development. It has followed a multi-prong strategy, pursuing portfolio investment, direct investment, technology transfer and trade links through the Diaspora."[17] Although the Indian government's diaspora engagement has certainly come a long way in the last twenty years, it is still far from formalizing an FDI engagement strategy similar to that of China. That same MPI report later states that "the 20 million Indians abroad generate an annual income equal to 35 percent of India's GDP, yet have generated less than 10 percent of India's rather modest $4 billion of FDI – in contrast to the overseas Chinese, who, as noted above, have contributed half of China's $48 billion."[18] This gap has not gone unnoticed by Indian policymakers. Over the past two decades, national leaders from both the Congress Party and Bharatiya Janata Party (BJP) have called for deeper outreach with the Indian diaspora and an overall improvement in India's unwieldy investment climate.

In 1998, the State Bank of India issued government bonds exclusively for Indians living abroad (called Non Residential Indians, or NRI). The bonds offered a 2 percent higher interest rate than U.S. bonds and were exempt from India's income and wealth taxes. Since the first round of investment, India has offered two more bond issues exclusively for NRIs. A 2002 report from the LM Singhvi Committee (convened to consider the role of NRIs in India's development) placed blame on the national government for ignoring the potential economic gains from its diaspora. The report identified two factors that have prevented diaspora members from investing in India: unmanageable bureaucracy and pervasive corruption. Although China's government faces similar issues, the Indian context is far graver; the decentralized nature of India's governance structure has

created overlapping jurisdictions between national and local governments, which make investment in most states burdensome. Additionally, India has not seen a national anti-corruption campaign similar to that of President Xi. Rather than addressing diaspora-specific investment potential, however, the Indian government implemented reforms that reduced red tape for overseas investors across the board. For instance, the government created an Investment Information Centre as a "one-stop shop" for maneuvering India's FDI market, but the Centre had no additional value for investors from India's diaspora.

Although the government has recognized the untapped investment potential of the diaspora, this recognition has not translated to a cohesive engagement strategy, nor has it led to an improvement in diaspora investment across sectors. Instead, the Indian government has created incentives for FDI inflows to specific sectors as a means of leveraging the success of India's diaspora in those industries. The most obvious example is the Information Technology sector (IT). In the 1970s and 1980s, overseas Indians in the U.S. attempted to invest in a nascent IT industry in India, but their pursuits were "quickly abandoned because of bureaucratic obstacles by the Indian government."[19] Over time, interaction with overseas Indians in Silicon Valley helped to convince the government that diaspora-led FDI in India's IT industry would improve the country's development. India's IT industry became one of the first in the country to open to partial, then full, foreign ownership thresholds. This sector-specific liberalization was a direct result of diaspora advocacy, as many U.S.-based Indians saw the opportunity for a mutual gain in offshoring production and support services to India.

Recent progress in India's market liberalization suggests that India's government, under Prime Minister Modi, seeks to reduce FDI barriers in the coming years. For instance, New Delhi announced in June 2016 that it was relaxing FDI restrictions in multiple sectors. While the easing of regulations will also benefit diaspora investors, there remains a conspicuous lack of incentives for the diaspora community in government initiatives to attract FDI. Considering FDI in India rose from $36 billion in 2014 to $55.5 billion in 2016, reducing government regulation may be sufficient to increase investment without direct diaspora engagement.[20]

In spite of its limited role in attracting diaspora-led FDI, India's government has a diverse set of diaspora engagement strategies that are not focused on investment. For example, the transfer of technology and industry-specific knowledge has been much more broadly promoted than has diaspora-led FDI. Rather than identifying the success of India's diaspora community in the U.S. and elsewhere as a source of investment, the Indian government has instead focused on the technical expertise that can be shared through overseas networks. For example, India has offered cost-sharing programs with overseas Indian executives to "create programs within their companies in which Indian programmers could work in the United States with U.S. technology (at Indian wages plus travel-related cost)."[21] Unfortunately, this diaspora engagement too has taken a narrow view so that only specific industries like IT have benefited from government-led initiatives.

Explaining the gap in diaspora investment

According to a 2006 World Bank Institute study, "the earnings of the 20 million-strong Indian diaspora are equivalent to about two-thirds of the gross domestic product of India."[22] Given the relative wealth of the diaspora, why then has there been low diaspora investment in India, especially when compared to China?

Devesh Kapur, a leading expert on India's economic development, contended that Chinese emigrants are more "entrepreneurial" than Indian emigrants.[23] However, his argument is largely inconsistent with the role India's emigrants have played in the U.S. and elsewhere. In high-income countries, Chinese and Indian emigrants actually enter similar professions, such as IT, engineering, and medicine. In the U.S., more Indian emigrants have held senior management positions than their Chinese counterparts, most likely because of the lack of a language barrier and the role Indians have played in founding and expanding U.S. technology companies. Business leaders are better positioned than engineers and scientists to direct investment back to their country of origin, so India's entrepreneurship in the U.S. should translate to greater FDI in India.

Similarly, India has a more open capital market than China, which continues to use significant capital controls to manage its exchange rate. While neither country has a particularly advanced set of laws protecting the rights of foreign-owned firms or intellectual property, India has a more transparent judicial system that is more likely to protect foreign investment. China, by contrast, has used its judicial system to force foreign firms to share intellectual property and continues to require mixed ownership for foreign firms operating in many sectors.[24] All of this would suggest a more attractive climate for FDI in India than in China. Why, then, does China continue to receive four times India's FDI?

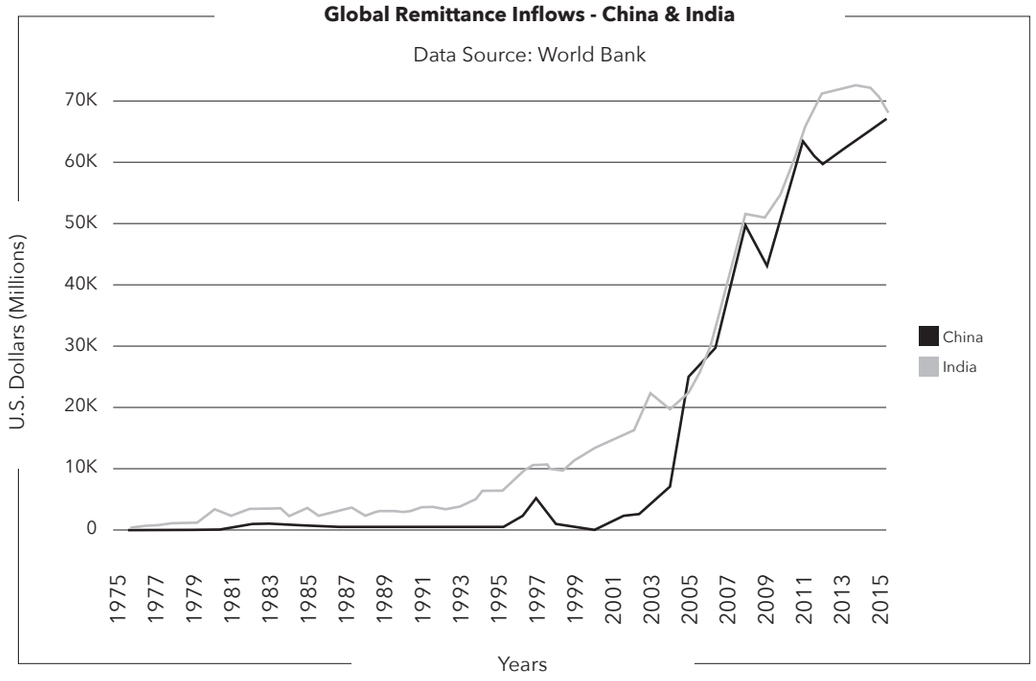
Although it is difficult to compare trends in FDI between two emerging countries, India and China provide strong examples of how government engagement with its diaspora can impact economic development. While China has pursued an active diaspora outreach strategy since early in its reform period, India has done very little to attract and simplify diaspora-led investment. The modest gains made in India's investment climate in the 1990s and 2000s were not so much a testament to government flexibility as they were a result of the tenacity of India's diaspora. Rather than identifying the development potential of diaspora-led FDI, the Indian government has instead focused on the cultural and knowledge sharing networks offered by its diaspora.

The importance of city-level and province-level networks in attracting diaspora investment in China speaks to perhaps the greatest weakness of India's diaspora engagement: while a national FDI strategy is now taking shape under Prime Minister Modi, there are very few initiatives at the local level to attract FDI. By comparison, much of China's success as a recipient of diaspora investment has been due to city-level and province-level FDI incentives. Given India's pluralism and the federalist approach to state authority, Indian states can learn from China's local initiatives in attracting diaspora-led investment.

Appendix I: Remittances as an explanatory factor

Through the 1990s, India received a much higher share of global remittance flows than China. For instance, in 1990, India's formal remittance inflow was over 12 times that received by China. By 2000, the gap had closed somewhat so that India received 2.5 times the volume of remittances of China – still a major disparity given the relative size of emigrant populations from India and China in 2000.[25] Remittance flows for the two countries have continued to converge since the early 2000s. While both countries have seen an explosion in the aggregate level of incoming remittances, China's inflows have increased at a quicker rate than India's. In fact, remittance flows in 2015 were recorded as $59 billion for India and $54 billion for China and are estimated to be almost equivalent in 2016.[26]

The Chinese government has done relatively little to improve the ease of sending remittances. Since the 1980s, the price of sending remittances to China from most countries has decreased only incrementally. China remains one of the more



expensive destinations for remittance payments, requiring an average of USD $14 in transaction fees for every $200 sent, compared to USD $8 for every $200 sent to India. Instead of simplifying international remittance transactions, the Chinese government has focused on policies that will attract greater FDI, technology transfers, and high-skill returnees from its diaspora. In this sense, the rapid growth of remittances to China in the past decade is not so much the product of government policy as it is the growth of the sheer size of Chinese emigrants abroad, particularly white-collar professionals working abroad.

Remittances and FDI have very dissimilar consequences on a country's economic development. While remittances flow directly to households and tend to be more efficient at alleviating individual poverty, FDI has more consequential long-term development impacts due to its potential for creating infrastructure and employment opportunities. Given the relative historical importance of remittances in India compared to China, perhaps one explanation for the difference in diaspora-led FDI is the tendency for India's diaspora to send remittances rather than FDI. Diaspora-led investment may not only be hampered then by government ambivalence and red tape, but also by the perceived importance of sending remittances to family members back home.

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