Research Report for India China Institute

Experiments in Drug Pricing Control in Sanming, China

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Introduction

September 2019. Representatives from various international as well as Chinese pharmaceutical companies gathered outside the Shanghai Medical Procurement Office in to submit their bids for over two dozen off-patent/generic drugs. The tension was palpable as this round of bidding was taking place right after a massive expansion of China's pilot 4+7 procurement scheme. Originally began in December 2018 as a bulk-purchasing scheme that put public hospitals in 11 (hence 4+7) large, tier-1 cities into one single group,[1] the bulk procurement scheme has been expanded to 25 *provinces*, comprising more than 100 cities ten months later.

When the pilot program launched its first round of bidding in late 2018, big pharmaceutical companies such as Novartis, Sanofi, Eli Lilly lost out big to their smaller domestic competitors, who offered bids that were sometimes as much as 90% lower than previous prices. The catch is that the winning bid would be guaranteed a certain amount of purchasing orders; this is appealing because the 11 cities alone account for 60% of the Chinese pharmaceutical market. The second round of bidding under the expanded 4+7 procurement scheme took place in 2019, it mandated that the bidding price must be equal to or below the winning bid in the first round. The industry media reported what happened alarmingly as "a race to the bottom."[2]

Meanwhile, 8 years before this massive experiment in pharmaceutical procurement, under the pressure of imminent bankruptcy, Sanming, a small city in the southeastern, mountainous region of Fujian, China, kickstarted its own series of comprehensive health system reforms and the development of its bulk bidding and procurement platform. Why did Sanming government taking enormous risks to pursue radical changes to its health system? How does a small health system reconcile "market logics" with their function as a basic social good as well as with the financial distress from its underfunded health insurance system? What form does the bidding and procurement platform and how is it used to control prices?

This paper will address these questions from three perspectives: 1) a review of China's decentralized, experimental governance paradigm, how understandings of "practice" and "pragmatism" are key, and how the case of Sanming's health reforms is both a part of and a divergence from that paradigm; 2) a narrative of some of the key pillars of the Sanming health reforms as told by the lead reformer, Jifu Zhan, pieced together from

[1] (Spencer 2019)
[2] Ibid

interviews and essays; 3) a short analysis of the bidding and procurement system in question based on available images from the company that provided its technological development and support. Lastly, the paper will end with a discussion of how this specific case study of drug pricing reform relate to the wider literature on technology, politics, and anthropology of value and pharmaceuticals.

Decentralized Experimental Governance in China's Health Reforms

China occupies a curious and unique position as an authoritarian government in its golden age. PRC has exhibited both the means and determination to tackle healthcare quality and coverage as a national priority, and the policies it proposed and enacted are remarkably consistent with many drug price control policy recommendations generated by the World Health Organization (WHO) and its affiliates. For that reason, perhaps, China's approach so far to health sector reform has been characterized as "non-ideological" and "pragmatic."[3] In fact, Deng Xiaoping famously pronounced that "practice is the sole criterion of truth" at the Third Plenum of the Eleventh Central Committee meeting in 1978, just two years after the death of Mao. Deng's ascent to leadership marked a conclusive end to the Cultural Revolution by declaring pragmatic, experimental attitude toward policymaking, which marks a clear departure from when truth was something that one only seeks from Maoist texts during the Cultural Revolution.[4] However, as per historian Rebecca Karl, what remains to be unaddressed is what the "measure of 'practice'" is supposed to be—it could be anywhere from "accumulation of individual wealth" to achieving "collectivist socialism."[5]

The fact that the measure of "practice" is open-ended and to be determined by others (e.g. "reformers") means that loyalty to "practice" makes rather spacious room for ideological maneuvering. Economist Yingyi Qian makes the point that those who study Chinese economic reforms post-1978 and ask why they have or have not succeeded are asking the wrong questions because for a reformer (and scholars of reform), it is not the "goal" but the process that matters:

> "The naive perspective often confuses the goal (i.e., where to finish) with the process (i.e., how to get there) and thus tends to ignore the intriguing issues of transition paths connecting the starting point and the goal…. It is not enough to study the forms of institutions found in the most developed economies as a desirable goal; it is also essential to study the variety of unfamiliar forms of institutions in transition."[6]

Qian's claim that process matters is by no means unique. However, Qian's position that puts goal below process conveniently skirts the question of ideology. Process only becomes the most important thing that matters when the goal is both understood and uncontested. In Qian's book, that supposedly understood and uncontested goal is market liberalization. In the context of recent health reforms, this universally understood and uncontested goal cannot be as clearly located. Yip and Hsiao, both scholars of

[3] (SCMP Editorial Board 2015)
[4] (Karl 2010)
[5] Ibid. p161-162
[6] (Qian 2017)

public health, claimed that "what drove the cycles of Chinese health system reforms" in the past two decades are in fact very sharply divided ideological factions on whether it is the role of the state or the market to finance public health.[7] According to Yip and Hsiao, for about a decade between 2003 and 2013, pro-government leadership gained power and pushed out a series of major reforms such as new insurance schemes that reportedly covered more than 95% of the Chinese population by 2012. By 2013, pro-market leadership took charge and plans that allow public hospitals to be partially financed by private capital were pushed forth. According to the slideshow used in a recent talk by Jifu Zhan, a leading reformer in Sanming, one of the "root cause of expensive healthcare" is that "the nature of medicine is to save lives and heal wounds, and hospital is a social safety net organization, not an economics department, and therefore market's law of value is not suitable for healthcare."[8] The ostensible goal is to finance universal healthcare[9], but how to get there is contested.

The emphasis on practice translates into an emphasis on an iterative process during which one learns from experience. Such process is another feature of Chinese experimental governance post-reform and opening. Important policy documents coming out of the central ministries are often quite short and vague in details; much of the work of interpretation and implementation is left up to the provincial or even lower governments. Sometimes, a very small number of cities are designated "pilot cities" to test out specific policies before wider implementation. This feature of policymaking post-1978 have been variously termed "fragmented authoritarianism" or "federalism, Chinese Style."[10] Fragmentation itself was not new; scholars have shown that the central government rarely have the power to dictate exactly how the rest of the country should implement policies in detail even more before 1978. Miriam Gross' account of the snail fever campaign during the Great Leap Forward and then the Cultural Revolution, for example, shows that the local cadres took quite a bit of liberty in interpreting, executing, and even resisting policy demands from the top. If such acts of what political scientists called local "bargaining" was possible during the Cultural Revolution, then what makes the fragmented nature of governance in present-day China distinct?

One answer perhaps lies in how post-1978 governance is fragmented by design to encourage experimentation and competition. In a recently published study on the wind power industry in China, Kierkegaard and Caliskan find such central-provincial policy fragmentation central to dynamics of the wind power industry:

> "During the period of rapid growth ('boom'), decentralized, fragmented control allowed for rapid mobilization of a wind power-STA[11]. Yet, it also resulted in an overflowing that led to a 'quality crisis'('bust'). Later, the

[7] (Yip and Hsiao 2015, 2015)
[8] (Zhan 2021)
[9] (Luk 2015)
[10] (Lieberthal 2004; Qian 2017)
[11] STA = "socio-technical market assemblages/agencements" as per Caliskan and Callon's (2010) definition of economization as 'the assembly and qualification of actions, devices and analytical/practical descriptions as "economic" by social scientists and market actors'" (Çalışkan and Callon 2010).

> Chinese government intervened flexibly, instigating a centrally governed 'turn to quality' ('survival'), through five types of framing. The ability to nimbly intervene and adjust when needed has linked fragmented authoritarianism to a particular Chinese experimentalism, also in regard to Chinese wind power governance, which pragmatically allows for crises to emerge in order to learn from them."[12]

In other words, central policy is purposefully vague, leading to decentralized implementation to encourage competition among provincial state actors that tied to their prospects for promotion. This decentralization, in turn, encourages unscrupulous or careless or outright fraudulent behavior that tend to turn into social problems (the "quality crisis") that require stronger centralized intervention. In the words of one of Kirkegaard's informant, a wind power industry expert and government advisor, the Chinese state's approach to the planning and execution of wind power marketization is one of "First do it then solve it!"[13] The idea is that the central state would first allow different provincial and municipal governments to rapidly devise and execute their own strategies to open up the wind power market in their jurisdictions (instead of, for example, only after long and careful deliberation of every aspect of the program), and then, as problems inevitably emerge (e.g. environmental issues, quality issues, overcapacity), the state would then tackle those problems "flexibly and nimbly."

Failure, thus, is not a "mistake" but a crucial part of the design that is meant to be both swift and iterative. While Kirkegaard's informant sees it as the enactment of a peculiar brand of Chinese pragmatism, what Kirkegaard did not mention is that it is a perfect encapsulation of the so-called "agile design" philosophy that traces its origins to industrial design and engineering practices in Japan and the U.S. and is now widespread among software developers.[14] Nevertheless, the presumably same informant continues to emphasize the Chinese characteristics of the wind power market, he remarks that this style of governance of the wind power industry is a testament to how "to learn from the *practice* is much better than learning from the *theory* [sic] or learning from *imagination*. [Emphasis mine] It's the Chinese way."[15]

China's post 1980s market liberalization reforms, which included mass deregulation of commodity prices, are products of a form of creative "experimentalism." The pattern holds true in the healthcare sector as well. Following these interests in how creativity, experimentation, and entrepreneurism manifest in the works of bureaucrats, I approach Sanming's bidding and procurement platform as a case study of specific creative instruments that regional state actors have invested in, designed, and deployed to control drug prices. As I will soon make clear, the case of Sanming is both a divergence from the experimental governance model, as it did not wait to learn from outcomes from the pilot cities, and a constitutive part of it, as its own outcomes have been fully incorporated into the experimental paradigm as a "success story" for others to learn from.

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[12] (Kirkegaard and Caliskan 2019)
[13] (Kirkegaard 2018)
[14] (Rigby, Sutherland, and Takeuchi 2016)
[15] (Kirkegaard, 2019: 24)

Sanming Reform through Zhan Jifu's Experience

Sanming is a small city in the southeastern, mountainous region of Fujian, China. Sanming is almost the size of Rhode Island but has just 2.59 million residents, comparable to the population of Brooklyn, New York.[16] Despite being a relatively small, unassuming municipality in China, Sanming was one of the earliest cities to pilot group purchasing platforms for the bidding and procurement of pharmaceuticals, alongside many other related healthcare reforms such as the reform of physician compensation. Sanming's government is frequently cited for its innovative policymaking as well as its success in drastically reducing drug prices, much to a large part of the pharmaceutical industry's dismay.[17] Today, Sanming remains at the center of one of the largest group-purchasing alliances that mostly comprises a network of other similar small cities across China.

Jifu Zhan is the Party Secretary and Chairman of Standing Committee of Sanming Municipal People's Congress. He is credited as the leading reformer in Sanming's healthcare initiatives.[18] Before returning to Sanming to take the helm of its health reforms, Zhan had worked in the Fujian provincial agencies that oversee food and drugs for over a decade; he was familiar with supply chain management and what he calls the "gray chains" as well as the series of health reforms since the early 2000s. As Sanming's healthcare reforms gather more and more national attention, culminating in a recent visit by Xi Jinping to the city in March 2021, Zhan also began to appear in larger and more prestigious platforms to talk about his experience.

According to Zhan, reforming Sanming's health system was not a choice; it was a matter of "reform or bankrupt" ("不改革就崩盘").[19] In 2010, Sanming's social insurance finances were under severe stress; the revenue it gets from contributions have not been able to pay all its expenses for years. The government was owning various health providers over 100 million yuan, which was about 15.5 million US dollars.[20] He referenced China's earlier healthcare reforms around 1997 that did not "touch the root problem," creating more problems in the process and leading to healthcare costs becoming out of reach to any people. Because of this prior experience with failed reforms, when China renewed healthcare reforms in 2009, most cities that were not part of the 17 "pilot cities" chose to wait and see the results and experiences from the pilot testing sites before implementing their own policy reforms. Sanming was not part of the 17 pilot cities, and it could have followed the steps of the experimental reforms, but when Zhan became the vice mayor of Sanming, he was immediately tasked to "reduce fiscal loss by 50 million yuan" in one way or another. After meetings with officials from Sanming's hospital system, Zhan identified drug pricing as a concrete area of intervention to potentially save money.

[16] (Jianxu and Shaohua 2020)
[17] (Xueqiao and Hancock 2018)
[18] (Song 2020)
[19] (Song 2020)
[20] (Zhan 2018)

The first place Zhan went to tackle drug pricing was the so called “miracle drugs.” These are certain expensive prescription drugs that are basically supplements that do not have much real effect; however, these drugs tend to be heavily promoted by drug reps and doctors are incentivized by large commissions to prescribe a lot of them. Zhan put over 100 hundred such “miracle drugs” on a “catalog” to be closely monitored; anyone who prescribes the drugs must record detailed information about who they are and how much they have prescribed. After this policy went into effect, Zhan said that they saved over 10 million yuan in just one month. He was surprised by the result and became convinced to continue looking for ways to reform drug pricing.

Moreover, Zhan promoted “limited price bulk purchasing,” which is to purchase drugs by soliciting bids for drugs but capping the bids at certain government-set price. Zhan recalled that earlier attempts at this scheme around 2011 failed almost immediately because as soon as he gathered hospital officials to meet to discuss the details, the information would be leaked, and the pharmaceutical industry would stir up an uproar. However, based on reports from the last year or two, it appears that Sanming is moving ahead with the “limited price bulk purchasing” for a handful of specific “non-conforming” drugs. It is not yet clear to me what these drugs are, what non-conforming means, and why anyone would feel safe to use and prescribe drugs that do not “conform” to, presumably, safety and consistency standards of brand-name drugs.

According to Zhan, Sanming’s market share is merely around 3% of Fujian province’s market share; and Fujian province is merely around 3% of China’s market share. In other words, Sanming is such a small market that larger pharmaceutical companies can afford to give up the market instead of lowering its prices to win bids, which would drag down their bids in other alliances covering larger populations (such as the 4+7 scheme discussed in the beginning of the paper, which consists of China’s most populous cities). Today, the Sanming bidding and procurement platform and alliance consist of 24 small and medium cities across 14 provinces. The Sanming Alliance’s ability to negotiate and control prices is partly dependent on its ability to grow its membership, and this is another source of interesting questions for future research.

The Bidding and Purchasing Platform

The bidding and procurement platform has two primary purposes: 1) cut out the multiple layers of intermediaries, which were where drug prices tend to inflate far beyond its initial cost right out of the factory and facilitate direct bidding and procurement from the manufacturer; 2) monitor and enforce compliance from the buyers, which are the hospitals and clinics, to ensure that they purchase from the list of winning bids.[21] With these purposes in mind, this section is analyzes a set of images (see appendix) and other information publicly available on the website of Haixi Medicine Exchange[22] is a Xiamen-based technology company that specializes in building digital exchange platforms for the procurement and circulation of pharmaceuticals and other medical resources.

[21] (Li and Reimers 2012)
[22] 海西医药交易中心 (Haixi Medicine Exchange). http://www.hxmec.com

Since early 2010s, Haixi has been commissioned to build bidding and procurement platforms for at least a dozen government entities including Sanming. According to its website, its platforms provide services such as: 1) smart bulk purchasing[23]; 2) transregional totaling and negotiations[24] and flexible settings for different procurement modes; 3) formulation of catalogs, selection of products, bidding, digital decryption, online contracting for deliveries, and more. In terms of the monitoring system, Haixi claims that their platforms can "realize the monitoring and control of the various stages of the whole circulation as well as "multi-dimensional" and mobile monitoring and control." They can authenticate whether the order is coming directly from the manufacturers, notify when there is a shortage of certain pharmaceuticals, and monitor whether vendors are compliant with various certificates and contracts. In summary, its platforms are meant to integrate bulk procurement, transaction, payment, and monitoring onto an online system.

Based on both images publicly available on Haixi's website and Sanming Alliance's website itself, the Sanming bidding and purchasing platform seems to exist solely online; there is no evidence that the platform involves any software installation. The landing page of the Sanming platform (see Image 1 in Appendix) shows that anyone with an approved account can log in onto any of the portals such as enterprise registration, bulk purchasing, transaction, and monitoring and control. Image 2 is an example of a different platform that seems to have combined all functionalities onto the same system (instead of having different portals like in Image 1). The menu bar on the left contains tabs to manage the bidding of pharmaceuticals and medical supplies (separately) and the purchasing of pharmaceuticals and medical supplies, and a tab for "Integrated Monitor and Control." Image 3 shows the dashboard of what appears to be the monitoring and control portal of the Centralized Procurement and Use of Drugs Organized by the State Platform. The components of this portal include data for "average settlement cycle length," "shortest settlement cycle length," "municipal stock monitoring and control," monthly total procurement of winning bids, procurement of winning bids by specific drugs, the number of delivered goods ordered by distribution enterprises, and the number of delivered goods ordered by the production enterprises.

In Image 3, the many different components of the monitoring and control portal are neatly stacked against each other and packed the entire screen to form a recognizable dashboard, evoking a futuristic, high-tech sensibility and aesthetic. The urban information dashboard is a design practice that began to proliferate among both corporate and governmental entities since the mid-2000s. The objective is to display important information, sometimes real-time, needed to make decisions in "consolidated

[23] Haixi's website does not provide further detail on what "smart bulk purchasing" means, but other news coverage on similar projects suggest that it is some kind of mechanism that can process and respond to real-time information about the usage and stocks of pharmaceuticals and medical supplies (based on data sent from similarly "smart" storage hardware at the hospital; much like "internet of things" but for medical services instead of "smart homes." (Source: 医大智能SPD. "集采下的信息化、智能化集配." QQ.com. December 2020.)

[24] My apologies for some rough translations here and going forward; I need to do a bit more research into what these Chinese terms mean in accounting language in English. I'm not sure what "negotiation" means, and whether it is a separate service or something modified by "totaling."

and arranged on a single screen so the information can be monitored at a glance."[25] According to Stephen Few, a leading designer in popularizing dashboard design, dashboard-style data visualization is a response to the issue of many companies having too much data that they do not know what to do with. In fact, data inscrutability was indeed a major issue with many bidding and procurement platforms developed by third party vendors before China's renewed health reforms in 2009. Even though officials always claimed that the primary purpose of these bidding and procurement platforms have been monitoring and control for compliance, in practice the technical staff that support and maintain the platform had no means of analyzing the data produced by the platform systems and making them legible for making decisions on enforcement.[26] The platforms then became mere transactional devices much like a conventional e-commerce site. The dashboard elements in Image 3 are an attempt to make data legible and actionable in order to realize the monitoring and control function of the platform.

While the style and substance of what Shannon Mattern calls "dashboard governance" borrows from the dashboards of NASA vehicles and airplane cockpits, Mattern makes an important distinction between the dashboard of the cockpits and more contemporary dashboards as found in automobiles: the former are meant to display essential sensor information that affects the survival of the pilots and the planes while the latter is "driven primarily by aesthetics:"

> "Dashboard design in today's automobiles is driven primarily by aesthetics. It's currently fashionable to give the driver lots of information — most of which has little impact on her driving behavior — so she feels in control of this powerful machine. Most "key performance indicators" have little to do with the driver's relationship to the car."[27]

The dashboard for the bidding and procurement platform's monitoring arm seems to align with the latter's preference for aesthetics. Many elements do not seem to merit dashboard-style attention. For example, it is not clear why one needs a pie chart of the different categories of healthcare organizations under monitoring and control; why one has to have a scoreboard-like feature of how much products each manufacturing and each distribution company have delivered; or how the middle panel list of drugs is ranked and listed, and how their ranking could inform any concrete decision making. These are more questions for future research as well.

Technopolitics and the Anthropology of Value and Pharmaceuticals

Over the last twenty years, anthropologists have studied many important transformations occurring in the global pharmaceutical markets, including shifts in pharmaceutical marketing; the effects of pharmaceutical knowledge; the effects of India's rise as a major producer of generics; the role of speculative financialization in pharmaceutical pricing; and the shift in research and development strategy relating to

[25] (Mattern 2015)
[26] (Li and Reimers 2012)
[27] (Mattern 2015)

investments in highly targeted therapies that generate high financial returns.[28] Importantly, these transformations are cited as the primary causes for the exponential growth in drug prices. However, these studies do not consider the actions and practices deployed by state actors to resist, manage, and negotiate their effects. More recently, some social scientists have argued that state actors can be – and historically have been – "entrepreneurial" and "creative," notably by investing in developing early-stage, high risk projects that are unappealing to private investment.[29]

Sanming is a case study of such "entrepreneurial" state agents working to manage and negotiate with the effects of rising valuations of pharmaceuticals. The bidding and procurement platform is comprised of what Madeleine Akrich would call "heterogeneous networks" where "elements of the technical, the social, the economic" are found together.[30] Moreover, the form of the network is still in contestation, by design, as the government is intentionally encouraging different pilot projects with competing models to proliferate so that they can learn from the "successes" and "failures," and perhaps eventually reach some form of "stabilization." As Akrich says, technical objects have political strength, and that strength is derived from how they "stabilize, naturalize, depoliticize, and translate these [social relations] into other media."[31]

At first glance, a state-led technical project to solicit bids and procure pharmaceuticals with the explicit goal of controlling cost seems to fit snugly into what Lewis Mumford would consider "authoritarian technics," which he uses to stand in for centrally and remotely controlled technology that are "system-centered," "powerful but unstable" and contrasts it with "democratic technics" characterized by as "diffused local intervention," "weak but durable."[32] However, the Sanming case is actually a form of "local intervention," and the experimental governance model encouraged such diffused local intervention on a national scale. Sanming and China's health reforms at large suggest that authoritarian technics not only can be diffused, but also can be very durable.

[28] (Petryna et al. 2006; Hayden 2007; Lakoff 2009; Peterson 2014; Hardon and Sanabria 2017; Sunder Rajan 2017)
[29] (Iskander 2010; Mazzucato 2014)
[30] (Akrich 1991)
[31] Ibid
[32] (Mumford 1964)

Appendix

Image 1: The landing page of Sanming Alliance's platform (Source: https://sm.udplat.org/deal/)

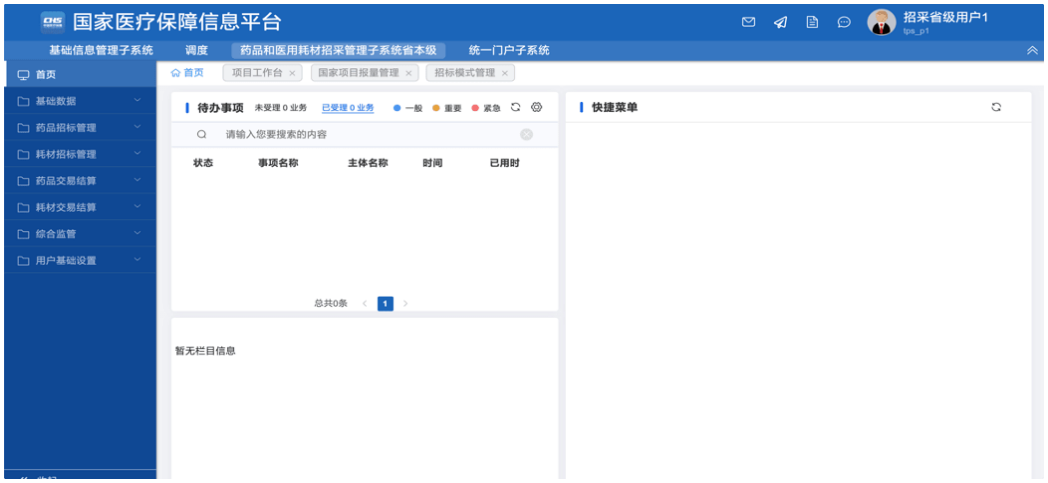

Image 2: National Healthcare Security Information Platform. (Source: https://www.hxmec.com/platform.html)

Image 3: Centralized Procurement and Use of Drugs Organized by the State Platform. (Source: https://www.hxmec.com/platform.html)

Bibliography

Akrich, Madeleine. 1991. “The De-scription of Technical Objects.” In *Shaping Technology/Building Society. Studies in Sociotechnical Change*, 205–24. MIT Press. https://halshs.archives-ouvertes.fr/halshs-00081744.

Çalışkan, Koray, and Michel Callon. 2010. “Economization, Part 2: A Research Programme for the Study of Markets.” *Economy and Society* 39 (1): 1–32. https://doi.org/10.1080/03085140903424519.

Callon, M., and V. Rabeharisoa. 2003. “Research ‘in the Wild’ and the Shaping of New Social Identities.” *Technology in Society*, Studies in Science, Technology, and Society (STS) North and South, 25 (2): 193–204. https://doi.org/10.1016/S0160-791X(03)00021-6.

Collier, Stephen. 2004. “Pipes.” In *Patterned Ground: Entanglements of Nature and Culture*, edited by Stephan Harrison, Steve Pile, and Nigel J. Thrift, 50–52. London: Reaktion Books.

Hardon, Anita, and Emilia Sanabria. 2017. “Fluid Drugs: Revisiting the Anthropology of Pharmaceuticals.” *Annual Review of Anthropology* 46 (1): 117–32. https://doi.org/10.1146/annurev-anthro-102116-041539.

Hayden, Cori. 2007. “A Generic Solution?: Pharmaceuticals and the Politics of the Similar in Mexico.” *Current Anthropology* 48 (4): 475–95. https://doi.org/10.1086/518301.

Jianxu, Zhen, and Chen Shaohua, eds. 2020. “三明统计年鉴-2020 (Sanming Tongji Nianjian 2020).” http://tjj.sm.gov.cn/xxgk/tjnj/2020tjnj/index-cn.htm.

Karl, Rebecca E. 2010. *Mao Zedong and China in the Twentieth-Century World : A Concise History*. Durham [N.C.]: Duke University Press.

Kirkegaard, Julia Kirch. 2018. *Wind Power in China: Ambiguous Winds of Change in China’s Energy Market*. 1st ed. Routledge. https://doi.org/10.4324/9781315226354.

Kirkegaard, Julia Kirch, and Koray Caliskan. 2019. “When Socialists Marketize: The Case of China’s Wind Power Market Sector.” *Journal of Cultural Economy* 12 (2): 154–68. https://doi.org/10.1080/17530350.2018.1544581.

Knox, Hannah. 2020. *Thinking like a Climate: Governing a City in Times of Environmental Change*. Durham: Duke University Press.

Lakoff, Andrew. 2009. *Pharmaceutical Reason: Knowledge and Value in Global Psychiatry*. Cambridge: Cambridge University Press.

Li, Mingzhi, and Kai Reimers. 2012. “Government Driven Model of Institutional Change through Adoption of New Technology: A Case Study of the Failed Pharmaceutical Bidding and Procurement Platforms in China.” Edited by Wei Wei Wu. *Chinese Management Studies* 6 (1): 53–64. https://doi.org/10.1108/17506141211213726.

Lieberthal, Kenneth. 2004. *Governing China : From Revolution through Reform*. New York: W. W. Norton.

Luk, Sabrina. 2015. “The Politics of Drug Price Control Policy in China: Regulation, Deregulation and Re-Regulation.” *Journal of Contemporary East Asia Studies* 4 (1): 41–54. https://doi.org/10.1080/24761028.2015.11869080.

Mattern, Shannon. 2015. “Mission Control: A History of the Urban Dashboard.” *Places Journal*, March. https://doi.org/10.22269/150309.

Maurer, Bill. 2018. “The Method of the Real: What Do We Intend with Ethnographic Infrastructure?” *HAU: Journal of Ethnographic Theory* 8 (1–2): 282–91. https://doi.org/10.1086/698219.

Mitchell, Timothy. 2011. *Carbon Democracy : Political Power in the Age of Oil*. New York: Verso Books.

Mumford, Lewis. 1964. “Authoritarian and Democratic Technics.” *Technology and Culture* 5 (1): 1. https://doi.org/10.2307/3101118.

Neiburg, Federico, and Jane I. Guyer. 2018. “The Politics of the Real Economy.” *HAU: Journal of Ethnographic Theory* 8 (1–2): 236–38. https://doi.org/10.1086/698221.

Peterson, Kristin. 2014. *Speculative Markets: Drug Circuits and Derivative Life in Nigeria*. Experimental Futures : Technological Lives, Scientific Arts, Anthropological Voices. Durham ; London: Duke University Press.

Petryna, Adriana, Andrew Lakoff, Arthur Kleinman, and Duke University Press. 2006. *Global Pharmaceuticals: Ethics, Markets, Practices*. Durham: Duke University Press. https://doi.org/10.1215/9780822387916.

Qian, Yingyi. 2017. *How Reform Worked in China : The Transition from Plan to Market*. Cambridge, Massachusetts: The MIT Press.

Rigby, Darrell K., Jeff Sutherland, and Hirotaka Takeuchi. 2016. “The Secret History of Agile Innovation.” *Harvard Business Review*, April 20, 2016. https://hbr.org/2016/04/the-secret-history-of-agile-innovation.

SCMP Editorial Board. 2015. “Under Xi Jinping, Pragmatism Now Trumps Ideology in China’s Foreign Policy.” South China Morning Post. June 14, 2015. https://www.scmp.com/comment/insight-opinion/article/1822071/under-xi-jinping-pragmatism-now-trumps-ideology-chinas.

Song, Chenhan. 2020. “三明医改始末：一个地级市的自救如何上升为国家战略.” 南方都市报, December 16, 2020. https://m.mp.oeeee.com/a/BAAFRD000020201214393473.html.

Spencer, Dina. 2019. “Chinese Pharma’s Latest Race to the Bottom on Pricing.” *PharmaBoardroom*, October 21, 2019. https://pharmaboardroom.com/articles/chinese-pharmas-latest-race-to-the-bottom-on-pricing/.

Sunder Rajan, Kaushik. 2017. *Pharmocracy: Value, Politics, and Knowledge in Global Biomedicine*. Duke University Press. https://doi.org/10.1215/9780822373285.

Xueqiao, Wang, and Tom Hancock. 2018. “Chinese City Touted as Model for Cutting Healthcare Costs.” February 19, 2018. https://www.ft.com/content/59e947ba-d4cf-11e7-8c9a-d9c0a5c8d5c9.

Yip, Winnie, and William C. Hsiao. 2015. “What Drove the Cycles of Chinese Health System Reforms?” *Health Systems and Reform* 1 (1): 52–61. https://doi.org/10.4161/23288604.2014.995005.

Zhan, Jifu. 2018. “我所经历的三明医改.” 2018. https://www.163.com/dy/article/G6NO806S0514WIJ2.html.

———. 2021. “贯彻新思想践行新理念 建设新时代健康保障体系 (Presentation Slides for Talk at Peking University).”