Seeking policy solutions in a complex system: experimentalist governance in China's healthcare reform

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Abstract
The proliferation of “wicked” policy problems in complex systems requires an experimental approach of problem-solving. Experimentalist governance offers a conducive framework through which to seek policy solutions amidst high levels of complexity in a multilevel governance structure. This study conceptualizes four distinctive experimental modalities based on varying levels of technical complexity and interest complexity, both of which represent salient constraints for policy reforms in a complex system, the health sector in particular. Trail-blazing pilots, crowdsourcing pilots, managed pilots, and road-testing pilots are all associated with distinct mechanisms of experimentation in a multilevel governance structure. Through four illustrative cases from China’s massive experimental program of public hospital reform, this study demonstrates how experimentalist governance seeks policy solutions in the health sector. Should governance arrangements, policy capacity, pragmatism, and informational devices become aligned in a conducive way, experimentalist governance can play an instrumental role in seeking solutions for difficult problems in a complex policy system. A governance structure capable of policy learning and adaptive management is the key.

Keywords  Policy experiment · Governance · Pilot · Policy learning · China · Health policy

Introduction
Many “wicked” policy issues in the contemporary world are increasingly seen as problems arising from systemic complexities. These complex, open-ended, intractable, and unpredictable problems have no clear solutions, and interventions may produce unintended consequences (Cairney, 2012; Peters, 2017). The lack of clearly defined solutions not only makes these issues wicked, but also intrinsically requires a more experimental approach to
problem-solving (Sabel & Zeitlin, 2010, 2012). Involving numerous interdependent components, massive technical complexity, strong material interests, and ideological biases, the health sector is a classic example of a complex system. Because the outcomes of healthcare reforms are inherently difficult to predict and the stakes are too high to ignore, there is a consensus that managing large reforms in the health sector should not follow fixed “blueprints” but requires repeated policy experimentation and deep learning, taking into account systemic complexity, context, capacity, and implementation processes (He, 2022; Husain, 2017; Husain et al., 2021; Lipsitz, 2012).

Defined as “a temporary, controlled field-trial of a policy-relevant innovation that produces evidence for subsequent policy decisions” (McFadgen & Huitema, 2018), policy experiments are intrinsically geared toward public-sector innovation and learning. As Ansell and Bartenberger (2016) elucidate, the desire to learn is what ultimately unites all understandings of experimentation. However, policy learning from experimentation is difficult. A multitude of factors, such as limited learning capacity, poor experimental design, hierarchical structures, and policy myopia, may all undermine the outcome of policy learning (Dunlop & Radaelli, 2018; Nair & Howlett, 2017). Scholars have therefore increasingly recognized the critical importance of the governance and design of experiments in facilitating effective policy learning (Mattocks, 2021; McFadgen & Huitema, 2018).

The wide practice of policy experiments has given rise to the notion of experimentalist governance, a mode of governance based on framework-making and revision through the recursive review of implementation experiences in different local contexts (Sabel & Zeitlin, 2012). Experimentalist governance is not merely a theoretical proposition, but is found to work well in practice within multilevel governance structures, such as the European Union (Sabel & Zeitlin, 2010) and North America (Wolfe, 2018). The recent scholarship underscores that experimentalist governance is not bounded to particular political systems but represents a conducive structure for seeking policy solutions in the face of deep complexities. Emerging studies based in China have revealed that, managed properly, this form of governance can effectively reduce the uncertainties and ambiguities of policy problems and direct the pathway for policy change in such a large country with significant subnational disparities (Wang et al., 2022a, 2022b; Zhang et al., 2022; Zhu & Zhao, 2021).

Set in the context of public hospital reform in China—a massive health policy experimental program—we examine how experimentalist governance reduces uncertainty and generates policy solutions in a highly complex system. Specifically, two central research questions will be answered: How does experimentalist governance respond to deep complexities in the world of health care in a multilevel governance context? How does effective policy learning occur in a large national policy experimental program in health care? Our bi-dimensional framework based on technical complexity and interest complexity yields four distinctive types of experimental activities, namely trail-blazing pilots, crowdsourcing pilots, managed pilots, and road-testing pilots. The four illustrative cases demonstrate how a versatile repertoire of learning mechanisms facilitates solution-seeking in China’s public hospital reform.

This study draws from the authors’ long observation on China’s health policy reforms and a dozen of in-depth interviews conducted in 2021 and 2022 with government officials, researchers, and practitioners at both central and local levels. Secondary materials were also collected from official documents, scholarly publications, and the gray literature. The four illustrative cases are built up through extensive synthesis of primary and secondary materials stated above.

The remainder of this paper proceeds as follows: Through synthesizing the literature on policy experimentation, Sect. 2 characterizes experimentalist governance in the midst
of deep complexities and establishes the conceptual framework. Section 3 offers a brief overview of China’s tradition of policy experimentalism and its public hospital reform. The conceptual framework is applied in Sect. 4 to analyze the experimental dynamics in China’s decade-long public hospital reform program through four illustrative cases. Section 5 offers a discussion of the case studies. Section 6 concludes the paper with implications and caveats.

**Conceptualization**

The steep rise in volatility and complexity in the public sector in recent decades has led to the emergence of a novel experimental form of governance that provides a flexible mechanism for policy development beyond the normal boundaries of the government system, by allowing for a greater degree of learning (Wolfe, 2018). Central to experimentalist governance, four elements work in an iterative style: (1) the setting of broad framework goals; (2) discretion being granted to lower levels when implementing goals; (3) the practice of regular reporting and assessment; and (4) the periodical revision of framework goals (Sabel & Zeitlin, 2010, 2012). On the one hand, higher-level principals grant sufficient freedom to lower-level agents to develop tailor-made strategies toward realizing the overarching policy goals. On the other hand, the pooling of individual local experiments creates opportunities for comparison and thus enables policy learning and framework adaptation (Zhu & Bai, 2020; Zhu & Zhao, 2021). This virtuous feedback loop is conducive to the continuous improvement of problem-solving capacity of the policy system through reflexive learning (He, 2022; Telle, 2017).

At its heart, experimentalist governance reflects an approach to policy experimentation based on recursive review and monitoring of the experiences of different jurisdictions at the local and regional levels (Sabel & Zeitlin, 2012; Wolfe, 2018; Zhu & Zhao, 2021). Faced with various constraints, especially systemic complexities, the goals set by national policymakers are typically broad and provisional, while the revision of goals is based on lessons drawn from local experiences through “learning by doing” and “learning by monitoring.” Hence, the effectiveness of governance ultimately relies on the experimental structure in support of policy learning. In this study, we illustrate that experimentalist governance fosters multi-directional learning that is built on iterative policy experimentation and the extensive synthesis of subnational policy lessons toward national-level policy development.

Offering a novel framework conducive to solving policy problems amidst high levels of complexity, experimentalist governance is associated with two salient characteristics. First, there are limits to *ex ante* policy design in complex systems (Husain, 2017). Due to the high levels of complexity, the macro-policy objectives are usually defined by the national government, but meso- and micro-level objectives are co-constructed by national and subnational policy actors within an “open policy framework” (Husain, 2017). Second, a wide range of experimental activities are carried out by subnational actors, but what makes experimentalist governance distinctive is the continuous monitoring by national authorities. Multiple forms of learning co-exist: peer learning between localities, learning by doing, learning from foreign experience, and learning between national and subnational governments. However, this versatile approach should not be seen as unconnected trialing, because policymakers ultimately perform policy synthesis through comprehensively comparing and assessing evidence gained from subnational pilots (Zhu & Bai, 2020). A
generalizable solution is ultimately codified and scaled up for nationwide implementation in a later stage of the policy cycle (He, 2022; Husain, 2017).

In this study, we formulate a conceptual framework to characterize the dynamics of experimentalist governance in a complex system. The framework considers the mechanisms of policy experimentation in the face of two salient constraints: interest complexity and technical complexity, which collectively define the “tractability” of a policy problem in a complex system, making it especially appropriate for use in the health sector (Thomann et al., 2019). Complexity is a key attribute of modern policy problems. As Peters and Tarpey (2019) elucidate, some of the policy complexity is political, given the involvement of a wide range of interests that make policymaking contentious. However, some of the complexity is more substantial, involving more scientific content and technicality. Many policy reforms, particularly in the health sector, affect enormous tangible and intangible interests. The degree of this interest complexity augurs the likely resistance from the vested interest that in turn sets the boundary for experimental activities. In the language of Guy Peters (2005), this complexity denotes the number of political and material interests and actors involved in the problem and, hence, the degree of difficulty in negotiating agreements among the parties involved. The second dimension of the framework is technical complexity, which represents the unpredictability of the occurrence and effects of policy solutions (Thomann et al., 2019). It determines the technical ambiguity of the problem, the range of plausible options that need to be considered, and the analytical efforts that policymakers need to make in order to reduce uncertainty.

These two dimensions lead us to a 2 × 2 matrix that encompasses four distinctive experimental patterns in a complex system; we characterize them as (1) trail-blazing pilot, (2) crowdsourcing pilot, (3) managed pilot, and (4) road-testing pilot (see Table 1). Regardless of the actual mode of piloting, policy synthesis is performed by policymakers, through which they comprehensively review the evidence gained from regional experiments and formulate a satisfactory solution for nationwide scaling-up (He, 2022; Zhu & Bai, 2020). Policy synthesis is supported by a battery of important mechanisms, such as reporting, feedback, review, and assessment, without which policy experiments often become uncoordinated sporadic trials of little value for policymaking in a larger scale.

**Trail-blazing pilot**

The complexity of interest and the absence of a clear technical solution create arduous circumstances for problem-solving. National policymakers therefore often adopt a loose policy framework to encourage local piloting and strive to reshape the complex interest structure (Husain, 2017). Trail-blazing pilots strive to identify directions for and possible paths to policy solutions. National policymakers grant considerable discretion to subnational experimental units to conduct unscripted trial-and-error, expecting them to take path-breaking actions and screen out effective solutions for hard policy problems. This approach, however, does not imply a laissez faire experimental process. Given the dual challenge of technical complexity and interest complexity, central monitoring tends to be strong, notwithstanding the autonomy granted to subnational pilots. The selection of experimental units tends to be flexible in trail-blazing pilots; policymakers may designate localities with a track record and strong capacity (Mei & Liu, 2014; Wang et al., 2022a, 2022b) or recruit a large number of localities with geographic or socioeconomic representativeness (Heilmann, 2008a; Zhu & Bai, 2020) to undertake the difficult reform. Open-ended learning is
salient in trail-blazing pilots. The national government, as the chief learner, organizes the learning process and solicits lessons from local pilots, through learning by doing, exploring, and monitoring.

**Crowdsourcing pilot**

When there is a lack of a clear technical solution but the level of interest complexity is low, policymakers are in a relatively favorable position to manage the experimental process. Subnational policy actors tend to demonstrate greater momentum and initiative because of the low resistance to reform. As a result, the selection of experimental units is usually open, through designation, recognition, or voluntary participation (Zhu & Zhao, 2021). This approach is regarded as a form of policy crowdsourcing, since a number of subnational governments contribute collectively—under central coordination—by providing original practices to be evaluated and compared by the national policymakers. Its key difference to the trail-blazing approach is that both national policymakers and subnational experimental units can largely concentrate on seeking concrete technical solutions. Because resistance to reform is relatively low, the search for concrete technical solutions can operate in a favorable environment without much need for coercion. National policymakers, as the chief learners, impose less top-down interventions onto the generic learning process but monitor the natural experimental outcome: Which solution survives and which does not?

| Interest complexity | High                                                                 | Low                                                                 |
|---------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|
| Technical complexity| **Trail-blazing Pilot** No clear technical solution; high resistance to reform  
_Aim_: to identify directions for and possible paths to policy solutions  
_Role of experimental units_: to take trail-blazing actions and screen out possible solutions  
_Mode of learning_: open-ended learning from unscripted pilots | **Crowdsourcing Pilot** No clear technical solution; low resistance to reform  
_Aim_: to seek concrete technical solutions  
_Role of experimental units_: to produce various feasible plans  
_Mode of learning_: synthesizing and comparing multiple feasible plans generated through local pilots |
| Low                 | **Managed Pilot** Clear preliminary solution; high resistance to reform  
_Aim_: to promote the testing of the workability of selected solutions  
_Role of experimental units_: to create a demonstration effect for other regions  
_Mode of learning_: performing contextual adaptation through strong central monitoring | **Road-testing Pilot** Clear preliminary solution; low resistance to reform  
_Aim_: to validate preliminary solutions in a wider scale  
_Role of experimental units_: to improve _operandi modus_ of preliminary solutions  
_Mode of learning_: performing contextual adaptation under strong central monitoring or bottom-up initiatives |

**Table 1** A typological framework for experimentalist governance in a complex system, Source: the authors

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Managed pilot

When a preliminary technical solution is available but interest complexity hampers necessary reform, policymakers usually have to undertake experimentation in a relatively coercive manner (Shi, 2012). Top-down designation is often used to select experimental units in order to seek a breakthrough, especially in reshaping complex interest structures (Mei & Liu, 2014). Local autonomy tends to be low in managed pilots (Husain, 2017), because too much administrative discretion may give rise to opportunism of the vested interests. Through managed pilots, policymakers hope to create a “demonstration effect” for other regions, showcasing the workability of the policy solution (Ettelt et al., 2015; Heilmann, 2008b). As a form of “correctness-testing,” managed pilots epitomize both top-down learning and bottom-up learning. Subnational agents are the chief learners, learning from both central mandate and successful peer practices, while national policymakers also learn from local pilots to validate and fine-tune the policy solution. The ultimate purpose of learning is to “test correctness” and seek contextual adaptation of the selected policy solution.

Road-testing pilot

When a preliminary technical solution is available and interest complexity is low, policymakers are naturally keen to understand its nationwide usefulness. Policy experimentation is hence expected to test the “external validity” of the policy solution and calibrate its *operandi modus*. Experimental activities here are typically characterized by the local adaptation of the policy solution, aiming to improve its technical design and produce a good contextual fit. Yet, it must be noted that when interregional disparities are large, road-testing pilots should be promoted in a “one-size-doesn’t-fit-all” fashion, which allows for flexibility, rather than a fixed approach (Husain, 2017). As in the managed pilots, policy learning in road-testing pilots also occurs in both top-down and bottom-up fashions. Central policymakers wish to improve the operational design of the policy solution through error detection, correction, and recalibration, while local implementers learn how to better carry out the designated policy solution in the local context (He, 2022).

Context

Policy experimentalism in China

Policy experimentation is a hallmark of the Chinese style of governance. It is widely acknowledged that the extensive use of experimentation copes well with the enormous regional disparities in this large country and effectively contains risks in the face of uncertainties (Heilmann, 2008b; Husain, 2017). The central authorities define the policy objectives and encourage local governments to try out appropriate policy instruments based on local circumstances that are further fed back into the formulation of national policy.

Yet, understanding policy experiments in China as entirely technocratic would mask the profound influence of the broad policy ecology. First, all sorts of experimentation are embedded within the broad structure of central-local relations. Keen to find useful solutions for policy problems of nationwide concern, the central state is willing to learn from local innovations, but has nothing to lose as local governments ultimately bear the political risk
and fiscal costs of trial-and-error implementation (Chan & Shi, 2022). Second, strong political incentives drive local governments to pursue experiments under the banner of “policy innovation.” Successful pilots may earn political rewards, especially career advancement, for local cadres, most of whom therefore engage in strategic competition for “innovativeness” of their local reforms (Zhu, 2014). Third, not all local pilots are sponsored by the central state; many are undertaken to solve urgent local problems in the absence of national policy guidelines. Doing so certainly involves political risks on the part of local reformers but it is made possible by major policy entrepreneurs (Teets & Hasmath, 2020). The role of policy entrepreneurship is particularly evident in less developed regions that typically have limited capacity in undertaking policy experiments.

**Chinese health system: a brief overview**

Some 11,000 public hospitals constitute the cornerstone of China’s health system, providing 84% of health services to the population in 2020.¹ Public hospitals in China have experienced dramatic transformations in the past four decades, driven by major changes in the economy. The Chinese health system under the communist planned economy was built on the principles of public ownership and easy accessibility. Hospitals belonged to either government or state-owned enterprises (SOEs), and health workers were public employees receiving fixed salaries. Fee schedule and medical supplies, including drugs, were both managed by the government, which provided substantive subsidies to public hospitals. Hospitals’ remaining income was earned through public health insurance programs and nominal user fees. These key system features together largely guaranteed equal accessibility and the provision of cost-effective care to the entire population, until the 1980s (Hsiao, 1995).

China’s transition to the market economy, which began in the 1980s, brought about tremendous changes to the health system. Fiscal subsidies to public hospitals drastically diminished, so hospitals were forced to break even through increasing user charges (Hsiao, 1995). Aggravating the situation was the significant weakening of the old health insurance system, which was no longer able to provide stable payments to hospitals or adequate financial protection to patients. Concerned about rising medical costs, the government intentionally set prices for basic procedures and drugs very low in order to keep services affordable for most people, but cash-strapped hospitals quickly learned how to “game” the system. They circumvented regulations by prescribing drugs and procedures with a larger profit margin and significantly increasing the utilization of expensive diagnostic tests, especially those involving advanced medical imaging (Liu et al., 2000). The pharmaceutical procurement system was ill-designed, and there were enormous amounts of corruption associated with distribution and prescription (Tam, 2011). Drug expenses used to account for more than 40% of China’s total expenditure on health, a situation rarely seen in other health systems (Fu et al., 2018). Due to limited technical capabilities of health administration and social insurance agencies, provider payment mechanisms in China heavily relied on fee-for-service (FFS) that is widely known for its cost-inflationary nature (Yip et al., 2010). These defective institutions quickly turned Chinese public hospitals into profit-minded

¹ National Health Commission. 2021. “2020 China Statistical Bulletin for Health Care Development”, available at http://www.nhc.gov.cn/guihuaxxs/s10743/202107/af8a9c98453c4d9593e07895ae0493c8.shtml (accessed on March 5 2021).
cash cows. Hospital managers extensively used bonuses and other financial incentives to encourage frontline physicians to earn revenue. Over-prescription became extremely common in Chinese hospitals (Liu & Mills, 2005; Yang, 2016). Out-of-pocket expenditures skyrocketed from the 1980s until the end of the 2000s.

The perverse incentives described above drove Chinese public hospitals toward revenue-making, resulting in severe consequences—particularly ballooning cost inflation and reduced access to care. Medical impoverishment was a key cause of poverty in the country, owing to high out-of-pocket payments (Zhou et al., 2020). The problems cited above did not exist in isolation, but were highly interdependent, thus forming a vicious gridlock illustrated in Fig. 1. The situation well embodies a complex system. The complex interactions among different components often result in a policy gridlock where problem A must be solved in order to solve problem B, but problem B requires a solution to problem C and the solution to problem C depends on finding a solution to problem A (He, 2011). In light of these deep complexities, previous health-sector reforms were mostly piecemeal in nature until 2010 (Fu et al., 2017).

**Experimental program in public hospital reform**

Eager to overhaul the health system and realize its commitment to universal health coverage, the Chinese government initiated a series of deliberations and consultations that led to the launch of its landmark national health reform program in 2009. Among the five key components of the reform package, the public hospital reform program was the hardest to execute. The senior leadership used terms such as “deep water zone” and “hard bone” to highlight the extraordinary complexity and uncertainty of the reform (Chen, 2014). While the overarching objective was explicitly defined as “bring the ‘publicness’ back in,” neither the central leadership nor local implementers had a concrete roadmap for how to reform the gigantic public hospital system. On the one hand, political imperatives required policymakers to “do something significant” but, on the other hand, drastic reforms were not preferred because the impact of reforms must be within what thousands of public hospitals could absorb. Deep complexity and uncertainty prompted the central government to launch a large-scale nationwide experimental program in 2010. Policymakers initially selected 16 cities to undertake various pilots, hoping to solicit useful experience, but soon realized the tremendous challenge they faced, given technical complexity and reform inertia at the local

![Fig. 1 The health policy gridlock in China, 1980s–2010s, Source: the authors](image-url)
level (He, 2011). The experimental program was subsequently expanded to include four phases and 200 cities across the country. A wide range of experimental activities has been observed since then.

Before presenting the analysis, two strategic reform documents that will be frequently cited below are highlighted here. Promulgated in 2009, the “Opinions of the Chinese Communist Party Central Committee and the State Council on Deepening the Health Care System Reform” is the blueprint of China’s landmark national health reform and is hereafter referred to as the 2009 blueprint. The “Guiding Opinions on Urban Public Hospital Reform Pilot” released in 2010 was the first policy document specifying the objectives and roadmap of the public hospital experimental program and is hereafter referred to as the 2010 pilot document.

Analysis

Trail-blazing pilot: the case of the staff remuneration reform

The perverse staff remuneration scheme in Chinese public hospitals has long been found to be a “deep-seated” problem that is hard to reform. For decades, Chinese doctors received nominal basic salaries, benchmarked with the rigid standard of civil service. Public hospitals hence resorted to high-powered bonus schemes to boost doctors’ productivity (Bloom et al., 2001). Usually tied up with the sheer quantity of clinical service, the bonuses accounted for up to 80% of doctors’ take-home income (He & Qian, 2016). This perverse incentive has powerfully incentivized doctors to provide unnecessary care that led not only to rapid cost inflation but also to a lower quality of clinical encounters (Qian & He, 2018). Eager to earn additional income to compensate their low nominal salaries, many doctors also received drug commissions, (diagnostic) test kickbacks, and informal payments (so-called red packets) (Bloom et al., 2001). All of these inappropriate financial incentives dramatically altered the behaviors of Chinese doctors, tainting their professional reputation in society (Tam, 2011).

Possessing high levels of professional autonomy, doctors are the frontline troops in health care. No health reform could succeed without their day-to-day cooperation. Enjoying high incomes earned from various sources, managers of big hospitals and senior doctors have formed a robust interest group that is resistant to reform (Hsiao, 2014). The Vice Premier overseeing health affairs stressed that public hospital reform could not succeed without properly realigning the perverse financial incentives that drive the behaviors of millions of doctors. The 2009 blueprint and the 2010 pilot document stated that an ideal remuneration scheme should be able to create the right incentives for doctors. Performance-based and quality-based pay was envisioned to be the strategic direction, while gross legal income should be increased, commensurate to the value of doctors’ service.

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2 Available at http://www.gov.cn/jrzg/2009-04/06/content_1278721.htm (accessed on March 6 2021).
3 Available at http://www.nhc.gov.cn/wjw/gfxwj/201304/7e4b16efde9d4ca390b753ea147efeb1.shtml (accessed on March 6 2021).
4 National Health Commission. 2015. “Xinchou Gaige Shujun Yigai ‘Zaihou Yigongli’: ‘Xinchou Gaige Dataolun’ Lanmu Zhengwen Zhi Ba” [“Discussion Series of Staff Remuneration Reform” No.8: Dredging the ‘Final Mile’ of the Public Hospital Reform], available at http://www.nhc.gov.cn/renshi/s3578/201507/5e111f45625746bf96147d616acc8682.shtml (accessed on April 22, 2021).
However, there was a high degree of technical complexity regarding how to recalibrate the right remuneration scheme for the huge medical workforce, not to mention the imperative to consider varying local financial circumstances. Policymakers had little idea how to do so. Furthermore, the financial stakes of the reform were extremely high for millions of doctors, as it was virtually a matter of bread and butter. Operating within a context of high resistance from stakeholders, the reform had to be handled very carefully.

The experimental process began with unscripted pilots at the local level. The strategic importance of the reform prompted the central policymakers to maintain close monitoring through various mechanisms such as policy briefings, work conferences, and field visits. Open-ended learning was conducted through multiple onsite visits to localities undertaking bottom-up initiatives, such as Anhui, Changsha, and Huzhou. These pilots were given the opportunity to report their reform ideas, showcase progress, and express concerns. Meanwhile, notable local innovations were also presented and discussed during multiple work conferences on public hospital reform, enabling policymakers to synthesize local lessons.

The first-phase trail-blazing pilots yielded a variety of practices, including (1) a basic annual salary package; (2) a higher proportion of performance-based bonuses in the pay structure; (3) negotiable salary packages; and (4) stronger monetary recognition of overtime, night shifts, and house-call services in the payroll (Fu et al., 2017; Yip et al., 2019). Particularly, the practices of Jiangsu and Fujian were deemed useful and were incorporated into the central government’s reform plan on hospital staff remuneration. Policy learning at this initial phase was fruitful, as policymakers significantly reduced the ambiguities surrounding the design and technicalities of the reform. They subsequently recruited 11 provinces in 2017, requiring them to further select three prefectures for piloting. In 2018, the experimentation was expanded to other provinces, which were asked to enlist one public hospital each to trial the new remuneration scheme. Despite the decentralized pilots, the State Council reiterated that central oversight was pivotal in this experiment, given its complexity and policy significance.

Many useful practices bloomed. As many as 2800 public hospitals had participated in the pilots by the end of 2018. The central government solicited useful experiences after a series of onsite visits to local pilots. Outstanding reform models were showcased and promoted through regular press conferences and onsite promotion meetings. Synthesizing the abundant evidence garnered from the pilots, policymakers eventually recognized the practices of Sanming, Shanghai, and Chongqing as being replicable nationwide (see Table 2). These practices then informed the drafting of “The Guiding Opinions on the Reform of Public Hospital Staff Remuneration” (the “guiding opinions”). Throughout the piloting process, several official evaluation projects were undertaken by think tanks and research institutes to comprehensively assess local experiences. Policy learning arrived with the release of the “guiding opinions” in 2021. This document stipulates a comprehensive set of principles as well as concrete policy instruments pertaining to the remuneration of doctors. This policy now serves as the central framework for doctor remuneration in China’s public hospitals.

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5 Xinhuanet, “State Council officials elucidated the Opinions on Further Promoting Health Care System Reform Practices”, November 5 2016 (in Chinese), available at http://www.xinhuanet.com/politics/2016-11/08/e_1119875159.htm (accessed on September 2 2022).

6 National Health Commission, 2015. “Written Records of 6 August 2015 Press Conference”, available at http://www.nhc.gov.cn/xcs/s3574/201508/b54154c33e3045379d3bc9686c7abee4.shtml (accessed on September 2 2022).
## Table 2  Recognized models of doctor remuneration pilots, Source: summarized by the authors

| Model                                      | Pilot city | Key features                                                                                                                                                                                                 |
|--------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Target annual salary package + work credit | Sanming    | Payroll income = basic annual salary package + performance-based pay  
Performance-based pay linked to ‘work credit points’  
Work credit points based on basic points, (service) volume points, merit points, and penalty deductions  
Basic points tied to rank and seniority  
Volume points tied to quantity of inpatient and outpatient service, and job-specific responsibilities  
Merit and penalty points determined by individual hospitals |
| Surplus-based remuneration                 | Chongqing  | Payroll income = basic salary + earmarked allowance + performance-based pay  
Performance-based pay = basic performance pay + excess performance pay  
Basic performance pay pegged to average pay level of local public service institutions  
Excess performance pay drawing from hospitals’ gross financial surplus of the year |
| Adjustable total pay increment            | Shanghai   | Total wage budget of a hospital = base budget x (1 + increment coefficient) + merit/penalties  
Base wage budget determined by approved budget of previous year, to be adjusted by service volume of current year  
Pay increment based on average pay level of the entire profession, to be adjusted by operational performance of individual hospitals  
Merit/penalties consider patient satisfaction, research performance, public education, and so forth |
Crowdsourcing pilots: the case of telemedicine innovation

Rooted in China’s significant interregional disparities in socioeconomic status, quality medical resources are concentrated in major cities, with limited accessibility for numerous patients in rural and remote areas (Wan et al., 2021). This uneven distribution of medical resources has been further exacerbated by the severe “brain drain” of senior doctors, who tend to pursue better-paid positions in coastal China. As a result, the accessibility of quality health services in less developed regions became a critical policy problem in the 1990s. The rapid advancement of digital technologies offers a clear solution to this problem through telemedicine. A variety of technologies can effectively bridge the gap through remote monitoring, videoconferencing consultations, and even tele-surgery.

However, the implementation of telemedicine does not hinge solely on digital infrastructure, but must be supported by policy provision, including pricing of such services, their inclusion into the coverage of social health insurance, and legal liability. It is ultimately people rather than technologies that render and receive telemedicine services, and therefore, designing a policy framework was of utmost importance. These policy issues were all of high technical complexity and there was virtually a vacuum of national guidelines to govern this emerging form of health services. Thus, central policymakers at the beginning apparently lacked clear ideas as to how to set up a telemedicine system. The 2009 blueprint generally put forward the promotion of telemedicine in rural and remote regions as a policy objective. The 2010 pilot document also broadly stated that integrating medical system across regions and levels of hospitals through telemedicine was a key task to pursue.

Despite a high level of technical complexity, the telemedicine innovation exhibits moderate interest complexity as it does not undermine the interest of main stakeholders. Lead tertiary hospitals can expand their “market reach” to remote areas and the vast countryside, while such initiatives can be easily packaged under the banner of poverty alleviation that is highly valued by the government. Partner hospitals in the hinterland are able to strengthen their clinical capabilities through learning and training. Social health insurance departments would not perceive telemedicine as a threat so long as an appropriate reimbursement standard can be calibrated. For numerous patients in the hinterland, telemedicine is, needless to say, much welcomed. Therefore, it represents a typical “harm-free” policy and there is no major opposition.

The telemedicine innovation embodies crowdsourcing pilots. Moderate resistance allowed both central policymakers and local governments to concentrate on seeking concrete technical solutions. The central government encouraged unscripted pilots in an open-ended manner and local governments indeed created multiple bottom-up initiatives. The Ministry of Health (MoH) issued two directives in 2010 to define the technical standards of remote consultation and subsequently matched 12 major tertiary hospitals in big cities with 22 provinces in central and western China for pilots. Among them, Yunnan stood out as a pioneer. It built up a telemedicine network covering all counties by 2011.

The COVID-19 pandemic triggered another round of leap-forward in telemedicine. In the early waves of the outbreak, the capacity of public hospitals was stretched to an extreme limit by the influx of COVID patients, while numerous patients of other medical conditions were unable to seek care due to lockdown or other mobility restrictions. Telemedicine, at this critical moment, played a highly instrumental role in filling the gap, mainly through online consultation. In recognition of its unique strength, both central and local governments offered additional investment and favorable policies to accelerate the growth of telemedicine.

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7 The COVID-19 pandemic triggered another round of leap-forward in telemedicine. In the early waves of the outbreak, the capacity of public hospitals was stretched to an extreme limit by the influx of COVID patients, while numerous patients of other medical conditions were unable to seek care due to lockdown or other mobility restrictions. Telemedicine, at this critical moment, played a highly instrumental role in filling the gap, mainly through online consultation. In recognition of its unique strength, both central and local governments offered additional investment and favorable policies to accelerate the growth of telemedicine.
services were not limited to remote consultation but expanded to multiple telemedicine services. These local practices facilitated the introduction of a more comprehensive policy document outlining the classification, process, and management of telemedicine services in 2014. In 2015, the central government further selected five hinterland provinces to explore feasible solutions pertinent to pricing, insurance coverage, and liability. The pilots in Guizhou and Ningxia generated remarkable outcomes. Both pilots received great attention from the central government, and their experiences were recognized by senior leaders, including the Premier and Vice Premier, through multiple site visits.

The crowdsourcing pilots considerably reduced the technical complexities and facilitated the design of national telemedicine framework. In 2016, “The Essential Operational Protocols of Telemedicine System” was introduced. In order to gauge the progress of local implementation, two rounds of technical assessment of telemedicine systems were conducted between 2018 and 2019. Onsite evaluation was also organized by the National Health Commission in six provinces across the country. A major piece of regulation that specifies legal liability standards, as well as two administrative guidelines on pricing and insurance payment, were further announced between 2018 and 2020. By the end of 2021, 94.6% of secondary and tertiary hospitals in China had provided telemedicine services to patients. Performing well throughout the experimental process, crowdsourcing pilots in the midst of high technical complexity and low interest complexity have managed to create workable solutions through which to enhance the accessibility of quality health services in rural and remote areas.

**Managed pilots: the case of pharmaceutical procurement reform**

Pharmaceutical procurement is notoriously prone to numerous forms of disguised and blatant rent-seeking behaviors worldwide. The “medical-industry complex” features a concentrated combination of tremendous material interests and unethical behaviors (Vian, 2008). This problem was remarkably evident in China. It was a common practice for pharmaceutical companies to pay lucrative commissions and kickbacks to doctors who subsequently developed keen incentives to over-prescribe downstream (Tam, 2011; Yang, 2016). In the upper stream, corruption of even higher magnitudes occurred rampanty. A very telling piece of evidence is that the first Director of China’s State Food and Drug Administration was sentenced to death as a result of the glaring corruption. The outcome was skyrocketing drug prices and financial grievance for numerous patients. Mounting drug prices were responsible for a large portion of China’s escalating health expenditures (Fu et al., 2018). The government responded to this problem in the early 2000s by centralizing pharmaceutical procurement to the provincial level, through which public hospitals acquired the bulk of their pharmaceutical supplies. Unfortunately, there was little evidence that provincial competitive bidding had either increased competition among suppliers or controlled price increases (Sun et al., 2008).

Building “an appropriate pharmaceutical supply system” was envisioned as a key policy objective in the 2009 blueprint. Revamping the problematic procurement system was an integral component of the public hospital reform program. Policymakers certainly knew...
that any major reform in this area would offend the massive vested interest in the industry, and huge resistance was unavoidable. On the other hand, however, the policy solution at hand was actually very straightforward. Often referred to as the “two-invoice” policy, the first solution was to cut off unnecessary intermediaries in the distribution chain, most of which made few contributions but elevated drug prices (He, 2018). The second solution was to form a larger purchasers’ group, preferably at the national level, to engage in collective negotiation with suppliers. The enormous bargaining power of the centralized procurement would then allow the government to secure lower prices through a larger purchase volume. Apparently, both solutions were nothing novel for policymakers; the challenge primarily stemmed from interest complexities.

With an unprecedented political determination, the central authorities mandated the nationwide implementation of the two-invoice policy in 2017, since its general principles were fairly clear. Because the centralized procurement policy was associated with more stakeholders and the *operandi modus* needed to be finalized through repeated testing, the policymakers steered a pilot program in a top-down fashion from 2018. Four big municipalities (Beijing, Shanghai, Tianjin, and Chongqing) and seven major prefectures kicked off the pilot, commonly referred to as the “4 + 7 pilot.” These cities were selected mainly because they were home to major tertiary hospitals in China and the volume of drug consumption in each city was gigantic. Despite the subnational recruitment of experimental units, the central government played the dominant role in this experimentation and set up a central coordination office to steer local pilots. In order to strengthen central guidance, two high-profile steering conferences were held shortly after the launch of the pilot program to announce detailed instructions, indicating a high degree of central mandate in the reform.

Aside from testing the operational details of centralized procurement, policymakers also wished to create a demonstration effect to the rest of the country. Recognized as a leading model, the pilot of Shanghai was frequently promoted through various official channels. Such pilots would be hardly possible without strong political backing and central monitoring, given the significant reshuffling of vast material interests. The “4 + 7 pilot” yielded highly impressive outcomes, with average reduction of pharmaceutical prices going beyond 50% (Yang et al., 2021). The positive outcomes indeed generated a demonstration effect, as more localities joined the pilot in the subsequent years. Following an interim evaluation of the “4 + 7 pilot” that revealed satisfactory results and suggested further replication, the central government in 2019 decided to scale up the model to the whole country.

The useful lessons learned throughout the piloting process were quickly incorporated into a concrete national regulatory framework. By the end of 2021, five rounds of national-level group purchases had been conducted, resulting in a significant reduction in drug prices and more transparent procurement practices. In the meantime, the regulatory framework and operational details were gradually improved through multiple consultation meetings and policy forums that collected feedback from experts and subnational implementers. This was complemented by several evaluation projects undertaken by research institutes and academics between 2019 and 2020 that examined the local pilots in a systematic manner. Yielding remarkable learning outcomes, this managed pilot program paved the way for the institutionalization of centralized pharmaceutical purchases in the entire country from January 2021.

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10 The five rounds of group purchase took place in September 2019, January 2020, August 2020, February 2021, and June 2021, respectively.
In relation to the systemic fragmentation of the health service network, the information infrastructure of Chinese public hospitals was rather dated. Developed between 1990s and early 2000s, most of these systems were low in terms of technology standards and interconnectivity, hampering the power of big data. It was very common for hospitals to have installed multiple incompatible information platforms that were connected to different social health insurance agencies. In the end, much of the work related to billing, payment, reimbursement, and clinical filing had to be performed manually, resulting in a massive waste of time and resources, and great inconveniences for patients (He & Ma, 2020). The 2009 blueprint included advancement in digital infrastructure as one of the policy objectives. Yet, although upgrading the infrastructure involved a great deal of technical nitty-gritty, the policy solution itself was clear. The 2010 pilot document explicitly stated that building up an electronic medical record system was a key task to be undertaken. Interest complexity was low too because no stakeholder anticipated any major loss. Health facilities were keen, as the reform would not only modernize hospital management but might also bring in additional fiscal investments. Hence, the availability of policy solutions and the absence of resistance created a fairly favorable environment for road-testing pilots.

Immediately after the 2010 pilot document was released, the MoH issued the “Basic Standards of Electronic Medical Records,” for the first time specifying the regulatory and administrative framework. Nationwide pilots soon followed. Because all major stakeholders were keen, the experimental process was smooth, and localities joined through either central designation or voluntary participation. A total of 188 public hospitals from 22 provinces joined the pilots, seeking to validate the prototype framework in a wide range of local contexts and to finalize the operandi modus through adaptive learning. The MoH held multiple onsite meetings, underscoring that local pilots should strictly follow the national regulatory framework and produce good contextual fit. Prior to the release of subsequent policies, several rounds of expert consultation and discussion forums were organized by the MoH in 2011 and 2012 to solicit local feedback and modify policy guidelines. Error detection worked well in the road-testing pilots, as a variety of technical issues regarding data safety, storage, and sharing were resolved, paving the way for the introduction of the “Management Protocols for Electronic Medical Records” in 2017. Peer learning among experimental units also accelerated the pilots. Apart from work conferences that enabled onsite observation of local practices, notable experiences were also disseminated in written form through policy memos and briefing series. By 2018, all tertiary hospitals in China had built up digital infrastructure systems with high levels of interconnectivity (Shu et al., 2019).

Discussion

Through the four illustrative cases presented above, we have shown how experimentalist governance seeks policy solutions in the Chinese health sector. We conceptualized four distinctive experimental modalities based on varying levels of technical complexity and interest complexity, both of which represent salient constraints for policy reforms in a complex system—the health sector in particular. Trail-blazing pilots, crowdsourcing pilots, managed pilots, and road-testing pilots are all associated with distinct mechanisms of
experimentation. It is not the objective of this paper to evaluate how successful or unsuccessful China’s public hospital reform was in terms of conventional health policy criteria, such as the rate of cost escalation, the increase in accessibility, or patient satisfaction. This evidence has been well documented in recent literature (for example, see Yip et al., 2019; Meng et al., 2019). In this present study, we mainly examine the reform in terms of how a huge experimental program sought solutions for wicked problems in a complex system and how it informed national health policy development through multiple modalities of piloting. Our analysis identified three crucial characteristics.

First, while an overarching policy objective was set at the beginning, it needed to be operationalized into meso-level provisional goals, given the huge size of the health sector and its complex structure. The Chinese government managed to incrementally ease the wicked policy gridlock by dividing the formidable reform mission into a series of experimental tasks. Policymakers employed different experimental strategies to solve different policy problems, demonstrating very high levels of methodological pragmatism. The experimental frameworks of these tasks were co-constructed by both central and local authorities in an interactive way. Steering the entire decade-long experimental program, central policymakers left sufficient autonomy to subnational governments for place-based trial and error, but did also intervene by wielding their political power when high levels of resistance impeded reforms. Therefore, the proper role of national government in experimentalist governance does not lie solely in its pragmatic stance toward trialing, but also in its political backing of subnational implementers. This study defies the argument that effective policy learning is difficult in hierarchical regimes due to the emphasis on rule-following and compliance, which discourages innovation and reflexivity (Dunlop & Radaelli, 2018). In fact, the recursive central–local interaction observed throughout China’s public hospital reform has shown impressive dynamism and adaptive reflexivity, despite a highly complex environment.

Second, what distinguishes experimentalist governance and ordinary policy experiments is continuous monitoring by policymakers and iterative multi-directional learning. A host of actors—the central government, local implementers, and public hospitals—all serve as problem solvers, change managers, and learners in a dynamic fashion. The pooling and sharing of pilot experiences enable policy learning and periodic framework adaptation. Buttressing large-scale learning in China is referred to as “informational devices” (Husain, 2017; Xiao et al., 2018). The Chinese governance system owns a fairly comprehensive repertoire of such devices: policy briefs and bulletins within and across ministries, open forums, media coverage, technocrats’ training, inter-visitation programs, advisory groups, the exchange of documents, internal evaluation reports, and all sorts of meetings and conferences. Informal devices especially professional peer networks are also instrumental in accelerating policy learning (Teets & Hazmath, 2020). Table 3 depicts some of them for illustrative purposes. These informational devices have collectively facilitated peer reviews and performance comparisons of ample local practices, playing an instrumental role in generating possible policy solutions.

Third, the emergence and pooling of subnational innovations do not automatically lead to policy synthesis, which must be supported by assessment and feedback—especially so in the health sector, which involves a great deal of technicality. In the present cases, Chinese policymakers rely on the evaluation of various forms to understand and assess the preliminary outcomes and nationwide usefulness of local pilots, before determining whether or not particular experiences should be recognized and promoted. Research institutes, academics, and international agencies frequently offer technical input and rapid feedback (Husain, 2017; Husain et al., 2021). Xiao and coauthors (2018) found that
| Informational device                          | Organization-in-charge | Details of learning                                                                                                                                 |
|---------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Onsite briefing meeting (Case #4)           | Ministry of Health     | November 2010 in Shenyang Introducing the policy framework of electronic medical records Arranging pilot work                                       |
| Expert consulting meeting (Case #4)         | Ministry of Health     | December 2010 in Beijing Briefing the technological solution of digitalization Sharing experience and discussing policy and operational details     |
| Onsite promotion conference (Case #1)       | State Council Health Care Reform Office | August 2019 in Sanming Promoting the 'Sanming Model' of doctor remuneration Stressing the importance of exploring staff remuneration practices |
| China Health Informatics and Technology Conference (Cases #1 & #2) | Chinese Health Information Association | December 2010 in Xiamen Holding forums on electronic medical records and telemedicine Participants including central and local officials, research institutes, academics, and IT companies |
| Steering meeting (Case #3)                  | National Healthcare Security Administration, National Health Commission | January 2019 in Beijing Arranging pilot work of centralized pharmaceutical procurement and highlighting the role of central monitoring Emphasizing key targets and expectations for local pilots |
| Stakeholders’ forum (Case #3)               | National Healthcare Security Administration | June 2020 in Shanghai Collecting opinions from pharmaceutical industry on key issues in centralized pharmaceutical procurement prior to national rollout |
| National Health Reform (televised) Conference (All cases) | State Council Health Care Reform Office | May 2019 in Beijing Sharing local experiments in pharmaceutical procurement, staff remuneration reform, internet-based services |
| Onsite visits (Case #1)                     | State Council General Office | November 2017 in Yan’an Inspecting the progress of staff remuneration pilots Soliciting local lessons to inform national framework design |
| Model demonstration conference (Case #2)     | National Health Commission | November 2018 in Chongqing Officials from Chongqing, Shanxi, Henan, Qinghai and Ningxia sharing pilot experience |
Table 3 (continued)

| Informational device                          | Organization-in-charge                                         | Details of learning                                                                 |
|-----------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Local collaboration forum (Case #3)           | Sanming Municipal Healthcare Security Administration              | May 2020 in Sanming  
Reviewing the progress of local-level drug procurement  
Discussing collaboration details and sharing peer experiences |
| Onsite learning conference (Case #4)          | Ministry of Health                                                | August 2011 in Hangzhou  
Observing the practices of Zhejiang in electronic medical record system and health informatics |
| Interim evaluation (Case #3)                  | National Healthcare Security Administration                      | Interim evaluation of the “4 + 7” pilot for centralized pharmaceutical procurement reform in 2019  
Revealing satisfactory results and recommending national rollout |
| Health Reform Express (All cases)             | Ministry of Health                                                | An official bulletin introducing local reform practices  
10–20 issues per year |
| Pilot Briefing (All cases)                    | Ministry of Health                                                | Local governments contributing articles to report reform practice  
Frequent publication |
| Health Care Reform Briefing (All cases)       | State Council Health Care Reform Office                           | Local governments contributing articles to report reform practice  
Frequent publication |

Intended to serve illustrative purpose, this table is by no means exhaustive.
evaluation serves as a pivotal decision-supporting tool in China’s health reform, and this “utilization-driven evaluative thinking” lies at the heart of effective policy synthesis.

Concluding remarks

The health sector represents a classical example of a complex system in which systemic reforms are highly difficult. Built on a conceptual framework highlighting interest complexity and technical complexity, this study has analyzed how China has managed its massive experimental program of public hospital reform in the past decade. We have shown that the Chinese style of experimentalist governance has performed well in generating policy solutions and reducing uncertainty. Four distinctive experimental modalities have together formed a versatile toolkit that can be used in a multilevel governance system. This study highlights that the performance of policy experimentation is contingent upon good governance arrangements and an effective experimental design, without which productive policy learning does not automatically occur (Mattock, 2021). Piloting as a useful governance tool indeed serve multiple purposes (Ettelt et al., 2015). Should governance arrangements, policy capacity, pragmatism, and informational devices be aligned in a conducive way, experimentalist governance can play an instrumental role in seeking solutions for difficult problems in a complex policy system.

We do acknowledge that this distinctive form of governance hinges on a set of crucial conditions—a multilevel institutional architecture, an unambiguous definition of policy competencies, and an interactive feedback loop between national and subnational actors—that may not be present in all political systems and across all circumstances (Sabel & Zeitlin, 2010; Telle, 2017). Needless to say, many aspects of the cases presented above are highly “Chinese.” It is hard to conceive of a decade-long experimental program involving hundreds of cities and pilots taking place in a liberal democratic system, where party alterations alone would largely rule out such possibilities. In political systems plagued by policy capacity deficits, engineering an experimental program on such a scale would be inconceivable too. Yet, distinguishing China from other authoritarian systems is that this “learning authoritarian state” excels in terms of its adaptive learning and implementation capacity (Heilmann, 2008a). It is ultimately the experimentalist form of governance combined with the Chinese-style authoritarianism that has forged China’s impressive endeavor of healthcare reforms in the past 13 years.

On the other hand, we also contend that the dichotomous conception of authoritarianism vs. liberal democratic politics offers limited explanatory value in terms of understanding the rapid changes in governance worldwide. While the Chinese political system is indeed distinctive, many of the key factors discussed above—the pragmatist stance to experimentation, the periodic review of evidence, and informational devices supporting policy feedback and synthesis—are not unique to China; they are of relevance in broader debates (Husain et al., 2021). When penetrating contextual complexities, problem-solving in a complex system ultimately depends on a governance structure capable of learning and adapting to what is learned through experimentation. For other countries that are also grappling with their health policy problems, lessons from China underscore the critical importance of developing a policy repertoire that enables the dynamic adaptive management of reforms.

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