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Scientific institutions and effective governance: a case study of Chinese stem cell research

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Abstract

In terms of stem cell research, China appears both as a “powerhouse” armed with state-of-the-art facilities, internationally trained personnel and permissive regulation and as a “bit player,” with its capability for conducting high quality research still in question. The gap between China’s assiduous endeavors and the observed outcome is due to a number of factors. Based on interviews with 48 key stakeholders active in Chinese stem cell research, this article examines how the structure of scientific institutions has affected effective governance in China. It is demonstrated that despite China’s recent efforts to attract highly competent researchers and to launch new regulatory initiatives, the effects of these attempts have been diminished by an absence of middle-layer positions within research teams and by the uncoordinated administrative structures among regulatory bodies.

Keywords

scientific institution; effective governance; stem cell research

Introduction

Existing data on China’s life science development often depicts two different stories, both of which are true: on the one hand, China has been most assiduous in promoting scientific advancement. During the period of 1995 to 2005, China’s R&D expenditure sustained an annual average growth rate of more than 18% (OECD 2007a). Yet on the other hand, in terms of China’s patent and publication per unit of investment, the “growth rate of scientific productivity of China’s S&T institutes has been negative since the 1990s” (Huang, Varum and Gouveia 2006, p. 453). In addition, in recent decades, the Chinese government has been most active in rewarding and improving professional excellence, which has attracted an increasing number of scientific personnel trained abroad to join its scientific force (Fox 2007, Schaaper 2009). However, the old rule of “an inclination toward competition and secrecy, rather than openness” (Solo and Pressberg 2007, p. 106) is still predominant among Chinese researchers (Hao and Liu 2005). As one of the expanding fields in China, the development of stem cell research also hosts two conflicting images (DTI 2004, UK Stem Cell Initiative (UKSCI) 2005). To paraphrase Murray and Spar’s (2006) findings, in terms of stem cell research, China appears both as a “powerhouse” armed with state-of-the-art facilities, internationally trained personnel and permissive regulation and as a “bit player” with its capability for conducting high quality research still in question.

As with all national governance strategies, there are a number of factors worth investigating to comprehend the gap between China's endeavors and the observed outcomes. Effective governance theorist, Morten Egeberg has pointed out that discussions on regulatory effectiveness often concentrate on seeking behavioral, cultural or procedural explanations, while showing a lack of interest in how organizational structures "might intervene in policy processes and ultimately shape policy outputs" (Egeberg 1999, p. 155, Egeberg 2003). This is to say, institutional arrangements may affect "actual decision behaviour," as well as influence "coordination, choices and implementation" (Egeberg 2003, p. 116). Current research on China's stem cell governance seems to exhibit a situation similar to what Egeberg described. Existing literature has offered many rich descriptions of particular aspects of Chinese stem cell governance, such as clinical application (Chen 2009), problem framing in basic research (Sleeboom-Faulkner and Patra 2008), economic incentives (Salter *et al.* 2006) and governance participation (Salter and Qiu 2009, Zhang 2010a). Yet how existing institutional *structures* affect the translation of governance initiatives into practice seems to have been less explored. This article provides an initial empirical discussion on China's institutional arrangement and its relation to effective governance in stem cell research. It expands upon arguments made by the author in previously published work (Zhang 2010b). The focus is not to assess individual R&D policy *per se*, but to investigate how existing structures at the micro- and macro-levels (i.e. research group and ministerial level) shape actual policy outcomes.

Data used in this article forms part of a larger study on China's stem cell governance funded by the Wellcome Trust. In 2008, a total of 48 semi-structured interviews were conducted in six cities (Beijing, Tianjin, Changsha, Shanghai, Hangzhou and Guangzhou). Interviewees consist of two Ministry of Health officials, one former popular science editor, seven bioethicists, and 38 stem cell researchers. Each interview was recorded, transcribed and sorted into themes according to reoccurring concepts (Corbin and Strauss 1990). This article contributes to the ongoing discussion on the observed gap between Chinese stakeholders' input and expected research output. It indicates that one of the possible factors impeding effective governance in China's bioscience is the lack of institutional structural adaptations.

Scientific institutions and their role in innovation governance

Before investigating structural influence on the implementation of R&D policies, it is necessary to first clarify why the "institutional milieu" (Morgan 1997, p. 493) is considered to be important to innovation. Previous studies have highlighted two aspects (Rey-Rocha *et al.* 2002, Reagans and McEvily 2003 and Burau *et al.* 2009). First, structural configurations constitute the context in which information flow and decision-making take place within and between existing organizations, such as research institutions and regulatory agencies. Secondly, institutional structures embody and promote norms, routines, and social conventions, which provide the setting that constrains or enables innovative agents' research goals and interests. Innovation system scholar Joseph Leibovitz more explicitly highlighted the function of institutions in facilitating collective learning and nurturing inter-organizational collaborations. He argues that institutions have a key "*co-ordinative role* in terms of reinforcing norms, routines, trust and collaboration within the process of innovation" (Leibovitz 2003, p. 2615, original emphasis). When such roles are not fulfilled, the institution may post barriers to regulatory efficiency. Furthermore, research on national regulatory contexts and biomedical research capacity building have also indicated that besides individual skills development and organizational practices, structural features of research teams and "supra-organizational" support are also vital to R&D efficiency (Cooke 2005, pp. 46–47; see also Albert and Mickan 2003, DOH 2004).

Following this line of enquiry, this article investigates how at both the micro- and macro-levels, China's institutional structures for stem cell research accommodate various research directives. The first section examines micro-level structures, namely the building of research teams. Data suggests that, in many cases, there is a common deficiency in research positions between the team's top level (the professor) and the broad bottom level (research students). In spite of China's recent administrative incentives in attracting global scientific talent, research efficiency may be hampered by the absence of "middle-layer researchers," who serve as the key for team-level exchange of ideas and coordination. In the second section, this article investigates macro-level structure and its connection to effective policy implementation. It is demonstrated that China's recent scientific governance strategies might have been overshadowed by uncoordinated jurisdiction arrangements among different national institutions, such as the Ministry of Health (MOH) and the Ministry of Science and Technology (MOST).

Team structures and micro-level inefficiency

Governing initiatives: single spark set the prairie afire?

At the 2007 National Award Conference for Science and Technology, China's Premier Wen Jiabao highlighted that "the real fuel for scientific progress is research personnel. The greater number of excellent research personnel one country has the more advantage for that country to become the leader in science and technology" (Wen, 2007). The ethos of promoting individual excellence as the core of scientific governance has been reflected in a series of Chinese funding incentives launched since the early 1990s.¹ This is further backed by the State Council (China's highest executive branch) issuance of the State's Decision on Further Strengthening Personnel Development Programs (State Council China 2004 2003) and MOST's recent funding schemes' amendments in attracting more overseas-return scientists (MOST 2007). As the Chinese saying goes "a single spark can set the prairie afire." In the case of the life sciences, key researchers with the appropriate knowledge/experience are seen as the "sparks" or the main force to push China's development forward.

The emphasis the Chinese government lays on professional distinction has successfully created enthusiasm among researchers in obtaining rigorous professional training and better communication skills with overseas partners. Overseas-returns are now the backbone in bringing international experience and fresh ideas into China (He 2008, Schaaper 2009). Half of the 38 researchers I interviewed in China have various types of training experience abroad. The ratio of international experience is even higher among those in senior positions. Among the 21 senior scientists interviewed, 14 have acquired doctoral or post-doc training in Western institutions.

Flat team structure

Despite hundreds of researchers returning to China every year with the expectation of being the "sparks" to initiate regional scientific advancement, the "prairie" of the life sciences has not yet been ignited as anticipated. In fact, China's publications in internationally recognized journals are still low both in terms of quantity and quality (Wang and Wang 2006, Corbyn 2008). Moreover, during my fieldwork, interviewees expressed a shared anxiety that most researchers who have demonstrated high proficiency abroad find it difficult to keep up with their research productivity once settled back in China. One recurring reason indicated by Chinese scientists is that in contrast to the considerable

¹For example, the Cross-Century Foundation for the Talents (MOE 1993), the Hundred Talents Program (CAS 1994), the Spring Bud Program (MOE 1996), and the Chang Jiang Scholars Program (MOE 1998) and the most recent "Thousand Talents Program" supported by a resolution promulgated by the General Office of Central Committee of the Communist Party of China (General Office of CCCPC 2009).

development in scientific practice and supportive policies, the institutional structure of scientific teams has shown little change in the past decade. One Chinese senior scientist, currently based at King's College London, described the circumstances of Chinese researchers as isolated islands.

Scientist 01: I have a very good friend who used to work at NIH, returned to China a few years ago ... I am worried that he cannot maintain the level of research as he used to at NIH. He can't, although he was generously given lots of funds. The government invested 100 million RMB to establish a lab in Peking University ... Lots of money, but he is not able to keep up with his research.

Interviewer: Is it because of lack of research personnel or of management issues?

Scientist 01: Personnel! Just think about it, he returned with no other people in his lab, and his new employees are all PhD students. Research project cannot be accomplished in this way. The biggest problem China facing now is that the only inferior to a professor is PhD student, there is no way to build a "team."

Interviewer: Why is it hard to build a team in China?

Scientist 01: Too many professors. It's not like in the West, where a professor for example, me, I have three lectures, then senior post-docs, then several post-docs, then some PhD students. It's a team where everybody has different roles, makes different contributions ... In China, everybody is a professor; everybody works on their own project; there is no connection between groups. Everybody is their own team-leader. Thus it's hard to make progress.

As pointed out by this respondent, in terms of scientific productivity, it is not just the *professional qualification* of research personnel that matters, but also the *structural arrangement* of these talents. Greater within-team heterogeneity (meaning diverse tasks held by team members) and synergies among members' expertise are positively related with research efficiency (Magjuka and Baldwin 1991, Katzenbach and Smith 1993). Scientist 01's own team in London is one such example, in which the majority of research personnel take up various positions between the team leader and the broad bottom layer, the students. In the Chinese context, however, Scientist 01 pointed out the problem lies in a thin "middle layer" in the team structure. This is to say apart from the "professor" (Scientist 01's friend), the other members of the team were "all PhD students." Despite the generous funding, administrative support and highly capable principal investigators (PIs), the Chinese situation that concerned this respondent was that "there is no way to build a 'team.'"

This insufficiency in middle-layer positions appeared to be not unusual in Chinese science. In fact, among the 22 Chinese research teams I visited in early 2008, six have the bare structure of "one professor and many students."² Even in cases where positions such as associate professors and research fellows do exist, they are more nominal positions than actual functioning members within a team. One such example is from the key laboratory in Nankai University.

I have two associate professors in my team and one technician with undergraduate training ... I did a count the other day, in this academic year we have about 30 students [in my lab], undergraduates, masters, PhDs ... My two assistants [the two associate professors] don't participate in laboratory works ... Well, they are my assistants. I could give them assignments, ask them to contribute to the research,

²One team in Sun Yat-sen University, one in Nankai University, one in Chinese Academy of Sciences, one from Beijing Chinese Traditional Medicine Hospital and two from Peking University Health Science Centre.

but they are relatively independent ... In comparison [with PIs in Western teams], I have less commanding authority over them. (Scientist 06)

Scientist 06 echoed Scientist 01's comparison between the more complex, multilayer, fully competent team in the West and the rather flat team structure in China, where "the only inferior to a professor is PhD student." Scientist 06's team constitutes 34 members, with one professor (the respondent), two associate professors, one technician and 30 students. The staff-student ratio already seems alarmingly low. Yet in reality, the situation is worse. As put forward by Scientist 06, the two middle-layer researchers are rather nominal members of the team who are "relatively independent." By drawing on Chinese researchers' accounts, the key structural difference between "inefficient" (reported by interviewees as common in the Chinese context) and "efficient" (associated by interviewees with "Western") teams can be demonstrated by the graphs in Figures 1 and 2.

In summary, according to interviewees, a productive team structure constitutes researchers with diverse professional ranks, who take up different branches of the research and cooperate at different levels. Yet many respondents identified a popular model of Chinese teams as isolated research islands, in which skilled researchers are separated into many independent one-professor-many-students research groups.

Intra-team support and inter-team communication

As little attention has been paid to teams' *structural* reforms, the output from China's investment in overseas-return scientific talents seemed to be impeded by the missing middle layer in research groups. Two consequences of this structural barrier to effective governance are most visible: (a) the flat team structure led to teams' internal inefficiency in the comprehension and application of knowledge, or the inadequacy of intra-team support; and (b) structural inadequacy in accommodating middle-layer researchers diverted personnel to establishing their own independent research units. In some cases, this has created unnecessary social barriers for research collaborations. This section analyzes these two consequences in turn.

First, the recurring term in Chinese scientists' explanation of internal inefficiency is the absence of "stage," as one scientist in Peking University Stem Cell Research Centre put it:

My impression is that in Western research institutions, once you got a new idea, [supposing that financial and legal conditions allow] you can almost immediately start laboratory works to test your hypothesis, because there are other experienced researchers in the group who together could provide you with a stable stage to carry out your plan. But in China, there is no such stage in the group. However great your idea is, you have to start from scratch, say from culturing cell line or other basic laboratory works (Scientist 14).

Scientist 14 pointed out that contemporary research relies as much on the novelty of ideas as on a "stable stage" in which these innovative ideas can be appropriately tested. This professional "stage" within the team requires diverse expertise which a bare "professor-student" structure cannot offer. In other words, R&D objectives cannot be sustained solely on one person's (the professor's) distinction, but also require a structural arrangement (a "stage") which can host a combination of professional expertise. Another respondent in the Chinese Academy of Sciences further explained team structure and its effects on knowledge transfer efficiency:

I don't think it's fair to say that overseas-returns' individual research efficiency decreases when they settle back in China. They are the same person. But they no longer have the stage to facilitate their work. The output of a research lab has a lot to do with its "intellectual deposits" ... In my view, both the accumulation, or say

the deposit of knowledge/data and the deposit of research personnel are important in producing quality papers ... say if a group has been doing stem cell research for 10 years, of course this group has a bigger research advantage, for it has set up a stage ... But if all you have are new comers, or new teams, you need a long time before [the research] finally gets on track. (Scientist 31)

It is again highlighted that individual team productivity depends on the accumulated efforts from experienced professionals, or what Scientist 31 noted as “intellectual deposits.” In the eyes of interviewees, a team that can stably host skilled researchers in the middle layer, which forms the scaffold of team support, has a “bigger research advantage” in facilitating the realization of members’ scientific potential. In contrast, if a group mainly relies on inexperienced “new comers,” with the convention of junior scientists aiming at setting up their “new teams” immediately after acquiring some experience, then the chance to develop a strong intra-team platform is slim. It may even take “a long time before [the research] finally gets on track,” not to mention yields results.

Furthermore, as many of the potential middle-layer researchers head their own team instead, the increase in the number of solitary research units also implies growing social boundaries in the field of stem cell research, which in effect increased the difficulty for inter-group collaboration.

We’d love to collaborate with anyone that wants to collaborate with us. [But] Under the current research environment in China, I feel that our inner-institutional collaboration is more frequent than other kinds of collaborations. In other words, it’s easier to work with other PIs within our own institution ... There might be two reasons that hindered communication between Chinese researchers within China. One is because everybody is busy, right? The second is precaution. This might not be too significant [a] factor, but it is one of my own concerns There may be no mutual benefit ... We have tried to build up collaborations, but eventually they didn’t work out. (Scientist 18)

Precaution against being taken advantage of and ensuring mutual benefits are undoubtedly universal rules in team communications. The difference lies in under what conditions and to what degree mutual benefits are acknowledged. What is interesting in Scientist 18’s narrative is a delicate yet clear distinction between “precaution” in collaborating with distant groups and with groups in the same institution. This resonates with Lamont and Molnar’s (2002) theory that symbolic social boundaries, such as professional affiliation, also generate a secondary social boundary which is “manifested in unequal access to unequal distributions of resources (material or nonmaterial) and social opportunities” (Lamont and Molnar 2002, p. 168). In the case of stem cell research, this means that the establishment of a new team not only marks a conceptual separation between one group of scientists and the rest, but also produces social boundaries, indicated by the extra “precaution” as regards distant groups. A simplified analogy may help to explain why the organization of scientists affects inter-team communication efficiency: if intra-institution groups have one boundary to cross (group A to group B), then the symbolic boundaries for external groups include several levels (group A to institution A to region A to region B to institution B to group B). All these social boundaries accumulate for potential collaborators to overcome. In other words, the Chinese team structure not only inhibits intra-group discussion but indirectly has negative effects on inter-group communicative efficiency as well.

In short, in the eyes of the interviewees, China’s recent international recruitment of scientific talents seems to only satisfy one of the two necessary conditions in promoting China’s research. Apart from generous funding programs, there also should be corresponding attentiveness to team-building. A common team structure found by this study echoes with

OECD's description that China's life science system consists of a "very large number of 'innovative islands' with limited synergies between them" (OECD 2007b, p. 22). How flat team structures contributed to an over-dispersion of research resources and raised unnecessary communicative barriers are elucidated by the author's previous work (Zhang 2010b). This section, however, is to highlight the correlation between structural particularities and effective governance. The flat team structures affect research behaviors ("everybody is their own team-leader," Scientist 01), hamper intra-team coordination (PIs have "less commanding authority," Scientist 06), set actual research constraints ("however great your idea is, you have to start from scratch," Scientist 14; "precaution" against other institutions, Scientist 18) and result in a research environment with only host "sparks" of individual talents but no "intellectual deposits" (Scientist 31) to "set the prairie afire." To summarize, although China's stem cell governance exhibits generous financial commitments and an encouraging attitude towards world scientific excellence, its output seems to be curtailed at the grassroots level by team structures.

Regulatory institutions and macro-level inefficiency

Governing initiatives: collaborative governance?

At the onset of China's stem cell development a decade ago, ethical oversight was loosely carried out through local institutions. In the absence of a nationally recognized directive, skepticism arose internationally about the quality of Chinese laboratories' working standards and regulatory supervision. Stem cell research in China soon became a symbol for "a morally bankrupt 'Wild East' of biology" (Dennis 2002, p. 334). To enhance China's research credibility, MOH and MOST, the two main regulatory bodies concerning stem cell research, made a collaborative initiative and jointly promulgated the *Ethical guidelines for research on human embryonic stem cells* in 2003 (MOH and MOST 2003). At the time, this was seen as a major step for China to promote coordinated ethical governance across different institutions.

Fragmented administrative infrastructure

Before discussing the implementation of this regulatory initiative, let me first provide a brief account of China's administrative infrastructure. At the macro-level, regulatory responsibilities on stem cell research are divided among a number of national institutions, which enjoy similar legislative status. For example, MOH should "propose development plans for the state's key medical technology and education development, organize key medical and health research" (MOH Charter, www.moh.gov.cn). Stem cell research falls into this category. Meanwhile, MOST is commonly recognized as the principal mediator in China's scientific governance, "which supports big-ticket items and assists in the formulation of science and technology policy" (Ratchford and Blanpied 2008, 227). In general terms, MOH is a key player in setting medical-related research agendas, while MOST has both the regulatory authority and financial leverage in basic research.

The division of managerial accountabilities is not unique to China. In fact, with the complexity of stem cell research, many countries often assign administrative responsibilities to several regulatory bodies. For instance, in the UK, the issue of "processing stem cells" alone is divided into different processing stages and thus falls under the jurisdiction of two separate institutions: the Human Fertilization and Embryology Authority (HFEA) and the Human Tissue Authority (HTA). That is, the HFEA regulates the procurement of gametes up until the point where an embryo is created. Then, it is HFEA's remit to provide oversight on the use of embryos. Once the stem cell line is derived the HTA regulatory remit begins and the HFEA's regulatory remit ceases (Human Tissue Act 2007).

However, there is one major divergence between the British and Chinese arrangements of regulatory bodies. In the UK, both the HFEA and HTA work within the legislation reviewed and approved by Parliament, that is the Human Fertilisation and Embryology Act 1990 and the Human Tissue Act 2007. In China, the State Council's supposed role in cross-ministry coordination has so far only been nominal (Liu 2006), with different national agencies "independently formulat[ing] and implement[ing] their S&T plans" (Zhong and Yang 2007, p. 324). In other words, whereas in the UK, the division of administrative responsibility is based on cohesive decision-making with cross-institution overview, in China, the "current governance system" lacks the "interagency co-ordination to ensure the consistency and coherence of various policies" (OECD 2007b, p. 50).

MOH as the "mother-in-law"

Bearing in mind this fragmented characteristic of regulatory institutions, it may not be surprising to find that in practice, intended collaborative ethical oversight met with low compliance. Scientist 17 explained the situation as follows:

[In practice] the Ethical Committee in MOH cannot supervise anything! One big problem is that MOH is not the money provider [so it has no say in funding decisions]. For example, in March 2007, one major reproductive center was to set up in Shanghai. The funder was MOST. So, the site inspection was hosted by MOST, I [an embryologist] was invited, a few Academicians were invited, but the Ethical Committee from MOH was not invited. [The actual relation between MOH and labs to be regulated is] like what local researchers say "MOH is just a mother-in-law. I won't let MOH cause us additional trouble." For example, if they [MOH] want to inspect my colleague's lab in Peking University, my colleague would tell the inspector, "sorry I don't want to be inspected" ... Researchers dare to do that because MOH doesn't exert influence over MOST's decision on their funding. (Scientist 17)

There are two points worth elucidating in this respondent's account. First, although MOH and MOST jointly endorsed the *Ethical guidelines*, there is not sufficient coordination in implementation. While both ministries employed inspection procedures to ensure decent research conduct, as each ministry had separate regulatory priorities, such inspection was carried out with different emphasis. As noted by this respondent, although MOST required compliance with basic ethical standards, its site inspection was mostly made up of scientific experts. This point echoes several accounts provided by ethicists:

In terms of stem cell regulation, of course they [MOH and MOST] listen to experts' advice, but they only listen to those "hard-core experts" advice. I mean MOST only turns its ear to those scientists that work in the lab, MOST won't listen to us [ethicists]. (Ethicist 01)

Probably it had to do with the nature of their job [priorities]: people from MOST were more inclined to listen to what the scientists say [while] MOH was a bit more cooperative [with us]. (Ethicist 02)

Secondly, as pointed out earlier, there is nothing essentially "wrong" with different ministries having different priorities. Yet what seems to have made MOH's regulation redundant was the fact that existing regulatory infrastructures posed a hindrance for the different priorities to be coordinated. As both ministries were entitled to decision-making autonomy, neither authority (MOH or MOST) can override the other's ruling on whether a particular research project should go ahead. Instead of providing complementary administrative support, regulatory rulings made by MOH and MOST became rivals. When conflicts arose, as demonstrated in the ethical inspection case given by Scientist 17, supposed joint supervision from MOH and MOST became local research groups' "pick-and-

choose” on which ministry to follow. In extreme cases, as the example of Scientist 17’s colleagues demonstrates, as long as they secure MOST’s endorsement, scientists “dare to” ignore MOH’s inspector by telling them, “sorry I don’t want to be inspected.” MOH is associated with a problematic image of a “mother-in-law.” In other words, it was perceived as a non-directly (interests-) related superior who intervenes with research activities. Supposedly a main regulator in stem cell research, MOH became an “excessive” authority and its ethical guidelines “regulations-in-theory.” Subsequently, the supposed collaborative ethical supervision was overshadowed by individual ministerial funding decisions.

The fragmented nature of regulatory authorities also offset potential assistance from scientists in achieving effective governance. One life scientist, who had been working in Nankai University for two decades, explained his indifference in shaping regulatory directives as follows:

Every [administrative] office has their own standpoints, they have their own interests to take into consideration, so they view things differently from each other. I am not interested in making any suggestions to the current administrative system. No, no use ... they are neither going to listen to you nor listen to their peers in other administrative branches ... so what’s the point of me wasting my time communicating with them? ... I am not being cynical or anything. It’s the system. If I were in their shoes, I’d think from my own point of view as well. Everybody take care of their own business, that’s all. (Scientist 11)

This professor witnessed China’s scientific reform in the past 20 years, and during the process was well connected with the scientific community in Tianjin. Yet, precisely because of his years of experience working as a scientist in China, this respondent deemed that the current governance initiatives made little difference in terms of actual governance efficiency, for one thing remained unchanged: the conventional administrative divide. In practice, as the decision-making authority and priorities in regulatory bodies were structurally independent from each other, administrators had little interest in incorporating wider concerns from researchers or “their peers in other administrative branches.” Scientist 11 highlighted the seriousness of this structural limitation by stating that this was not a “cynical” opinion, but a matter-of-fact condition that would distort anyone’s original objective if one “were in their shoes.”

Similar to what has been demonstrated at the team level, at the ministerial level, many intended regulatory effects also fell short for they were discounted, offset, or even distorted, by the existing configuration among different administrative branches. The situation of China’s stem cell research echoes Egeberg’s (2003) findings on the connections between bureaucratic structures and policy implementation. That is, actors within an established ministry may be subject to particular moral and collegial pressures in challenging existing organizational incentives (such as narrow priority setting described by Ethicists 01 and 02) or amending institutionalized norms (such as uncoordinated site inspections described by Scientist 17). Thus, the reluctant “sympathy” Scientist 11 expressed towards regulators in different ministerial offices reflects Egeberg’s argument that “structure can never be neutral,” but always functions as a “filter” of potential alternatives and promotes certain actions (Egeberg 2003, p. 117). In other words, for a coordinated ethical governance to come into effect, MOH and MOST may need more than a joint promulgation of guidelines. They may also require corresponding structural adaptations in their jurisdictions.

Conclusion

In many ways China has been most diligent in employing new managerial leverages to promote effective scientific governance. Yet, “unsupportive framework conditions”

and "insufficient interconnection among innovative systems" (Guinet and Zhang 2007) often weaken China's scientific initiatives. Despite generous institutional patronage, some have noted that "China does not yet have the infrastructure in place to fully take advantage of this increased spending" (Lane 2008, p. 256).

This article provides an empirical examination of how China's institutional structures influence effective governance. At the research team level, structural deficiency in retaining middle-layer researchers places practical constraints on the efforts of research personnel to fulfill national funding schemes' expectations. Similarly, managerial divides among national institutions also obstruct intended coordinative governance. When jurisdictions overlap, different social authorities may compete, diverge, or contradict in administrative judgments, which creates confusion and promotes inconsistency and minimal conformity with the law. This article is not aimed at proposing what an optimal regulatory institution structure should be, as this requires a separate investigation. It does however demonstrate that regulatory *structural* changes, especially in the case of Chinese stem cell research, should be regarded as vital as updating the managerial agenda in achieving effective governance. In all, just as a flat team structure cannot provide a sound "stage" for scientists to carry out their innovative ideas, the fragmentation of decision-making failed to enlighten a coordinated and well-balanced "platform" on which responsible research can efficiently proceed. Effective governance demands a parallel attentiveness to the structural organization of key stakeholders, such as scientists and regulators.

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Figure 1.
Inefficient teams structure in the eyes of interviewees.

Figure 2.
Efficient team structure in the eyes of interviewees.