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The dual reality of the Chinese knowledge economy

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Abstract

This paper draws on stem cell research and financial derivatives as two case studies to analyse the role of scientific knowledge and technology in the development of the Chinese knowledge economy. The findings suggest that, despite China's recent commitments in acquiring international expertise, there is a decoupling between knowledge acquisitions and applications in the institutionalisation of knowledge within these sectors. Scientific-based knowledge and professional know-how are on the one hand perceived as prime drivers of China's development, yet they on the other hand remain subordinate to existing administrative infrastructures. The paper further elucidates the causes and implications of this by describing the dual reality of knowledge in relation to an isomorphic process of rationalisation outlined by new institutional organisational theory.

Keywords

institutionalisation; science; knowledge, stem cells; financial derivatives

1 Introduction

According to a most recent survey conducted by the United Nations Conference on Trade and Development (2009), China is considered the world's most favoured destination for R&D investment. Further, harmonisation with global standards and the importation of global knowledge into Chinese institutions are considered important for China both to further sustain its competitiveness and to realise potential investment returns (Auerwald and Branscomb, 2008; Pilat et al., 2009). Centring on stem cell research and financial derivatives, this paper examines the role knowledge plays in the development of the Chinese knowledge economy. These are two different sectors that have both received increasing attentiveness in China for their implications on global competitiveness. They provide complementary insights into the evolvement of an increasingly knowledge intensive Chinese economy.

Finance is a service industry while stem cell research may be best described as applied medical research, which with the potential of stem cell-based remedies forms a production industry. Following consecutive economic reforms in the early 1980s and the mid-1990s, China's financial market has much expanded (Neftci and Ménager-Xu, 2007). Currently,

there are more than 1700 companies listed on the stock exchanges in Shanghai and Shenzhen. Some of the largest IPOs have taken place in China. To further the efficiency of the already expanding markets, derivatives markets have also been created. Commodity futures exchanges have existed in Shanghai, Dalian and Zhengzhou since the early 1990s. In recent years, interbank markets (OTC) for derivatives, such as FX forwards and swaps, have also been created. Meanwhile, stem cells have come to be seen as central to the development of regenerative medicine. Stem cell-related patents by Chinese firms or scientists have enjoyed an approximately 30% annual growth rate in the last decade (Salter et al., 2006). Although still at its early stage, experimental stem cell therapies have already contributed to the treatment of a variety of diseases in China, such as cardiac repair, graft-versus-host disease, limb ischemia, liver disease, neural repair and idiopathic pulmonary arterial hypertension (Liao and Zhao, 2008).

While the two industrial sectors are different, several features tie them together. Not only are they both knowledge intensive sectors, but more importantly, both have undergone an institutionalisation process, where formal and codified organisational routines, technologies, regimes and practices – predominantly science-based – have been implemented. As such, the Chinese stem cell industry and the derivatives sector both have, to some extent, been ‘Westernised’ as they have adopted professional conventions (such as peer-review procedures, ethical standards, accounting standards and use of derivatives pricing models) mostly initiated or invented in the West. This paper focuses on these institutionalisation processes which are simultaneously knowledge transfers.

Yet, as is demonstrated in this paper, these institutionalisation processes have not been penetrative. Although Chinese stakeholders at all levels have been most keen on engaging with global exchanges and learning from international community, China’s building of a knowledge economy is not a simple importation of knowledge with a subsequent ‘isomorphic’ assimilation process (Powell and Dimaggio, 1991). Rather, data suggest there has been a decoupling between knowledge receptions and its applications at certain phases of the knowledge economy. Scientific information and professional know-how are both perceived as a prime force to drive China’s development and as subordinate to existing administrative infrastructure.

By identifying this dual reality of knowledge utilisation in the Chinese setting, this paper contributes both to the explicit understanding of China’s institutionalisation process and to a more general comprehension of institutional hybridity which many ongoing social transformations may share with the one described here.

2 Methodology and structure

Data used in this paper are based on interviews with key Chinese stakeholders and practitioners. For the case study on stem cell research, 38 Chinese scientists were interviewed in six cities (Beijing, Tianjin, Shanghai, Guangzhou, Hangzhou and Changsha) during the period of 2006 and 2009. This research employs a grounded theory approach (Charmaz, 2006), in which data collection and social science literature reviews were repeatedly carried out at different stages. Through detailed and repeated analysis of the data, the transcripts were then indexed into themes by identifying reoccurring concepts (Corbin and Strauss, 1990). The interviews were focused on the formation of stem cell research practices in China.

The case study on financial derivatives draws on 30 transcribed interviews which were indexed as described above (Corbin and Strauss, 1990). The research on derivatives markets was from the outset focusing on derivatives traders’ perceptions of risk in the context of

Chinese financial markets. As such, the interviews sought traders' accounts of their work with the aim of analysing the meanings (Kvale, 1996) which were attributed the market environment in which the traders work.

The subsequent sections are organised as follows: First, the role knowledge plays in the creation and development of stem cell and financial derivatives industries will be examined in turn. Second, the common themes emerging from the two cases are discussed in relation to new institutional organisational theory. Finally, a conclusion is presented.

2.1 Case one: stem cell research and the two-tier funding mechanisms

China "has made biomedical science a central plan in its bid to become a dominant force in the global knowledge economy" (Salter and Qiu, 2009, p.4). In particular, a series of funding incentives (MOE, 1998; State Council, 2003; MOST, 2007) have been focusing on attracting overseas-returns Chinese as a means to transform "'brain drain' into a 'brain circulation'" (OECD, 2007, p.29; Schaaper, 2009). The number of stem cell-related projects funded by the National Natural Science Foundation of China (NSFC) has increased with nine projects in 1999.

Yet, despite the attentiveness in promoting the domestic knowledge economy by keeping up with global research, it remains a major challenge how scientific expertise would be accommodated by and interact with regulatory frameworks. Although China has continuously taken new science and technology (S&T) initiatives since 1985, the "S&T administration system has not implemented any major changes for more than 20 years" (Zhong and Yang, 2007, p.324). Regulatory decisions and social resources are still mainly channelled through governmental administrative branches (see Huang et al., 2004; Ratchford and Blanpied, 2008; Song, 2008). Major funding sources can be traced back to a few national agencies, such as the Ministry of Science and Technology (MOST, 2007), the NSFC, Chinese Academy of Sciences (CAS) and the Ministry of Education (MOE, 1998). Alternative funding, such as venture capital, business investment or social charities, remains limited [Liu and White, 2001; UK Stem Cell Initiative (UKSCI), 2005]. In other words, current Chinese R&D still relies on a much centralised regulatory infrastructure and depends upon governmental funding. Consequently, when global scientific information and know-how are imported into Chinese research communities, they are not automatically assimilated into institutional decision-making. Rather, as will be demonstrated in the following paragraphs, the reception of new knowledge prompts a two-tier expertise-dependence mechanism. At one level, decisions on scientific investments are said to be made by "relying on experts and developing democracy to select best proposals" (Zhu and Gong, 2008, p. 298). Some national agencies, such as NSFC, have extended its peer-review panel to the international scientific community, as a means to ensure that China's progress keeps pace with the latest global development (Zhu and Gong, 2008). Yet at another level, data suggest that the rigour of influence professional knowledge has on China's scientific investment decreases as the level of research programmes go higher up (from local to national). Nationally speaking, "top-down, nationally mandated programs' that 'seem to favour hierarchical guidelines'" (Nichols, 2008, p.440) still play a dominant role in the allocation of resource in the bio-industry.

This two-tier expertise-dependence mechanism was suggested by many interviewees during the authors' fieldwork. One such example was from a professor in Zhejiang University, who explained the funding process as follows:

The funding system in China is like this: the smaller the grant, the more stringent the reviewing process. The bigger the grant, the less rigorous the review is. If it is a billion-RMB project, there is virtually no reviewing process. Who the grant-holder

will be has already been decided internally by funding bodies before applications are sent for 'peer-review' (Scientist 04).

Scientist 04 described a situation in which, at one level, modern reviewing procedures were more or less in place, while at another level, with the increasing size of grants, there was a decreasing weight given to open competition. When it comes to '100 million-RMB projects' (roughly equal to 10 million Euros), peer review became only a matter of formality: 'Who the grant-holder will be has already been decided internally'. Such descriptions echo Cao and Suttmeier's (2001) study on Chinese scientific communities. This study pointed out that at the grass-root layer, where small grants or so-called 'mianshang' projects (Cao and Suttmeier, 2001, p.965) were given out, funding decisions were based on open peer review and scientific merit. Meanwhile on the top layer, which consists of 'key (zhongdian) and major (zhongda) programmes', actual executive power still mostly lies in centralised decision-making rather than being based on 'the intrinsic merits of a proposal'. Techno-bureaucrats, such as yuanshi (Academicians of CAS), were entitled to "inappropriate influence in recommending the types of projects which should be included in the guidelines for proposals" (Cao and Suttmeier, 2001, p.966).

It is useful to highlight here that both in Cao and Suttmeier's (2001) study and in Scientist 04's account, there was not a complete ignorance of scientific peer review. Quite on the contrary, both the 2001 study and Scientist 04's account support the fact that peer review had been quite 'stringent[ly]' carried out in circumstances where it was (allowed to be) applied, namely distributing small grants. The point is, however, that professional knowledge was given different weight in the funding of 'mianshang' projects and 'key' projects.

Yet the role of professional knowledge in determining resource distribution at the upper level (major programmes) and the bottom level (small scale/local programmes) is not clear-cut and is being increasingly challenged. One such example is from a professor in Sun Yat-sen University:

Many funding schemes internally decide who to fund. Including the 863 Program and the 973 Program [administered by MOST], they are the same. Those decision boards are very clear about who these grants will be given to, mostly to their affiliated institutions.... I once applied for a scheme sponsored by a ministerial department. The feedback from the review board was all good. But this department has its own affiliated institutions to feed. So we didn't get the grant at first. But [comparing to the team internally-decided by the funding body], our proposal was too good. It was too obvious a favouritism. So we made our appeal, then we shared the grant with the [internally-decided] team (Scientist 04).

There are three points in Scientist 04's statement that are worth highlighting. First, it exhibits a tension between scientific expertise and administrative convention. This respondent's application was initially rejected, not on the basis of its research value but on the basis of his institutional affiliation. Yet this ministerial department did respond to Scientist 04 with the good comments from peer review. But his application was turned down anyway. In other words, there was no obvious attempt of a 'cover-up' from the ministry for its allocation of scientific resources on a basis other than peer review. This leads to a second point. That is, it seems that Chinese regulators recognised professional assessments as both important and inferior to ministerial decisions. Third, and most interestingly, there seems to be an emerging limit to this traditional managerial discretion. When institutional interference was 'too obvious', appeal based on scientific argument can exert a certain leverage and alter governmental decisions. In the case of Scientist 04, his appeal was a

partial success, as he shared with the internally decided team the grant that could have been all his.

A similar example is the experience of Scientist 16, whose application on stem cell-related tissue-engineering was originally rejected by NSFC. On a private occasion, one regional grant administrator told him that although people were impressed by his research capabilities and academic profile, the board thought he was too young (Scientist 16 was in his 30s) to be granted major funding. Thus, they internally decided to reject Scientist 16's application and granted the funding on a similar topic to a less outstanding scientist in his 50s. The irony of this case was that, after being denied a national grant, Scientist 16 applied for an alternative local governmental funding and received, albeit a much smaller, grant. Soon his team raced ahead of the parallel research lead by the older scientist. By the time the author revisited his lab two years later, the administrators, who once thought Scientist 16 should 'wait for his turn' in handling a major grant, had already tried to invite him to be incorporated into the bigger project. The reason, Scientist 16 specified, was that it would cause (political) embarrassment if the 'chosen team' with major national funding had been exceeded by a 'rejected team' supported by local funding.

The dual reality confronted by scientific expertise in China can be recapitulated as such: at the upper level resource distribution, professional knowledge (such as national/ international peer review) is recognised as important but subordinate to administrative conventions. In the above case, the NSFC panel acknowledged the research potential of Scientist 16's proposal. But internal preference overrode the scientific evaluation. Just as described by a 2006 Science article, at least in terms of national major funding, the Chinese scientific community still resembles 'a milieu of unhealthy relationships' in which "success often depends more on how well a scientist cultivates support from grant managers and politicians than on the quality of research" (Xin et al., 2006, p.1464). At the lower level, namely 'mianshang' projects or local scientific schemes, professional opinions seem to exert more influence over the course of research development. Scientist 16's project, denied of NSFC funding by internal decision but supported locally, is one such example.

Cases such as Scientist 16 who was later 'invited back' to the major project and Scientist 04's successful appeal seem to suggest that there is an emerging negotiable area over top-down decisions on the 'chosen teams'. Yet, such cases require persistence from grass-roots stakeholders and do not come without temporary impediments to scientific progress (such as insufficient financial support or research delay). Instead of 'directly' shaping China's innovation progress, in most cases, there seems to be a 'detour' before scientific knowledge can influence research directions.

2.2 Case two: finance and the dual reality of professional expertise

The development of the financial sector in China mirrors closely the general economic reforms in the country. After reforms launched in 1978, the big four Chinese banks were (re) created, that is the Bank of China, the Agricultural Bank of China, the Construction Bank of China and the Industrial Bank of China. In the 1980s, smaller commercial banks were being established. In the early 1990s, stock exchanges in Shanghai and Shenzhen were established together with commodity futures markets (see above). Since the mid 1990s, a host of commercial banks has been established. The big four Chinese banks have been reformed which, above all, means that loans to SOEs have been written off and the Basel frameworks have been implemented. This process started as early as in 1994, when smaller policy banks were established with the aim of reliving the big four banks of this function. The People's Bank of China acts as the national bank in China. Although many SOEs have been privatised, the Chinese government, as well as local governments, continues to own big

stakes in now private companies. Structurally speaking, there is, even today, a marked degree of government control.

Governmental control is visible also in terms of financial regulation and the general architecture of the financial markets. Foreign investors are monitored through a Qualified Foreign Institutional Investor (QFII) scheme, while domestic investors can only invest abroad through the Qualified Domestic Institutional Investor (QDII) scheme. The exchange rate of RMB remains under government control. The RMB interest rate has not been liberalised either. An intermediary step towards this has been the creation of the SHIBOR index rate (roughly similar in method of calculation to LIBOR). Although current market cap of China's listed companies exceeds 50% of China's annual GDP, there are a range of regulatory measures which results in the government still being able to exercise corporate control. Shares are divided into two types (A and B), with one being opened to domestic investors and the other to foreign investors. Although this distinction has been blurred over time, shares continue to be divided into subcategories with only one category being traded freely on the exchanges. Many of the other shares are owned by the government or governmental investment vehicles.

In spite of the very special traits of the Chinese economic architecture, common policy statements assert that a sound and efficient financial system is seen as essential for creating the investment flows necessary for economic growth, channelling in foreign direct investment, managing financial and economic risk associated with high volume of export and monitoring both incoming and out-flowing foreign direct investment. It is on this background that China's government gave a green light for the creation of interbank financial derivatives markets. The process primarily took place in 2004–2006.

The products which are traded in the interbank market are relatively simple derivatives. They include FX forwards and swaps, RMB/foreign exchange currency swaps, interest rate swaps, interest rate forwards and bond forwards. Trading on the interbank market, as is the case for all securities trades, is regulated by the China Securities Regulatory Commission (CSRC), a spin-off from the PBC. The regulatory framework is quite similar to the sector-based system in the USA (Huang, 2010).

These developments are of course only possible through the employment of Western expertise, both in regard to the design of market infrastructure (trading platforms, clearing, regulation, etc.) and derivative products creation and asset pricing. This expertise has been transferred into China in different ways. First, the transfer has taken place through the stream of Chinese students who have attended business schools and universities in the USA and Europe (Jongsthapongpanth and Bagchi-Sen, 2007). Many of these have then returned directly to work in Chinese banks or the Chinese government. Others have first had a stint working in Wall Street or the city of London before returning. Second, Western banks actively strive to disseminate knowledge in the Chinese market place. At least one of the big Western banks operating on a large scale in the interbank derivatives market conducts regular seminars for smaller Chinese banks on asset pricing and risks assessment. Many of the Chinese banks only promote staff to middle management positions if they have completed 3–6 months post experience education courses in finance. And finally, the implementation of Basel II, although this in some cases has lead to the creation of Potemkin villages rather than real reform, has without question helped to spread knowledge about financial theory and risk management in Chinese banks.

At the same time, however, the development of China's financial institutions seems to follow a common trajectory of (centrally planned) knowledge and technology transfer in that the temporal order of the institutional and regulatory development seems wrong. This often

creates an impression of window dressing, when, for example, a regulatory measure is created before there are activities to be regulated. 'Attempting to build the third story of a building before the second story' was an expression dryly used by one interviewed trader. Another trader puts it as follows:

The most traditional way for Chinese banks to make money is to get deposits from clients at a very low rate and let the loans climb at a high rate so that the interest rate difference is huge. But nowadays the central bank is trying to change the institution. They want to free the interest market, but the government always does things in a step-by-step fashion. And before they free the interest market they announced they will establish a forward market. The order is wrong (laughs) (Trader 18).

While further liberation of the financial sector may seem as a dominant theme in the current portrait of China's emerging market efficiency or maturity, the other side of the story is that the Chinese government continues to exert strong influence over the financial markets. This happens both through regulatory schemes such as QFII and QDII and through strong, yet often informal, control over the big four Chinese banks (Bank of China, China Construction Bank, Industrial and Commercial bank of China and China Agricultural Bank). These four banks are the main market makers in the interbank markets. According to the interviewees, they exert considerable influence over the market, not least because they are regarded by other market participants as having privileged access to information. Hence, instead of making their own decisions on basis of acquired knowledge, other market makers tend to follow the lead of the four banks.

They [the smaller market makers] will think that... it is the practice, no, I'll say the convention, that the Bank of China or the Agricultural Bank... are all government controlled. We view that when some new policy comes out, they will get instructions first. So that is why all the other market makers will follow. Because they will think that their [the big four] behavior may instructs something – they [the smaller market makers] just don't want to miss something, new policy or something (Trader 09).

Chinese economic policy is often described with the term 'gradualism'. The rationale is that unlike the sudden transition from state to market economies in the former eastern European Block, China has made a slow and careful transition (Hsu, 2005; Redding and Witt, 2007). However, it is far from clear if China's approach will lead to the creation of market institutions in forms that are familiar to the West. Indeed, gradualism also refers to a situation where there are ongoing discussions about reforms versus tradition within the government and party (Naughton, 2008). More importantly, China's gradual transition has been a process in which the government, albeit not so much the central as the local government, has become a prime motor for new economic development. In spite of the privatisation of many state-owned companies, the Chinese government has taken on new and extensive economic roles in various forms of partnerships with private entrepreneurs in such a way that there is great competition between local branches of the government which again has created a much higher efficiency than in the time of the SOEs (Walder, 1995). The result is that "in China, the government is the entrepreneur" (Khanna, 2009, p.37).

Of course the continuing dominant role of the state does not necessarily mean that a slow process towards a Westernisation of financial institutions will happen. Yet, a Western and former high-level financial consultant to the People's Bank of China clearly stated that the Chinese government, in his experience, was wary of being too embedded in Western financial systems due to the belief that this would lead to the creation of Western institutional structures and make China dependent upon Western expertise. There seems to be general consensus in the industry that the Chinese regulators do not intend to create

neither institutions nor regulatory schemes similar to the West as this is seen as a pathway to volatile markets beyond state control. Not surprisingly, the financial turmoil in 2007–2008 is seen as having fortified this perception.

This paper is not to speculate whether the development of the Chinese markets is on course towards matching generic Western markets structures or whether they will maintain their distinct characteristics. Rather, we note that interviewees commonly describe how they, in their daily practices, negotiate a dual reality. While Western theories and pricing models are commonly recognised by Chinese stakeholders as essential knowledge in developing a robust financial sector, their functions are often negotiated and even discounted in actual market operations. One example could be the following observations from a trader:

[There is] no correct yield curve because the interest rate market hasn't been liberalised. The PBOC still controls the rates for the client and lending. But for interbank there are no restrictions because the interbank price will be decided by the real supply and demand which means that we have different markets... That is why it's difficult to get a correct and objective...market level...what the real market level is for that interest rate. Even now we have SHIBOR, but that actually doesn't affect the market value. When the SHIBOR was just announced in 2006, we could see that [...] for the very short term, the prices were correct which mean that you could deal with other parties. But for other tenures...all the other like 3 months, 6 months, we have really dealt with all the counter parties and you have to put in margins (Trader 22).

3 Discussion

The role of knowledge in China's knowledge economy can be summarised into the following points. First, the importation and accumulation of global knowledge seems to be attributed a value in its own right. Even in cases where new knowledge does not exert obvious influence over stakeholders' decisions or course of actions, bringing in international practice and expertise is considered a necessity. In both the case of stem cell research and financial sectors, Western training and familiarity with novel know-how are considered a prerequisite for individuals to acquire a job or secure a grant. What is more important, despite the fact that major research grants are still determined by internal administrative decisions, peer reviews with national and international expertise inputs have been employed as standard procedures by funding agencies. Similarly, although markets are still largely dominated by top-down directives from the central bank, financial derivatives models and other forms of technical financial knowledge are being used, and an index such as SHIBOR has been created. In other words, even in the absence of clear administrative functions assigned to newly imported practices, there has been an institutionalisation of formal structures based on science in parallel to existing decision-making conventions. This is not to deny the utility of professional expertise and tools. But it indicates that importance attached to knowledge must be explained through other things than utility only.

Second, as demonstrated by the development of both sectors, the motive for implementing new knowledge and standards may not necessarily be the improvement of productive efficiency but rather the expansion of resources for administrative control. In the research setting, global professional expertise is incorporated not as the foundation for better funding strategies but as subordinate to administrative conventions. In the financial setting, Chinese regulators hesitate in creating new institutions or regulatory schemes on basis of Western know-how, as this is seen as a pathway to volatile markets beyond state control. In this sense, we argue that the role of knowledge is perceived less as a helping hand in transforming institutional norms into more effective ones and more as a resource for enhancing institutional capabilities for comparison and control. This finding corresponds

with previous empirical studies which suggest that the importation of global knowledge is about increasing institutional governance options rather than replacing existing ones (Pilat et al., 2009).

This highlights that a correlation between knowledge transfer and institutional change may not be straightforwardly assumed. Instead, as suggested by the Chinese experience, hybrids between economic and regulatory schemes may emerge. The dual reality confronted by the Chinese knowledge economy may not be unique, but may be indicative of the dynamic between knowledge and institutions in emerging economies' path to global competitiveness more generally.

The existence of such dual reality can be explained as a process of coupling and decoupling. Powell and Dimaggio (1991) have pointed out that modern organisations or field of practices often are established through an isomorphic process, in which scripts of rules and specifications are institutionalised and subsequently disseminated, imitated and adapted by other social actors. Through this process, different rationalised conventions gain a symbolic (i.e. persuasive) power, which enable them to be perceived by certain groups as a means to promote their interests. Among all forms of such 'scripts', scientifically acquired knowledge (such as research data and financial models), with its abstract and theoretical nature, is arguably among those most easily diffused. Such scientific scripts transcend the details of local reality and hence are applicable to many specific situations and contexts (Strang and Meyer, 1993). Moreover, the authority of science makes scientifically grounded practices and scripts attractive in situations characterised by high uncertainty.

But organisational practices are often decoupled from these institutionalised scripts and conventions. In fact, as has also been pointed out by new institutional theorists, "the more inspiring and universal the values and claims at the institutional level are, the more bounding and decoupling at the practical level are likely to result" (Drori et al., 2003, p.15). As written, such decoupling processes are clearly exhibited in China's stem cell research and financial sectors in particular in regard to funding decisions and market behaviour.

From a top-down perspective, it is arguably so that in the Chinese setting hierarchical centres in existing institutions are comparably more influential in filtering, selecting and incorporating knowledge than what is usual. As Strang and Meyer (1993, p.495) have noted, sciences and scientific professions are communities that are 'relatively central, prestigious, influential' and they thus play a key role in theorising and promoting the diffusion of global knowledge. Yet, cross-border transference of knowledge requires support from existing social authorities as well – something which seems particularly important in China. As Meyer and his colleagues' later study indicates, 'pick-and-paste strategies' are often used in which "only some components of the global model of science are [deemed, authors' addition] transferable or that only some components of the global model are appropriate for the local context" (Drori et al., 2003, p.213). Although the Chinese individuals interviewed (scientists or bankers) are either Western trained or highly familiarised with global practices, it is high ranking Chinese officials that 'pick (not copy!)-and-paste' how the range of expertise should be incorporated into their management norms. In other words, the embodiment of global knowledge at the individual level is not automatically assimilated and presented at the institutional level. Quite on the contrary, Chinese institutions have shown reservation, even some resistance, in institutional adjustments in accordance to international know-how. This is the reason for the tension described above. And it shows that there is not simply an isomorphic assimilation process going on, but a more complex process where selected elements are institutionalised.

Reversely, it is clear that, from the bottom-up perspective, individual practitioners do not possess the same leverage in influencing professional norms as authorities at the upper-end of the command chain. Yet, the institutional need to acquire global knowledge (so as to further stabilise administrative control) does empower professionals to some extent to influence institutional actions. Although peer review and financial derivatives have not constituted a central role in China's institutional administrations, they nonetheless have become an important reference. In some cases, as demonstrated by this paper, grass-root practitioners can use this relevant knowledge to influence, revise or even overturn executive decisions. Similar dynamics among grass-root actors and institutions in acquisition of new knowledge can be found in Jang's study on the global diffusion of ministries of science and technology. Jang (2003) pointed out that institutional change is often initiated by political pressure or economic competitions, but successful transformations ultimately depend on "nonstate actors such as the sciences and professions, who advice [nation-states] on what to do" and "how they should behave" (Jang, 2003, p.123). In other words, the non-penetration of knowledge transfer or the decoupling of policy from organisational practice in the Chinese context may not necessarily be the limits of globalisation, but may indicate a prolonged process of new institutional balance in the making.

4 Conclusion

Many previous studies have elaborated on how knowledge can be better transferred to improve local efficiency and productivity (see Fritsch and Kauffeld-Monz, 2008; Luo and Hassan, 2009; Loof and Andersson, 2010). However, despite the fact that knowledge is a key element in modernisation, and scientifically based technologies and conventions may enhance productivity, the role of scientific knowledge in the development is far from straightforward. Data from two sectors (stem cell research and financial derivatives) have suggested a dual reality in China's institutionalisation of scientific knowledge, technologies and conventions.

On the one hand, both the Chinese stem cell sector and the derivatives industry have undergone an institutionalisation of formal organisational practices which in both cases is grounded on the authority of science. Among these are – in the former case, the adaptation of scientific conventions; and in the latter, the employment of 'scientific' or objective forms of risk management. This finding is in line with Strang and Meyer's (1993) theoretical analysis that a key incentive for institutions to acquire global know-how is to translate diverse activities in different societies into 'comparable' entities and to "theorise the universal and beneficial relevance of new and otherwise alien social materials" (Strang and Meyer, 1993, p.506). The symbolic authority of science lends power to such a process. Yet, on the other hand, current regulatory settings in both the R&D and finance sectors reproduce existing hierarchical structures in which developments are led by top-down directives, relying on centralised resource control. The diffusion of professional knowledge and global practices in China's building of its knowledge economy is shaped by and interacts with pre-existing political structures and interests.

By examining two examples of a new institutional balance in the making, this research not only provides empirical evidence of how knowledge is identified, processed and utilised in the Chinese context. Findings of this paper also extend and enrich the understanding of the isomorphic processes as well as decoupling proposed by new institutional theory. It specifies three features of how the coupling and decoupling processes are perceived and operated on the ground. First, accumulation of global knowledge is attributed a value in its own right, decoupled from utility, simply because the scientific basis of the knowledge adds credence to the institutional field, in which it is implemented disregarding any eventual utility. In this way, institutionalisation of formal structures based on science often precedes a recognition

of its administrative functions. Second, the motivation for importing global knowledge is linked and perhaps motivated by attempts to maintain existing institutional control rather than general enhancement of organisational efficiency. We find that institutionalisation of scientific knowledge rarely happens in ways which radically change existing power structures (that it may plant the seeds of change is a different question, but we would be cautious even of that assumption). Finally, the just mentioned reproduction of existing power structures and the identified dual reality more generally should not be interpreted as an institutional rejection of scientific knowledge but rather be seen as an example of how the Chinese authorities carefully – and so far rather successfully – have integrated various economic sectors in the global economy without losing political control. We suggest, in other words, that the dual reality we have identified in our case studies is part of a grander hybridity of government control and market economy.

Biographical notes

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References

- Auerwald P, Branscomb LM. Research and innovation in a networked world. *Technology in Society*. 2008; Vol. 30(Nos. 3/4):339–347.
- Cao C, Suttmeier RP. 'China's new scientific elite: distinguished young scientists, the research environment and hopes for Chinese science'. *China Quarterly*. 2001; Vol. 168:960–984.
- Charmaz, K. *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. Sage Publications Ltd.; London: 2006.
- Corbin JM, Strauss A. Grounded theory research: procedures, canons, and evaluative criteria. *Qualitative Sociology*. 1990; Vol. 13(No. 1):3–21.
- Drori, GS.; Meyer, JW.; Ramirez, FO.; Schofer, E., editors. *Science in the Modern World Polity: Institutionalization and Globalization*. Stanford University Press; Stanford, CA: 2003.
- Fritsch M, Kauffeld-Monz M. The impact of network structure on knowledge transfer: an application of social network analysis in the context of regional innovation networks. *The Annals of Regional Science*. 2008; Vol. 44(No. 1):21–38.
- Hsu CL. Capitalism without contracts versus capitalists without capitalism: comparing the influence of Chinese guanxi and Russian blat on marketization. *Communist and Post – Communist Studies*. 2005; Vol. 38(No. 3):309–327.
- Huang C, Amorim C, Spinoglio M, Gouveia B, Medina A. Organization, programme and structure: an analysis of the Chinese innovation policy framework. *R&D Management*. 2004; Vol. 34(No. 4): 367–387.
- Huang H. Institutional structure of financial regulation in China: lessons from the global financial crisis. *Journal of Corporate Law Studies*. 2010; Vol. 10(No. 1):219–254.
- Jang, YS. The global diffusion of ministries of science and technology. In: Drori, GS.; Meyer, JW.; Ramirez, FO.; Schofer, E., editors. *Science in the Modern World Polity: Institutionalization and Globalization*. Stanford University Press; Stanford, CA: 2003. p. 120–136.
- Jongstapongpanth A, Bagchi-Sen S. US-Asia interdependencies: a study of business and knowledge links. *Journal of the Asia Pacific Economy*. 2007; Vol. 12(No. 2):215–249.

- Khanna T. Learning from economic experiments in China and India. *Academy of Management Perspectives*. 2009; Vol. 23(No. 2):36–44.
- Kvale, S. *Interviews: An Introduction to Qualitative Research Interviewing*. Sage; London: 1996.
- Liao L-M, Zhao C-H. An overview of stem cell-based clinical trials in China. *Stem Cell and Development*. 2008; Vol. 17(No. 4):613–618.
- Liu X-L, White S. Comparing innovation systems: a framework and application to China's transitional context. *Research Policy*. 2001; Vol. 30(No. 7):1091–1114.
- Loof H, Andersson M. Imports, productivity and origin markets: the role of knowledge-intensive economies. *The World Economy*. 2010; Vol. 33(No. 3):458–481.
- Luo X, Hassan M. The role of top management networks for market knowledge creation and sharing in China. *Journal of Business Research*. 2009; Vol. 62(No. 10):1020–1026.
- Ministry of Education (MOE). Rules on the Employment of Changjiang Scholar in the 'Changjiang Scholars and Innovative Team Programme. Ministry of Education; Beijing, China: Aug 4. 1998
1998 Available online at: <http://www.changjiang.edu.cn>
- Ministry of Science and Technology (MOST). Section 6 International Comparison', *China Science and Technology Statistics Data Book 2007*. MOST; Beijing, China: 2007.
- National Natural Science Foundation (NSFC). Internet-based Science Information System (ISIS). China: 1999. Available online at: <http://isis.nsf.gov.cn/portal/index.asp> [accessed on 14 September 2010]
- Naughton, B. A political economy of china's economic transition. In: Brandt, L.; Rawski, TG., editors. *China's Great Economic Transformation*. Cambridge University Press; Cambridge: 2008. Chapter 4
- Neftci, SN.; Ménager-Xu, MY. *China's Financial Markets*. Elsevier; Amsterdam: 2007.
- Nichols RW. Innovation, change and order: reflections on science and technology in India, China, and the United States. *Technology in Society*. 2008; Vol. 30(Nos. 3/4):437–450.
- OECD (Organisation for Economic Co-operation and Development). *OECD Reviews of Innovation Policy: China Synthesis Report*. OECD in Collaboration with the Ministry of Science and Technology China, OECD; Paris: 2007.
- Pilat, D.; De Backer, K.; Basri, E.; Box, S.; Cervantes, M. The development of global innovation networks and the transfer of knowledge. In: Primo Braga, AC.; Padoan, PC.; Chandra, V.; Eröcal, D., editors. *Innovation and Growth: Chasing a Moving Frontier*. OECD Publishing, OECD and the World Bank; Paris: 2009. Chapter 5
- Powell, WW.; Dimaggio, PJ., editors. *The New Institutionalism in Organizational Analysis*. Chicago University Press; Chicago: 1991.
- Ratchford JT, Blanpied WA. Path to the future for science and technology in China, India and the United States. *Technology in Society*. 2008; Vol. 30(Nos. 3/4):211–233.
- Redding, G.; Witt, MA. *The Future of Chinese Capitalism*. Oxford University Press; Oxford: 2007.
- Salter B, Cooper M, Dickins A. China and the global stem cell bioeconomy: an emerging political strategy? *Regenerative Medicine*. 2006; Vol. 1(No. 5):671–683. [PubMed: 17465734]
- Salter B, Qiu R-Z. Bioethical governance and basic stem cell science: China and the global biomedicine economy. *Science and Public Policy*. 2009; Vol. 36(No. 1):1–13.
- Schaaper, M. *Measuring China's Innovation System: National Specificities and International Comparisons*. OECD Directorate for Science; 2009. Technology and Industry Working Paper Series
- Song J. Awakening: evolution of china's science and technology policies. *Technology in Society*. 2008; Vol. 30(Nos. 3/4):235–241.
- State Council. *The State's Decision on Further Strengthening Personnel Development Programs*. People's Press; Beijing, China: 2003.
- Strang D, Meyer JW. Institutional conditions for diffusion. *Theory and Society*. 1993; Vol. 22(No. 4): 487–511.
- UK Stem Cell Initiative (UKSCI). *UK Stem Cell Initiative: Report and Recommendations*. UKSCI; London: Nov. 2005

- United Nations Conference on Trade and Development (UNCTAD). World Investment Prospects Survey 2009–2011. United Nations; New York and Geneva: 2009.
- Walder AG. Local governments as industrial firms: an organizational analysis of China's transitional economy. *The American Journal of Sociology*. 1995; Vol. 101(No. 2):263–301.
- Xin H, Marshall E, Yidong G. Scientific misconduct – scandals shake Chinese science. *Science*. 2006; Vol. 312(No. 5779):1464–1466. [PubMed: 16763127]
- Zhong X-W, Yang X-D. Science and technology policy reform and its impact on China's national innovation system. *Technology in Society*. 2007; Vol. 29(No. 3):317–325.
- Zhu Z-Y, Gong X. Basic research: its impact on China's future. *Technology in Society*. 2008; Vol. 30(Nos. 3/4):293–298.