

Book reviews

Foreign High-Tech R&D in China: Risks, Rewards and Implications for US-China Relations. By Kathleen Walsh, Stimson Center, Washington, DC, 2003, xv, 141 pp. pdf file, www.stimson.org

Engendered by the continued efficacy of globalization as a key enabling factor, China is steadily emerging as an increasingly key player in the international technology system. A combination of steady investment in domestic science and technology modernization and expanded foreign investment into higher value added manufacturing and R&D have clearly enhanced the PRC's technological trajectory. There is little doubt that given the size of its domestic market and its steadily improving technological prowess, China will assume a critical role in the playing out of global competition and have a substantial impact on the pace and direction of international scientific progress.

It is against this backdrop that one must read Kathleen Walsh's monograph entitled *Foreign High-Tech R&D in China: Risks, Rewards and Implications for US-China Relations*. Sponsored by the Henry L. Stimson Center, a Washington DC-based think tank concerned with national and international security affairs, the book is based primarily on fieldwork conducted by the author in China, Hong Kong, and the USA during 2002. Along with the information gathered from her interviews, Walsh relies largely on secondary materials from the Western press and scholarly literature on China. The 2002 time period was an important watershed phase in terms of the growth of foreign R&D in China, the main subject of the monograph. In contrast to the manufacturing focus of most foreign investment prior to this period, from 2002 and beyond, numerous foreign firms began a steady series of initiatives aimed at plugging into China's key technological assets – the large pool of Chinese engineering and technical talent, which now includes a growing number of PRC returnees who have decided to 'reverse the brain drain' of the prior two decades and secure employment back home in China. The book does not spend much time evaluating the actual size or quality of this apparent strategic asset for China,

which would have been helpful in giving us a better sense of where and how China was going to make its impact felt.

Walsh makes a major contribution in alerting observers of the Chinese scene to the rapid growth of foreign R&D in China. While she does note that the growth of foreign R&D in the PRC is not necessarily unique in the context of larger global economic and technological trends, she points out that there are several unique characteristics to the Chinese situation, including the place of Beijing accession to the WTO that has opened the market and given foreign firms greater confidence in the Chinese situation. All too often, China is seen as just another developing country or a huge menace and potential international *bête noire* – when in reality the situation is far more complex. Throughout the book, Walsh tries to ground her analysis in hard data so that the reader can walk away with a more secure sense of where China is headed and how it will make its influence felt. As she indicates, however, the rise of foreign R&D remains a relatively new phenomenon and the full extent of its meaning and consequences are yet to be determined because the data is still anecdotal. Still, the author does do a respectable job in detailing how the growth of foreign R&D might affect China's commercial and military position. I say 'might' because even the author notes that current information about the workings of the Chinese defence technology establishment remains scant at best.

The book's major conclusions fall into two categories. First, the author suggests that even after recognizing all of the technology and know-how flowing into the PRC, 'China still has a long way to progress before achieving parity with the S&T capabilities of most industrialized economies or before reaching its goal of implementing a "national system of innovation".' The major areas of immediate benefit appear to be in the telecommunications and information-technology sectors, both of which have been given a high priority by the Chinese government because of their commercial, development, and defence significance. And second, Walsh indicates that given the potential commercial and defence implications tied to the

extensive growth of knowledge transfers to China and other countries via the R&D channel, 'reforms are needed to the US export control process to account for this new form of international high-tech trade', especially with respect to the US 'deemed export' rule covering foreign R&D investments and technology transfer outside the USA.

As a student of corporate strategy and global technology management, this reviewer believes that the book would have benefited from exploring, in greater depth, the larger international business ramifications of the growth of foreign R&D in China. Winning and losing market share or establishing key market positioning in China have become important elements in the global strategy of many multinational firms. To ensure success against competitors from other countries or within China, many foreign firms are leveraging their technological advantages and are bringing to the Chinese market more advanced technologies at an earlier point in their life cycle than heretofore has occurred in any other emerging market country since the end of WWII. As a result, China has become the net recipient of both high end and state-of-the-art production and R&D facilities – thus facilitating its steadily important role in global knowledge networks and the global supply chain of numerous leading edge high technology companies. There is little doubt, as Walsh indicates, that it will not be too long before foreign-invested R&D centres in China as well as Chinese R&D organizations both generate new innovations and associated intellectual property that will make its way into the USA. In this regard, the book would have benefited from detailing two or three case studies so readers could have gotten a better feel for exactly what types of tasks foreign firms are bringing to China.

One may ask, however, if Walsh is correct in seemingly emphasizing the risks and concerns of the growth of the technological activities in China – as opposed to the tremendous opportunities? Walsh suggests that, generally speaking, many of the foreign R&D activities in the PRC remain supplemental in importance – more 'D' than 'R.' But, this may be understating the strategic value in both actual and potential terms. The integration of Chinese scientific and technical talent into the mainstream of world science has the potential to enhance the overall rate of progress as we respond to an ever growing number of bio-medical, environmental, space, and other related human problems. On the commercial side, the key question

once was: how will Western business change China? Today, that question has become 'how will China change Western business?' Two decades after the inception of the 'open policy', Chinese leaders are trying to address this issue through their growing focus on technical standards as the way to influence international markets and capture revenue streams from foreign licensing of Chinese-generated IP re: WIFI, RFID, next generation DVD systems, etc. As China grows stronger and more sophisticated in the realm of science and technology, the major challenge for the USA, Japan and the EU will be to find incentives and rewards to ensure Beijing remains fully integrated into the rules-setting processes in place in the international system. In the final analysis, from both a business and political economy perspective, the key question is less one of whether China is pursuing a policy of 'techno-nationalism' than how evolving trends (and associated benefits) in terms of international flows of know-how and people will drive China to pursue a truly 'techno-globalist' posture.

The reality of current trends is that it is becoming less and less relevant to think in terms of what Richard Nelson labelled as the 'national system of innovation' and more important to think in terms of a global system of innovation. The rapid demise of national systems of innovation is part and product of the globalization process as multinational firms, the major purveyors of knowledge creation and transfer, orchestrate an entirely new transnational innovation infrastructure with facilities in multiple countries tied together through an advanced information technology infrastructure. Walsh has done a great service in bringing the issue of foreign R&D in China into greater relief. In less than just two short years since the publication of her monograph, the number of foreign R&D centres in the PRC has grown to more than 400, with global firms such as GE, Intel and IBM leading the way. This simply supports the point that China has moved definitively from sitting on the periphery of the world of global business and international science & technology systems, and for the foreseeable future, will become only a more important factor as it brings its technological weight to bear in all facets of the rapidly evolving global innovation system.

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Review of leading Chinese journals reporting on R&D management and innovation

Since the middle of the 1980s, Chinese research on R&D management and innovation has made significant progress. This is reflected in several Chinese journals on R&D management and innovation building market presence in China during this time. Table 1 provides a list of Chinese journals on R&D management and innovation. The Chinese Social Sciences Citation Index (CSSCI), developed by Nanjing University in 1997, is a multidisciplinary index to 418 Chinese journals of the social sciences. 22 management journals were covered by the CSSCI in 2003, 9 of them focus on R&D management and innovation studies, as Table 1 shows.

This review divides these nine journals into two distinct groups according to their thematic coverage. The first four journals, including *Science Research Management*, *Scientific Management Research*, *Science and Technology Research Management* and *Research and Development Management* share three common characteristics:

1. they are committed to advancing theory, research, education and practice in the field of R&D management and innovation;
2. acting as forums, they appeal to both practicing managers and academics in China;
3. published in Chinese, they are little known in and reported by the English literature, but they succeed in combining Western concepts and theories in their field with issues relevant in China.

Thus, advanced theories and concepts developed outside China are reported and highlighted in these journals, and Chinese authors seek and present solutions to specific Chinese problems.

The second group includes the remaining five journals covered by Table 1. In contrast to the journals in the first group, these journals emphasize a particular aspect of R&D management and innovation. For example, *Studies in Science of Science* centres on issues such as dynamics of scientific discovery, S&T policies and China's science and technology system reforms. Papers in the *China Soft Science* mostly deal with macro-level issues such as S&T policies and other economic development issues. *Forum on Science and Technology in China*, sponsored by the National Research Center for Science and Technology for Development (NRCSTD), provides a forum to explicate China's S&T policies and institutional changes.

Science of Science and Management of S&T reports some recent research progress in the West, highlighting Chinese solutions to real-world issues. To some extent, its role is comparable to IRI's Research-Technology Management journal. Finally, *Science & Technology Progress and Policy* covers a wide range of issues related to technology management and technology-enabling development, mostly at a municipal level.

Among the nine journals listed in Table 1, I personally enjoy reading *Science Research Management* for several reasons. In terms of impact factor, it has been selected by CSSCI in 2001 as one of the top journals in Chinese management research, only after *Management World* and *Report of Management Science*. Most of the papers are reports of empirical findings. The research published by this journal is deeply embedded in the Chinese context, and reports China's principal research progress made by the four leading Chinese centres on R&D management and innovation studies. (In no particular order, those four research centres are the School of Economics and Management at Tsinghua University, the School of Management at Zhejiang University, the Institute of Policy and Management at CAS, and aforementioned NRCSTD.) On the one hand, *Science Research Management* looks like *R&D Management* in the English-language literature, because it covers the full range of issues related to research, development and innovation; on the other hand, it is quite close to *Research Policy*, for its driving essence is multidisciplinary, involving ideas from many different disciplines and fields of study, devoting itself to policies of firms, municipalities, central-level governments, and universities. However, as a scholarly non-English journal, it is published for a Chinese audience rather than a global one, and thus its context differs from *Research Policy* and *R&D Management*.

All in all, in comparison with Western scholars' works in this field or literature published by Western journals, Chinese papers cover a slightly different range of issues on R&D management and innovation. In the first place, technology acquisition still matters more than technology invention for China at its stage of development. The issue of how to manage technology imports has remained a constant issue for Chinese researchers. Secondly, China inherited a Soviet-style system of science and technology. In such a system, technological development is isolated from industrial production. To strengthen technology flows and closer interactions between producers and users of knowledge, a number of

Table 1. Chinese journals on R&D management and innovation.

Journal in Chinese Pinyin	English translations used by the journals themselves	Sponsors	Main topics*	The Chinese websites
<i>Keyan Guanli</i>	Science Research Management	Chinese Academy of Science (CAS)	Innovation management; R&D management; technology transfer; Science and technology policies	www.kygl.chinajournal.net.cn
<i>Kexue Guanli Yanjiu</i>	Scientific Management Research	Soft Science Research Association of Inner Mongolia, China	Development strategies of science, technology and economic growth; science and technology management; forecast techniques; regional development	www.kxgy.chainjournal.net.cn
<i>Keji Guanli Yanjiu</i>	Science and Technology Management Research	Science of science and science and technology management research association of Guangdong Province	Science and technology management; regional technology and economic development; science and technology policies	www.kjgl.chainjournal.net.cn
<i>Yanjiu Yu Fazhan Guanli</i>	Research and Development Management	Management School of Fudan University and Science Research Management Association of Chinese Universities	Science and technology development; technology applications; technology commercialization strategies	www.yjyf.chinajournal.net.cn
<i>Kexue Xue Yanjiu</i>	Studies in Science of Science	Chinese Science of Science and S & T Policies Research Association, Science and Technology Policies and Management Research Institute of CAS	Science of science, science and technology policies, science and technology management policies	www.kxyj.chinajournal.net.cn
<i>Zhongguo Ruankexue</i>	China Soft Science	Chinese soft science research association	Chinese policies on macroeconomic, science and technology and social development; science and technology policies; science and technology system reforms; regional economic development	www.cssm.com.cn
<i>Zhongguo Keji Luntan</i>	Forum on Science and Technology in China	National Research Center for Science and Technology for Science and Technology for Development (NRCSTD)	Science and technology policies; science and technology system reforms	www.zgkt.chainjournal.net.cn
<i>Kexuexue Yu Kexue Jishu Guanli</i>	Science of Science and Management of S&T	Science and Technology Committee of Tianjin	Science and technology policies; science and technology management; high technology commercialization, technological innovation; knowledge-based economy	www.kxxg.chinajournal.net.cn
<i>Keji Jinbu Yu Duice</i>	Science & Technology Progress and Policy	Science and Technology Committee of Hubei Province	Science and technology progress management; science and technology investment; science, technology and sustainable development; forecast and management; innovation and commercialization	www.kjyb.chainjournal.net.cn

*The author summarized the coverage of these journals based on their recently published articles and their claimed thematic coverage through a Western lens of R&D management and innovation.

policies were implemented in China over the past two decades, and S&T system reforms and technology policies have been the principal issues and priorities of Chinese researchers, government officials and practicing managers. For example, *Research and Development Management* almost shares the journal title with *R&D Management* in the English literature, but in my personal view they are quite different. For instance, *Research and Development Management* focuses its publication attention on latter stages of the linear model of innovation, i.e. technology commercialization, especially the issue of how to commercialize technologies from government-supported R&D institutes and universities. *Research and Development Management* also focuses on technology transfer (whether cross-border or cross-organizational boundaries) and nation-wide science and technology development (as opposed to corporate R&D, as the journal's title suggests and whose management is extensively covered by *R&D Management*) It seems that as long as Chinese firms remain significantly behind their Western counterparts in R&D spending, they will be less willing to provide the data necessary for such management research. Thirdly, China still lags behind in many technology frontiers. Thus, how Chinese firms can close the technology gap between themselves and leaders in advanced countries, or how they can climb technology ladders through indigenous learning and their own R&D efforts, have become an increasingly important issue for Chinese managers and academics. The number of papers belonging to this stream of research has increased over years. Steven White, Xielin Liu and Wei Xie's literature review (White *et al.*, 2001) provides a good overview of research progress on the management of China's technology and innovation.

Like China's economic reform, the development of Chinese journals on R&D management and innovation was a typical gradual process rather than an abrupt change. As Chinese journals are on the way to Western standards, they still have several limitations:

- Much of the work reported by those journals is conceptual rather than empirical, partly due to the weak interaction between scholars and practicing managers;
- Few journals adopt a double-blind review process. Without a rigorous double-blind review process, it is hard for those journals to ensure that its articles are of highest quality in new theories as well as applicability to man-

agers and officials in the domain of R&D management and innovation;

- The research reported by those journals is very short. It is hard for researchers to fully realize their promises, especially for some case studies, due to the strict requirements of usually not exceeding 6000 Chinese words;
- Few journals publish notes, comments and reviews of new publications in the field, which significantly limits the exchange of ideas and information between officials, researchers and managers;
- Few international researchers are invited by Chinese journals to be a member of their editorial board;
- In addition to limitations of journal depth mentioned above, there are at least two holes to be filled in terms of journal breadth. First, although local market-orientation or local customer-tuned product development has been an important source of local Chinese firms' competitive advantages, the *Journal of Product Innovation Management* has no equivalent in China. Second, with some local Chinese companies emerging with strong R&D capabilities, competition intensified and in-house R&D and R&D-based strategic alliances have become more and more important. This opens the space for a new journal to cover this field (alternatively, one of the incumbent journals could extend its coverage towards R&D management). This journal should be of interests to both academics and managers. It would report on the type of R&D taking place in Chinese firms, bring in some cutting-edge theoretical insights and developments from the West, and provide a communication forum for Chinese researchers and managers to examine theory-based knowledge of R&D.

In conclusion, the journal list by Table 1 is not exclusive and this journal review represents the author's personal viewpoints. With technology becoming increasingly important for the survival of Chinese firms in times of market globalization and cutthroat price competition, and foreign R&D labs building their presence in China (as shown by several authors in this issue), an increasing number of additional Chinese journals have started to publish papers about R&D management and innovation. Those journals include *Research of Quantitative Economy and Technology Economy*, *Report of Management Engineering*,

China Management Science, Report of Management Science and Management World. Nonetheless, the nine journals in Table 1 dominate the output of literature on R&D management and innovation in China.

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Reference

White, S., Liu, X. and Xie, W. (2001) A survey of Chinese literature on the management of technology and innovation, 1987–1997. *International Journal of Technology Management*, **21**, 1/2, 130–150.

Knowing China. By G. C. Chow, World Scientific Publishing Co. Pte. Ltd., 2004, ISBN: 981-238-673-4 (hbk), 981-238-679-3 (pbk), pp. 268, £ 28.00 (hbk), £16.00 (pbk).

Gregory Chow has written a comprehensive and readable book, and it is strongly recommended for anyone who wants a complete introduction about China. The author is a native born Chinese, and for more than half a century he has been active as an academic (Princeton, Cornell, Chicago) and an economist (IBM) in the US. He has advised government officials from Taiwan ROC and the People's Republic of China on economic affairs at different times, and has published 11 other books, most of them are academic.

This general book offers an insight into China through its History (Chapter 1), Culture and Daily Life (Chapter 2), Economy (Chapter 3), People (Chapter 4), Education, Science and Technology (Chapter 5), Government System (Chapter 6) and Tourism (Chapter 8). In two separate chapters, Hong Kong and Shanghai (Chapter 7) and US-China Relations (Chapter 9) are addressed.

In Chapter 1 the author revisits Chinese history by abstracting interesting, famous historical stories, figures and books, and raises the question why science and technology did not develop in ancient imperial China, though it was among the richest countries in the world, having good education and a capitalist economy. Two explanations are given, which could be useful

lessons for policy makers in Western Europe (e.g. the Lisbon Agenda from the EU): 1) Low social status of merchants and businessmen, and 2) Abundance of low-cost labour. In our opinion, a third possible set of reasons that could be mentioned is the relatively isolated economy of ancient China, the conservative thinking of the feudal dynasties (considering the meaning of 'China'/'Zhongguo' in Chinese, i.e. Middle Kingdom) and the absence of economic competitors.

Later on in this book, when the modern technological development of contemporary open China is addressed, again we can learn in the West from the Chinese experience. The present government, whose predecessor has guided China into the WTO, actively stimulates education and the development of science and technology. Successful researchers are rationally recognised, and the President confers awards in person to scientists on TV. This model could also be of help to stimulate young researchers in the West to opt for studies and careers in engineering and technology. Furthermore, the author indicates that the Chinese government (through its National Science Foundation) spends ten times more on natural science projects than on social science research (we wonder what this ratio would be in the US or in Europe?). As correctly stated in the book, as a result of heavy input in S&T, indigenous Chinese R&D is emerging rapidly. Illustrations of this include the early development of the nuclear bomb, the development of a semiconductor

industry, and the first Chinese Taikonaut, Yang Liwei, in orbit in October 2003.

As a general book, it cannot cover all areas in detail, but a more in-depth discussion of the RMB currency, the fixed exchange rate, China's foreign currency reserves, the policy of the people's Bank of China, etc., would have been appropriate, especially given the economic background of the author and the special attention of the book to China-US relations. It is a pity that the author mainly focuses on the US-China relationship, although the 'less than perfect' role of some European countries is also examined. The present positive role of Europe is at least equally important for the contemporary issues raised in the book, such as the aforesaid currency policy, the Taiwan issue, the exchange of technology, the current discussion on lifting the arms sale ban, etc. In regard to Europe there is an error: the Berlin Wall did not fall in 1991 (p. 217), but in 1989. Also, in regard to Shanghai, the river flowing along the Bund is not Yang Tse but Huang Pu (p. 187).

What can people involved in R&D management and in technological innovation management

(as it is referred to in China) learn from this book? As stated in the introduction, this book is informative about China in general. By reading 'between the lines' one can learn about its cultural influence and the Chinese government's role in people's daily life, and gain a better understanding of how the Chinese people (both domestic and overseas) handle their complex social and economic environment, organizations and technical and social sciences.

Depending on the reader's background and interests some chapters of this book will be more useful than others. The book permits reading of the chapter in any order, though it is recommended to read Chapter 1 first. To conclude: it is a useful contribution for knowing China. The insights and opinions of the author as an economist make the book more vivid and interesting, and it is a joy to read it.

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