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Globalization of R&D and China: An Introduction

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ABSTRACT In this introduction, we discuss the recent changes in multinational corporations’ (MNCs) research and development (R&D) strategies and China’s rising role in this new development. Significant changes include: 1) More and more corporations have started overseas R & D operations; 2) the missions of many overseas R&D facilities have shifted from the traditional supplementing and supporting roles to become critical and strategic components of MNCs’ global R&D networks; and 3) MNC overseas R&D operations have expanded their geographic reach to carefully selected developing countries. China has benefited from such changes and has become one major attraction for such R&D facilities due to its rich endowment of low-cost and well-trained scientists and engineers as well as its fast growing domestic market and burgeoning foreign investment in manufacturing. The explosion of foreign R&D investment has also been accompanied by the rapid growth of China’s domestic investment in R&D. The growth in both domestic and foreign investment in R&D implies that China will improve its position in global economic and technological competition. However, it is unclear to the rest of the world about the implications of China’s rising R&D and whether or not China can capture the value from the presence of foreign R&D centres. We conclude that issues related to China’s science and technology development in general and foreign R&D in China in particular warrant more research in the future.

KEY WORDS: China, globalization, outsourcing, offshoring, R&D

Introduction

Outsourcing and offshoring have become eye-catching topics in the media as well as academic research, and China and India have become major recipients and providers of such activities, with China a major attraction for manufacturing and India a primary location for outsourced services. As Thomas Friedman explains in his bestselling book, The World is Flat, outsourcing is an inevitable trend in an increasingly flattened world. At the same time, this world is spiky, too, with China being one of the most pronounced spikes of production, population and investment.

Manufacturing industries have been outsourcing labour-intensive work to developing countries for quite some time, primarily due to the low cost in many
overseas locations. Companies have been building up new plants in developing countries such as China, Mexico, South Korea and others, while shutting down similar plants in their home countries. Recently, offshoring and outsourcing has expanded to service industries, which used to be considered as ‘local’ industries. Call centre support, tax document preparation, medical image diagnosis, and so on, are now activities provided offshore to customers on other continents and distant time zones. In the process, not just manufacturing but also service-related jobs have been lost in developed countries, with the labour being moved to developing countries. As a result, outsourcing has become a major source of political controversy in advanced economies such as the United States.

Adding to the perceived loss of home competitiveness, this trend of outsourcing and offshoring has extended into more advanced and upstream kind of work, invalidating the argument that only routine and low paid jobs are shifted to developing countries while advanced and high paid jobs remain at home. More and more of the better-paid and more brain-intensive labour such as research, design, education, and so forth that were ‘supposed’ to remain in developed economies have started to move to countries that were not believed to be conducive environments for this kind of activity. Specifically, many multinational corporations (MNCs), who have a history of setting up overseas research and development (R&D) facilities and global innovation networks are used to exploring other developed countries as hosts for advanced technology development and research (see, for example, Ronstadt (1977) for an early description of this trend, and von Zedtwitz and Gassmann (2002) for a recent global assessment). This strategy is different from the traditional centralized approach where corporate R&D activities concentrate at corporate headquarters or the home country only. However, it needs to be understood that the organizational ability to design, build and operate R&D centres in foreign countries is a hard-earned capability that takes individual firms many years and often decades to acquire. Since the first pioneers (for instance, IBM and Shell) started this trend in the 1970s, the practice of international R&D has seen a number of significant changes. First, more and more corporations have started to engage in international and collaborative R&D operations. By the mid-2000s, this phenomenon had encompassed every conceivable industry, including low-R&D intensive ones such as food or mining, and extended well outside the typical MNCs including also mid-sized companies for which such international expansions are even more difficult to manage. Second, the missions of overseas R&D have shifted from the traditional supplementing and supporting roles to become critical and strategic components of a MNC’s global R&D network. Third, and most recently, MNC overseas R&D operations have expanded their geographic reach into carefully selected developing countries, particularly in East and South East Asia. China and India have become hotbeds for such facilities; according to recent surveys (for example, EIU, 2004; UNCTAD, 2005; OECD, 2006), China is even more attractive than the United States as a place to do R&D.

These developments have attracted attention from governments, academia and the media. However, in comparison with the amount of literature on globalization of R&D in general, foreign R&D in China has not been well analysed and only a few studies have been published to examine this issue (Sun, 2003; Walsh, 2003;
Gassmann & Han, 2004; von Zedtwitz, 2004; Sun et al., 2006). Many questions remain to be answered. What is the extent and potential of global R&D in China? What is the implication of continued growth of foreign R&D for China as well as for foreign countries? If advanced R&D activities can also be outsourced to China and India, what will remain in the so-called ‘advanced’ countries? Have MNCs gone too far in this direction, and how does this trend affect their sources of competitive advantage? In China, questions arise as to whether foreign R&D is serving the policy objective to build an innovation-oriented society and the integration of foreign R&D into the country’s national innovation system.

The insufficient amount of in-depth research has led to a preliminary yet fundamentally incomplete picture on some of these questions. For example, reports from different sources interpret foreign R&D in China in two different ways. According to one interpretation, foreign companies are transferring their most advanced technologies into China, conducting their ‘state of art’ research and thus helping China develop the most advanced technological capabilities. Such activities are perceived to be detrimental to the competitiveness of origin countries while China’s competitiveness will be enhanced significantly. The other interpretation suggests that foreign companies conduct only supplementary activities in China, and that these activities are playing only marginal roles in MNCs’ global R&D network. Consequently, such R&D outsourcing will not reduce source countries’ competitiveness in the global market. These two interpretations have different implications for policy makers in the countries of origin of the firm (mostly the USA, Europe and Japan) or China. As far as China is concerned, if the first interpretation prevails, China would benefit significantly from such R&D outsourcing and should consequently promote and attract more foreign inbound R&D. Clearly, policy makers in countries of origin of the firm would then consider designing policies with the aim to prevent excessive R&D outsourcing to China and other developing countries. If the second interpretation should prove right, then the effectiveness of China’s efforts to attract foreign R&D and build an innovation society needs to be questioned.

To help understand the various issues, we organized a Workshop ‘Global R&D in China’ in Nanjing in May 2005, on behalf of the Nanjing Municipal Government. About 80 participants attended the meeting, including academics, foreign R&D managers and directors, foreign and domestic policy observers and Chinese government officials. The participants focused their discussion on three major themes: 1) the drivers and dynamics of foreign R&D; 2) R&D location decisions in China; and 3) challenges for managing R&D in China. Sample questions from the workshop include: What kind of R&D activities exactly do foreign companies conduct in China? Why do they go to China? What is the role of Chinese governments (central, provincial, municipal) in this process? How do foreign companies deal with issues of intellectual property rights (IPR) when conducting R&D in China? Specifically, why have so many foreign companies decided to establish R&D facilities while many of them are complaining about various problems regarding China’s lack of IPR protection? What are the challenges of R&D management in China?

Based on the results of this workshop we sharpened our understanding of the relevant issues of R&D in China, and we opened a call for papers on this topic,
specifically inviting workshop participants but also other experts in the field to submit papers on foreign R&D in China. The seven contributions eventually selected and presented in this collection will clearly help us to understand some of the above issues better.

**Summary of the Contributions**

In her contribution ‘China’s R&D: A High-Tech Field of Dreams’, Kathleen Walsh provides an overview on three critical (as well as controversial) issues related to foreign R&D in China: first, the forces driving foreign R&D investment in China; second, how this rapid growth of foreign R&D is influencing China’s own long-term technology development strategy; and third, the impact this trend could have on future Asia-Pacific relations. As many as 750 foreign R&D centres were reported to have been established in China by 2005. By China’s own measures, the number of foreign R&D centres in China grew by 500 per cent between 2003 and 2005. Walsh rightly argues that given China’s continuing problems in IPR protection and related areas, the sudden increase of foreign R&D suggests something unique going on. Walsh looked at the history of foreign R&D in China and identified several distinct stages: a slow period in the early 1990s, explosion in the mid-1990s, consolidation in the late 1990s and early 2000s, and more recently, another expansion starting in the early 2000s. In her explorations of the reasons, Walsh argues that three factors made China stand out in the early period: the rationale of firms to establish an innovative ‘listening post’ to monitor development in China’s growing market, requests from Chinese government officials and pressure from leading companies. Recently, two factors have become more important: one is to establish R&D functions alongside the manufacturing and production that have already been offshored in China and the other is to take advantage of China’s rich supply of skilled engineers. Walsh argues that the current expansion period will continue for some time for the following reasons: 1) the shift in the dominant rationale for establishing R&D in China from the former catering to Chinese governments’ requirement to one stressing internal corporate interests; 2) China’s admission to the World Trade Organization (WTO), which provides a more stable operation environment for foreign companies in China. For example, they are allowed to operate wholly-owned R&D centres now. In addition, many companies have started R&D activities in long-term projects, the benefits of which can only be realized and made public years after the original investment. Furthermore, Chinese officials have committed themselves to making S & T development a top priority, demonstrated by its most recent programme for the period between 2006 and 2020 and the 11th five-year plan. Such plans call for seeking more access to and assimilation of foreign technologies in developing its indigenous technological capabilities. Finally, the increased technological efforts of Chinese domestic companies will force foreign companies to enhance their own R&D activities in China in order to maintain their competitive edge. In the end, Walsh concludes that the rise of foreign R&D in China is the result of convergence of different factors, and that ‘China is in the right place at the right time’. The implications of recent foreign R&D growth for China’s own technological development and its
relationships with other powers depend on four indicators: how China chooses to leverage foreign R&D inputs; how transparent it is in this process; how successful these efforts prove; and how quickly these achievements are realized and perceived.

Operating R&D in a foreign country is very challenging. For foreign companies who want to conduct R&D in China, they have to realize the potential impacts of historical legacy on China’s current innovation system and their operations. In his contribution, Erik Baark provides a critical perspective on the institutional fabric for knowledge and innovative activities in Chinese society. In particular, he explores three legacies of traditional China: its perceptions of the utility of scientific knowledge, the balance between exploitation and exploration in the process of learning and innovation, and the cultural prestige accorded to creativity, innovation and entrepreneurship. As argued by Baark, ‘Few civilizations have been as explicit and persistent in professed reverence for knowledge as the Chinese traditional culture’. However, knowledge and innovation were conceptualized significantly different from those in the West. Compared to the focus of Greek sciences on investigation into nature and its elements, matter and cause-and-effect relationships, Chinese investigators were more interested in understanding how heaven, earth, society and the human body interacted with each other to form a single resonant universe. Ancient Chinese scholars were more interested in practical application of knowledge, and ‘there is little room in traditional Chinese culture for knowledge for its own sake’, as argued by Baark.

The production of knowledge in traditional China was also different from that in Ancient Greek civilization: it was embedded in a social context that relied on historical doctrines which were further refined for the purpose of government. As such, the legitimacy of knowledge ultimately comes from the emperor. Meanwhile, traditional Chinese culture tended to emphasize the accumulation, dissemination and refinement of existing knowledge on the nature of society, particularly the knowledge transmitted through the classical Confucian works. Such a tradition discouraged innovation and creation of new knowledge. Baark then explores the implications of such legacies on China’s innovation institutions today: they contribute to the tension between the search for knowledge and requirement of power, they bias innovative activity towards exploitation and they constrain creative entrepreneurship. Baark argues that such traditions may reduce the propensity of Chinese researchers to engage in truly innovative activities. Clearly such legacies have clear implications for foreign R&D as well. In another contribution in this collection, Yifei Sun and Ke Wen have revealed that one problem with conducting R&D in China is the lack of creativity among Chinese employees.

Putting the recent growth of foreign R&D in China into a large context, Jian Gao and Gary Jefferson notice that not just foreign R&D has experienced rapid growth in China, China’s domestic R&D has been growing very fast as well. They characterize this phenomenon as a science and technology (S&T) take-off. It is revealed that, within a short period of 10 years from 1996 to 2005, China’s ratio of R&D spending to its gross domestic product (GDP) more than doubled from 0.6 per cent to 1.4 per cent. Such an S&T take-off was observed in many other advanced countries as well. In their examination of the conditions for a S&T
take-off, they find that increasing subsidies to R&D labour may lead to a rise in the productivity of R&D labour in relation to its wage. Comparing marginal product to wage ratios in various R&D locations, including foreign ones, Gao and Jefferson find that many Chinese locations offer a far more attractive relation of R&D salary investment to output, which may help explain the recent surge of foreign R&D in China as well. Finally, Gao and Jefferson also explore the question why China has begun its S&T take-off so early. In most advanced countries, the R&D take-off began when purchasing power parity (PPP adjusted 1999 dollars) income per capita was in the range of $8,000. However, China’s PPP income per capita was just $3,600. Possible reasons for this, they argue, include high rates of literacy, China’s market size and proximity to dynamic economics. Clearly such reasons are related to the fast growing foreign R&D in China as well. The last reason may offer also some fresh insight into the recent growth of foreign R&D in China: foreign companies may have been attracted to serve China as well as its nearby dynamic economies of South East Asia.

Yun-Chung Chen examines the dynamic process of foreign R&D networks in China. Specifically, he examines the evolution of Motorola and Microsoft’s innovation networks in China. He argues that the localization of MNC R&D centres is a learning process, which has evolved from the early experimental phase to the more mature and integrated phase. In the case of Motorola’s R&D centres in China, Chen observes that the upgrading of R&D is due to increased market competition in China and the need to interact with firms in industrial clusters. In the Microsoft case, Chen shows how, in China, R&D was expanded from simple technical service and product localization to fully incorporating technology development with both research and development. Although these two companies started from different constellations, their China R&D networks have eventually become structurally quite similar. With positive impacts on China’s national innovation system generally recognized, he notices that Chinese do not have a consensus on this aspect, particularly with respect to domestic brain drain due to the movement of talents from Chinese domestic companies and government research institutes to foreign companies in China.

While Chen takes a historical perspective, Yifei Sun and Ke Wen explore Walsh’s observation that ‘the more difficult decision many chief executive officers (CEOs) face today is exactly where on the Mainland to locate their R&D centre(s) and what form of R&D to pursue, not whether or not to conduct R&D in China’. On the one hand, Sun and Wen confirm earlier findings that foreign R&D is largely concentrated in China’s two major cities, Beijing and Shanghai. They further argue that foreign R&D has over-concentrated in these two cities. The degree of concentration of foreign R&D in these two cities is much higher than that for many social or economic indicators these two cities command in China. Such an over-concentration of foreign R&D cannot be fully understood through the lens of traditional location theories, which emphasize the internal and external interactions between R&D and other functions. Instead, they argue that one must incorporate uncertainties and imitative behaviours in this process. While this argument was proposed by Walsh and others before, (‘where technology leaders go, others follow’), Sun and Wen point out that the same mechanism works at the sub-national scale as well. Many companies simply follow other leading
companies when considering their R&D locations within China. Such a strategy provides psychological security and justification to corporate policy makers, though it is not necessarily the best one: certain second-tier cities are well qualified to be locations for foreign R&D with much lowered cost and other benefits. Such a study clearly shows the challenge for China’s second-tier cities in competing for foreign R&D investment.

In the next contribution, Sun and Wen analyse the environmental challenges faced by foreign companies in managing their R&D operations in China. Their study confirms the findings from earlier research that significant institution, infrastructure and labour management barriers for foreign R&D operations are still present in China. In particular, issues related to labour management, such as increasing cost and mobility, lack of experience and creativity and cultural differences among the research staff, prove to be the most challenging for management. What is interesting about this study is the different responses from their interviews. They suggest that such differences may be explained by a framework incorporating three elements: 1) the relational distance between the parent country and China, where the relational distance is defined as the gap between the two countries along multidimensions including economic development, institutions, cultural and historical legacy; 2) power relationship between the investing company and the host country, where the power of a company can be affected by the size, technological/marketing capability, experience and presence of the foreign company with foreign markets in general and their specific relation with China in particular; and 3) manager comfortableness with the host country, which is affected by the experience and familiarity of the site manager with the host country. Such a framework also provides some useful suggestions for foreign companies in their location decisions within China.

Attracting foreign R&D and transferring more technologies from foreign companies has become a goal for many Chinese governments: from national, to provincial and to municipal levels. Foreign R&D not just adds to the local investment pool, more importantly such investment, it is hoped, will facilitate technology transfer and indigenous technological capability building. In his contribution, John Medcof reviews the literature on technology upgrading in subsidiaries and argues economic development policy should foster subsidiary technology upgrading as part of their efforts to increase international technology transfer. In particular, he reviews two major bodies of literature: technology upgrading in the context of manufacturing and technology upgrading in the context of international business studies. Technology upgrading is defined in his contribution to include the use of increasingly complex technologies in products and processes, as well as the development of the managerial and organizational capabilities. The literature reveals that overseas subsidiaries of MNCs evolve along different paths: upgrading, downgrading or retaining their status quo. A number of factors seem to be integral to the technology upgrading process: entrepreneurial managers at the subsidiaries who lobby at the headquarters to build credibility and to obtain financial and moral support for upgrading, collaboration with suppliers to improve and benefit from their capabilities, and the collaboration and interaction with sister subsidiaries to create viable and
sustainable support for subsequent upgrading. Medcof argues that such insights should become the basis upon which to design policies to promote technology upgrading, specifically that economic development policies should explicitly encourage subsidiary technology upgrading. Local governments should create a ‘facilitative psychological climate’ in the local area through a variety of measures. They should have declared policies to subsidiary managers, and their headquarters, local business and all other parties which might collaborate in the upgrading process. Specific policies include the facilitation of communication and travel between the subsidiary and its headquarters and sister subsidiaries (which is a clear problem among many foreign R&D centres in China, as revealed by Sun and Wen’s study), for which Medcof proposes concrete implementation recommendations. He also suggests that policies need to allow for the success of a subsidiary’s initial missions so that they gain credibility within the R&D network fast. This insight is valuable not only for many Chinese governments but also globally, as all too often the quantity and extent of new investments is preferred over the quality of existing R&D work to ensure successful operation. How many new businesses have been set up, and how much new investment has been attracted, is more important than how many R&D units are operating successfully still after a number of years. Armed with successful examples, local governments should be able to present showcases for attracting more businesses in the future.

Conclusions

China has become a major attraction for foreign R&D. It is clear that China is not satisfied to be a manufacturing base for the world and now strives to become an innovation-oriented country. It can be expected that foreign companies will continue to invest in China to establish their R&D facilities. What is not clear is whether or not China can successfully integrate these foreign R&D facilities into its national innovation system effectively, and what the implications are for the world when it is facing a rising China with growing science and technology capabilities. Chinese leaders have stated their commitment to become an innovative nation over the next 10–15 years, strengthening indigenous R&D capabilities while continuing to welcome and harness foreign R&D activities. The commitment to having foreign R&D locate in China remains a central feature of China’s innovation strategy. Whether or not the Chinese government can capture value from the presence of foreign R&D centres will depend on a combination of factors largely tied to the degree to which these centres become integrated into the fabric of the country’s overall R&D system and market for talent. The seven contributions in this collection explore many facets of these issues. It is our hope that the results of the research presented generate more interest for future investigation into China’s S&T development in general and foreign R&D in China in particular.

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