

PERSPECTIVES ON THE TRANSFER OF TECHNOLOGY TO CHINA: SCANDINAVIAN COMPANIES AND THE EUROPEAN CONTEXT

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INTRODUCTION

To most manufacturing companies technology is a key part of their organisational knowledge, which gives them their distinctive capabilities and competitive advantage (Kogut and Zander, 1993). In order to best make use of this resource such companies are increasingly extending the application of their knowledge through technology transfer. When transferred internationally this extension of technology application is seen increasingly as a means whereby companies can globalise their production operations in order to take advantage of cost or market factors (De Toni et al, 1992).

Looked at from the point of view of the host country, technology transfer also has significant benefits. For example China has a strategy to rapidly catch up with the industrialised countries in a range of advanced technology sectors. However, a major weakness has been the institutional structure in which its own research institutes have been operating in isolation from state enterprises, while the latter have had very little incentive to innovate. The inward transfer of technology from foreign countries through foreign direct investment has therefore been seen as the preferred alternative means of acquisition since the "open door" policy was introduced in the early 1980s (Saich, 1989).

In principle, therefore, in the short to medium term, there are complementarities between the strategies of European companies and their Chinese counterparts. However, in the longer term, there are concerns about the loss of competitive advantages of foreign industries and enterprises to China (Simon, 1997)

This paper examines the question of technology transfer from the perspective of techno-economic security, its importance and how companies respond to the possibility of losing competitive advantage through misappropriation or leakage. It explores transfers from Europe to China and addresses in particular the operations of Scandinavian companies within the context of the general picture for other European firms. Its point of departure is the situation described in an earlier paper that looked at the motivations for transfer and the awareness of companies of techno-economic security issues (Bruun and Bennett, 1999). This has been supplemented by new data gathered by the authors from a number of Danish and other European companies in China during 2000. Specific actions have been identified and the ownership issue is introduced together with consideration of the role of the companies against the Ferdows model (Ferdows, 1997). The analysis shows that the nature of the security question has changed together with the evolving context in which the companies are operating. In turn the response of companies is contingent on a number of factors including the time horizon of the strategy for a unit in China and the nature of the strategy. It is also influenced by the form of ownership and management style in the particular organisation.

EUROPEAN POLICY AND FOREIGN INVESTMENT IN CHINA

The EU's policy on China is "To engage China further on the world stage, through an upgraded political dialogue with the international community, and to integrate China into the world economy by bringing it into the world trading system, and by supporting the process of economic and social reform that is underway in the country" (EU, 2000). The legal framework for relations with China is currently still the "1985 EC-China Trade and Cooperation Agreement" and an EC-China Joint Committee reviews once a year all aspects of Sino-European trade and cooperation relations.

In 1995, the European Commission sought to set out its long-term strategy for EU-China relations in its Communication "A Long Term Policy China Europe Relations". This was supplemented in 1998 by a further Communication, endorsed by the Council of Ministers, called "Building a Comprehensive

Partnership with China", which set out recommendations aimed at upgrading the EU's relationship with China (EU, 1998). More recently, in September 2000, the European Commission adopted its Report on the implementation of the 1998 communication, which identified activities and progress in the various areas of EC economic and development cooperation, and dialogue with China.

Within its 1998 Communication the Commission recognised the importance of promoting foreign investment from Europe into China. It states that the development of Foreign Direct Investment (FDI) has been a key element in China's economic growth since it engaged its reforms in 1978. For several years, China has been the largest recipient of FDI among the developing countries. Investments originating in the Asia-Pacific region, notably from Hong Kong and Taiwan, dominate FDI in China, thus highlighting the regional dimension of China's integration into the world economy. The Asian crisis during the late 1990s, which reduced incoming FDI in China, makes it all the more important for China to attract investment from its other partners, especially Europe and the United States.

The EU's aim is therefore to improve the investment environment for European companies in China. The construction of a sound and transparent regulatory framework for investment and a better enforcement of Chinese regulations on intellectual property rights are prime examples to achieve this objective. The EU trade policy must be backed up by a comprehensive strategy to promote investment, as well as business and industrial cooperation with China, so as to strengthen the European presence in the Chinese market. The focus should be primarily on those industrial sectors - such as telecommunications, energy, environmental technology and services, transport and financial services - where Europe has a clear competitive advantage.

When looking at the actual Foreign Direct Investment figures for China the European policy has clearly had an effect and European companies have become the most active investors in China. In 1999 EU utilised capital investments totalled US\$ 4.472 billion, which was more than either the USA or Japan. Four European countries had Chinese investments of more than US\$ 500 million in 1999 (Germany, UK, France and Netherlands). The three Scandinavian EU countries (Denmark, Sweden and Finland), together with Belgium and Italy, are among the 'second tier' that invested between US\$ 50 million and US\$ 500 million. The third tier (below US 50 million) includes Austria, Spain, Portugal, Ireland and Greece. Also in 1999 Denmark, Sweden and Finland all increased the amount of utilised capital in China, whereas Hong Kong, Japan, Singapore and Taiwan, as well as several other European countries, actually had lower investment than in 1998.

On 19th May 2000, the EU and China signed a bilateral agreement, paving the way for China's accession to the World Trade Organisation (WTO). Once China joins the WTO, a key challenge for the EU will be to develop mutually acceptable methods to monitor and assist with WTO commitments.

TECHNO-ECONOMIC SECURITY ASPECTS

Ensuring security of the technology and protection of their competitive advantage is becoming an increasingly important consideration for foreign companies who are investing in China and thereby transferring their technology into subsidiary companies or joint venture operations. The term techno-economic security relates to the question of how, on a political level as well as on a company level, the business potential of the investment can be maintained. In other words companies transferring technology to China or other newly industrialized countries need to protect their core technology from misappropriation and subsequent imitation when contributing to the country's development and trying to strengthen competitive advantage through establishing foreign operations. One of the risks of transferring technology is that its absorption and dissemination can, in the longer term, bring about new competitors unless measures are taken to prevent leakage of know-how or the technology supplier can stay ahead of the technological race. In China this risk may be exacerbated by insufficient legal protection of intellectual property rights.

In relation to this issue the EU recognises that its interest vis-à-vis the transfer of commercial technology to China has different facets. On the one hand, the EU has an important interest in the sustainable development of China. There is the economic aspiration to seize the opportunities offered by the Chinese market for EU industry as well as the closely linked political interest in regional stability in East Asia. It

can therefore be argued that transferring technology and know-how at low cost in areas crucial to sustainable growth is in the EU's interest.

On the other hand, the EU has an obvious stake at exploiting its own competitive edge in advanced technology by selling its products at commercial prices, in particular on promising markets, like that of China. This presupposes, however, the adequate protection of IPR (e.g. patents) an area, in which China still has to achieve substantial progress.

Therefore, the question arises whether the EU should strive for an appropriate balance between the need to transfer urgently required technology to China and the need to maintain its own competitive edge in the high tech sector. In concentrating on this issue it also should take into consideration the different interests of the various players: e.g. the commercially motivated industry (presence on China's market and market share objective) and the objectives of governments (e.g. development objective, maintaining EU competitiveness, ensuring employment at home). It is, however, obvious that this question cannot be seen in isolation from policies vis-à-vis technology transfer applied by other third countries

RESEARCH METHOD AND CHARACTERISATION OF COMPANIES

Data collection took place through visits and interviews in 11 companies and 1 government institution during the year 2000. Compared with the authors' previous research in 1998, which was based on interviews of managers based in Danish parent companies, all interviews and data collection in this research have been undertaken in China. Also companies from Sweden and Finland have been included. Although they represent only a narrow sample compared to the total number of Scandinavian companies who have established operations in China the group does represent a representative selection on various dimensions, e.g. of industries related to an EU study on the medium to long term impact of technology transfer to China (Bennett et al, 1999), the legal set-up, business functions etc. (see Table 1).

Table 1 The Scandinavian companies in the study

Company	Industry sector	Strategic Role	Legal set-up	Business functions			
				R & D	Production	Sales	Service
A	Medical devices	Server /Contributor	WFOE	(x)	x	x	x
B	Biotechnology products	Contributor	WFOE	(x)	x	x	
C	Pharmaceuticals	Contributor	WFOE		x	x	x
D	Biotechnology products	Server /Contributor	WFOE	(x)	x	x	x
E	Surface coating materials	Server	EJV		x	x	x
F	Telecommunications and software development	Contributor	WFOE	x			
G	Management systems software	Server	WFOE			x	x
H	Telecommunication systems & equipment	Contributor /Lead	EJVs & WFOE	x	x	x	x
I	Mobile switching equipment	Server /Contributor	EJV	(x)	x	x	x
J	Base station installation materials	Server	WFOE			x	
K	Consultancy services	N/A	WFOE	N/A		x	x
L	General advocacy	N/A	N/A	N/A			x

WFOE = Wholly Foreign Owned Enterprise

EJV = Sino-Foreign Equity Joint Venture

x = type of business function in China

(x) = limited R&D activity, i.e. mainly development and little research

The interviews were conducted through the use of a semi-structured, open-ended, questionnaire covering a wide range of issues relating to the companies' business and operations in China. The general areas covered were:

1. General business profile – overall and in China.
2. Questions concerning the company's operations in China.
3. Current situation - overall and in China.
4. Management of the Chinese operation.
5. Human resources management and training.
6. Situation concerning research & development .
7. Intellectual property issues.
8. Criteria against which the European parent company judges the success of its Chinese operations.
9. Additional criteria against which the Chinese partner judges the success of its Chinese operations.
10. Additional criteria against which the Chinese authorities judge the success of the company.
11. Factors considered important for success of a JV or wholly owned subsidiary.

TECHNOLOGY TRANSFER FROM THE PERSPECTIVE OF TECHNO-ECONOMIC SECURITY

The issue of techno-economic security related to technology transfer to China has a special significance because of uncertainty about, and non-transparency of, the legislation compared to Western systems. The issue has been of concern from the political level in EU due to agreements with China on support of industrial development, including supply of technology on the one hand and a fact of non-adherence to legislation on the Intellectual Property Right area on the other hand. This latter can be observed by the fact that in China you see a huge amount of fake products in consumer and industrial goods (Business Week, 2000). In the longer term therefore there might be a fear that Chinese competitors may emerge and capture world market positions, and that there will be no possibilities to sue such for illegal use of technology. On the political level in China there is a deliberate long term concern on the importance of technology development in key areas like e.g. biotechnology and telecommunications in order to develop the society. Therefore special attention is paid to attract technology and know how in such areas.

On the level of the companies, there might be competing views on the matter. Many companies that are developing global production systems see China as a great potential market as well as a base for production and source of knowledge. The main background for the establishment of manufacturing, sales, service and research and development in China is to deploy and develop the intelligence of the prosperous and hard working young generation. This may only take place through in-depth involvement and continuous education, including from abroad. On the other hand some companies have learned from experience that competitive Chinese products based on the same technologies have emerged in world markets. For the companies this issue might therefore be looked at as a “double-edged sword” – either it might kill the prosperous potential if it is too restrictive, or it might kill the business if it is too loose. So the research question is whether the issue of security is a matter of concern. Furthermore, if it is so, how is the awareness of the issue addressed in the companies, both in general and individually? - and can specific activities be identified?

In the following section the elements are derived that enlighten these questions. The analysis and the discussions are framed by looking at various organisational levels: corporate, business unit and the functional level. This is followed by a broader discussion of the kind of technology and knowledge involved, the observed transfer mechanisms and how the responses to keeping knowledge and technology look. Finally it is shown how the security issue may change depending on the context of the strategy and the actual operation.

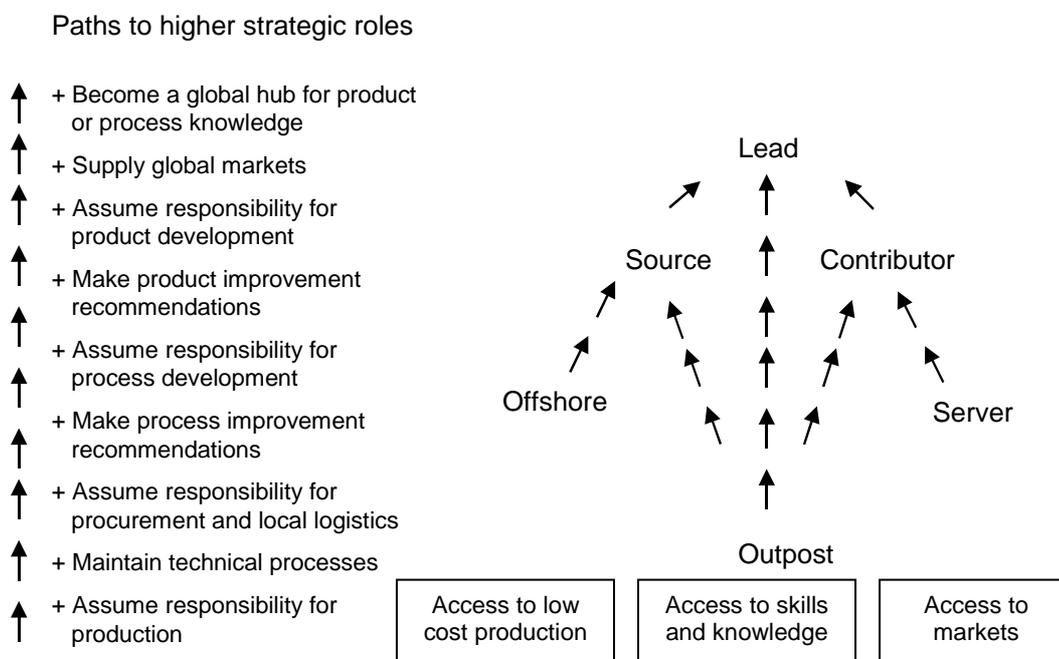
ORGANISATIONAL LEVELS

Corporate

The techno-economics security issue seen from the EU political level and the headquarters perspective was presented in earlier studies (Bruun and Bennett, 1999; Bennett et al, 1999). This more recent study has been based on analyses in the Chinese units of Western (Scandinavian) companies in China and may therefore have a bias in the information gained from local management. The issues dealt with on the corporate level are the unit strategy, the legal set-up, and the management lay-out.

The overall purpose for the establishment is classified using the Ferdows framework of strategic roles (Ferdows, 1997). In this framework the site competence is plotted against the strategic reason for the site, split into access to low cost production, access to skills and knowledge and proximity to market (see Figure 1). The other interesting dimensions are the ownership legal set-up as well as the intended constitution of the management structure and team (local, international, style etc).

Figure 1 The 'Ferdows' framework as applied to the company analysis



In accordance with the findings from the authors' 1998 study it is observed that all the companies have a long-term horizon for their investments. It is interesting that none of the companies now mentioned cost as the primary reason for their current operations in China, although that this factor is seen as an advantageous add-on. In continuation it has been identified that the sites have been established primarily with a "proximity to market" reason. Although on a simple level at entry the competence level has increased quite fast. Among the sample there were identified 3 "servers", 3 servers moving towards a "contributor" role, 3 contributors, and 1 contributor moving towards the "lead" position. This reflects the fact that these units in China have been chosen as regional East Asian Centres. In accordance with this ambitious goals/visions and success criteria are also observed. Overall these positions assume a wide range of responsibilities e.g. for development of suppliers, for process and product development, and for supply of global markets. Although the issue of techno-economic issue seems to be pertinent the potentials and dynamics of the market development seem to overrule this concern.

An observation is that there seem to be a trend away from Joint Ventures (JV's). Typically the earlier establishments started as JVs, but today the Wholly Foreign Owned Enterprise (WFOE) is the preferred legal set-up among the sample companies. Movements towards a higher ownership share for the foreign partner within the JV is also evident, and likewise conversion of an earlier JV to a WFOE by buying the shares of the Chinese partner. Other reasons have also been given for this trend e.g. enabling full control of the Chinese operation. This presumably also applies to control of the transferred technology. In relation to this latter issue a pattern of management structure and style has been recognised. Regarding the structure, nine out of the eleven companies in the sample have a mixed management team with Western managers in key positions. The aim has been to reduce the number of expatriates and to increase local management. On the other hand it may be very important also to keep a multinational team as a means of developing towards regional centres with global orientation. An interesting observation regarding style is that the companies seem to have adopted a multinational style in the management functions, but a conventional Chinese organisation at the floor level.

A general conclusion at this corporate level is that technology transfer to Chinese units seems to take place at conditions very similar to all other places. The techno-economic issue is not mentioned as a central issue at that level, and certainly it might also conflict with ambitious business goals. On the other hand the issue may be addressed implicitly in the way the legal set-up and management structure are dealt with today.

Business unit set-up

In accordance with the relatively high positioning in the Ferdows model and the market oriented focus, the business units studied represent full fledged production facilities, including sales, production, service and to some extent R&D functions. The service function has in more of the companies an important role. This relates to the fact that many of the products and their use are new to the market and therefore the provision of education in how to apply these is necessary. In the following section the various functions are characterised and ways/actions identified whereby the functional structure may contribute to the techno-economic security issue.

Production, process technologies

The production facilities in the companies' Chinese operations vary from full lines to part lines consisting of assembly/packaging. Overall quality requirements are equivalent to Western standards, and typically the production equipment is imported. This may be the latest 'state-of-the-art' version, although previous generations of lower technology equipment are also used. The time lag in moving away from the latter represents a security aspect, but may also constitute a disadvantage for gaining maximum advantage from fully exploiting the technology. Related to the establishment of the local operations companies have to obtain a business licence, and in the process of obtaining this is required to submit drawings etc., which may then need to be reviewed by government agencies and/or companies appointed by the authorities. This "system feature" is mentioned as representing, in itself, the possibility for leaking commercially confidential information. However, involving even more risk than this may be the first few years of operation. Although not necessarily organised as deliberate espionage, Chinese competitors have normally studied the products and processes within the first two years of operation. During the interviews examples of factories that had emerged based on new Western technologies were mentioned.

As regards the products there are a mix within the sample of industry sectors and products. On the one hand older generation product technologies are offered in the local consumer market (server role) and on the other hand the newest ones are available for the industrial and more regional markets (contributor role). See the later section on transfer of technology and knowledge.

Sales and Service

Sales and service functions were incorporated in almost all the companies studied, and the importance of building good relations with customers was stressed in the interviews. In general these functions are not seen as primary sources for leakage of knowledge and technology. On the contrary quite a strong emphasis was identified of the importance of service functions, especially in the companies pursuing industrial markets. Transfer of the product technologies and their appropriate applications are at the core of building strong customer relationships, especially in the industrial market.

R&D

Compared to the other business functions the representation of R&D is more scattered and, except for a few business units that are dedicated to this function, a wide variety of activities are involved. The picture is generally one of R&D supporting the production function and creating the abilities to develop products to meet particular local needs. In all cases development is dominant part of R&D. Most of the companies expressed a wish to expand the research part, including by transfer, but have so far been reluctant, because they see serious problems in the IPR area. A way to expand the R&D activities has been through cooperation with local universities, - the experience of this ranging from being extremely

successful to an outcome of varying quality. Related to this, there is a tendency to centralise R&D in areas where the best universities can be found. In addition to the quality of research this also has a strong bearing on the issue of recruiting the most qualified people. This combination has created excellent environments for development with very high growth in prosperous business areas. R&D contributions that are not limited only to China, but also for the companies' global use, have therefore emerged.

There is no doubt that the companies look at the organisation of the R&D function as being very sensitive in terms of maintaining and increasing competitive advantage. Presumably this is the way it will be as long as there are serious problems in dealing with the IPR issue in China. Keeping the core R&D in headquarters and/or spitting up R&D activities among various units are all devices to reduce risks of losing core knowledge and technology.

TRANSFER OF TECHNOLOGY AND KNOWLEDGE

Nature of the technologies and knowledge involved

The level of technology and knowledge involved in the companies, especially the ones supplying industrial markets, is generally the same as in the US and in Europe. This goes also for sectors known for the fast pace of introduction of new products. In order to document the specified level of technology, ISO and other quality certification systems have typically been implemented.

As mentioned earlier some products aimed at the consumer markets may be based on older generation technologies, and although the market might be able and willing to buy more high-technology products, companies are reluctant to transfer full product processing facilities.

There may be simple reasons for the differences between the consumer and the industrial markets. One may be the volume of demand in the consumer market, with China being so huge and the general buying power limited, so that the previous generation of technology is in fact considered to be the most appropriate for that market. However, the opposite is usually true with the industrial market. Here buyers are professional global players who demand the newest technologies and knowledge.

In general it has been observed that an appropriate and a relatively high level of technology is transferred. The main mechanism for transfer at that level is the use of experienced transfer teams coupled with extensive education and training (3-4 months) of key personnel in the parent company from early-on in the project. Considerable on site involvement by expatriate experts also seems to be crucial for a successful transfer.

As a special case for building technology and knowledge, the acquisition of competitors with strong capabilities were observed. A common and often seen way to transfer certain technologies is through a license agreement. However, this was not seen in the cases studied here. In fact, one company mentioned that a licence would be its normal procedure for transferring technology, but with China this form had been dropped because of the IPR concerns.

Efforts to maintain and amplify transfer within the business unit are pursued by regular visits to headquarters and on the job training.

Responses to the security aspect

As a response to the risk of losing competitive advantage most of the companies emphasised some important features relating to the product and the technologies involved, namely the concept of the "total product package" and the fact that the technologies are parts of greater complex systems. Both represent quite similar types of security measure. The total product package could, for example, be based on the necessary combination of good quality products, attractive delivery forms and outstanding service. Although technologies would be part of this, the total package would in fact comprise much more and, as such, it would be difficult to imitate.

Similarly it can be argued that developing even the most "high-tech" solution from an R&D function may have an isolated value, especially if the solution is only a part that will be integrated into a greater system. Therefore an R&D unit might deal with very sophisticated technology without compromising the company and its products.

Other forms of response to the security aspect are related to human resource management and will typically take account of the Chinese culture, e.g. showing respect at all levels, and the type of job and persons involved. Pertinent for the security issue are management and R&D levels. For both of these the creation of an attractive working environment was identified as a major action for the preservation of technology and knowledge. An open atmosphere and communication, where employees are invited to take responsibility, means that they trust and protect their company. If for any reason a person wishes to terminate their employment, most of the companies have their rules, e.g. prohibiting the removal of technology from the company. Furthermore there are legal rules, according to which, for example, the company can for a 2-year period be entitled to retain the work permit of an employee who wants to join a competitor.

In a broader context all companies stressed the importance of adapting to the local community and actively demonstrating the behaviour of a good corporate citizen. This adds credibility and contributes to peoples' trust and employees' protection of the company.

EU PERSPECTIVES

It is clear that possible threats to Europe arise from losing the technological lead to China in some sectors. However the Scandinavian and other European companies that have been investigated are aware of this threat and realistic about the length of technological lead they have over potential Chinese competitors. Their most important strategy appears to be to maintain a lead over potential competitors through R&D. European firms also have to form their strategies in the context of competition from the US, Japan and East Asia. Therefore, as long as there are no hard security issues, it is reasonable to start from the premise that firms are in the best position to make their own decisions on technology transfer and collaborations in China to enable them to best access the Chinese market and use China as a base for production and R&D activities.

However, there are two areas in which policies and initiatives at the European Union level could protect the interests of European firms. These are protection of intellectual property and Chinese trade liberalisation. Inadequate protection of their intellectual property in China was a concern raised by a number of companies involved in this study. Adequate formal institutional arrangements and a legal framework are now in place for the protection of intellectual property. According to Schlesinger (1997), China has attained a high level of compliance with the GATT (General Agreement on Tariffs and Trade) Uruguay Round Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs) and that there is an emerging legal culture in China, characterised by a strengthening of the judiciary and greater compliance with written laws. China will have to fully comply with TRIPs as a condition of joining the WTO (World Trade Organisation).

However, the situation on using the IPR (Intellectual Property Rights) protection framework is less clear. While the Chinese authorities have been active in dealing with a few high profile areas such as music CD-ROMs and software, enforcement overall is constrained by limited resources and administrative complexity (Potter and Oksenberg, 1999 and Simone, 1999). Further, the alternative avenues for dealing with infringements and levels of compensation are still not fully understood by foreign firms. Where a foreign company has transferred whole or part of technology to be used within the context of a transfer agreement, defending IPR often requires a combination of trademark, patent and copyright protection measures (Fawlk, 1996).

The annex on Intellectual Property Rights to the "Agreement for Scientific and Technological Cooperation Between the European Community and the Government of the People's Republic of China" (OJEC, 2000) is contributing to the progress China is making on protecting IPR in its bid to join the WTO. For companies, even if the framework for legal protection for IPR is adequate, the costs associated

with vigilance, taking legal action and pursuing enforcement can be large. Therefore, providing European companies, both established in China as well as new to the country, with a better understanding of the IPR regime and the possible risks and pitfalls is an important role at the European level. The continuing dialogue between the European Union and China can also be used to raise any issues on the implementation of the IPR regime. To be able to do both these effectively, it is necessary to improve an understanding of the actual problems and issues encountered by European firms operating in China and, in particular, transferring technology. One of the specific recommendations of this report therefore is the setting up of a policy and consultative panel of European businesses and research organisations with experience in China.

The second aspect is trade liberalisation. China's acquisition of technological capabilities, leading to success in export markets and better economic growth, do not have to be at the expense of Europe. Better economic performance in China should lead to more trade with foreign countries and if European firms develop business relationships in China they will be in a better position to gain from its success. For example, in the telecommunications equipment sector, China is becoming a large exporter but remains a net importer. In this respect, European Union policy to support China's membership of WTO and the liberalisation of trade and foreign investment policies as conditions of WTO membership should further benefit European firms.

Before China joins the WTO, the European Union should continue to put pressure on China to be more transparent in its policy on the local sourcing and technology transfer conditions. When China joins the WTO, under the agreement on trade related investment measures (TRIMs), local sourcing requirements will not be permitted (Daniels, King and Bernstein, 1995; WTO, 1999).

However, the WTO agreements do not at present encompass conditions imposed on foreign investors (such as requirements to transfer technology and form joint ventures with local partners in some sectors) or incentives and subsidies for investors. It is likely that China and other countries will continue to impose conditions on foreign investors and offer incentives to them. Foreign investors may also comply with the conditions imposed if they fear loss of opportunity to competitors willing to comply with the conditions. Therefore, there is a continuing role at the European Union level in securing greater transparency in the regulations affecting European companies and pressure to reduce the restrictions. The recommended policy and consultative panel of European businesses and research institutes would also have a role in identifying the issues on regulations and their implementation which affect European businesses in China.

There have been some concerns about European competitiveness in advanced technology sectors, not in relation to China at this stage, but in relation to the US, Japan and the Asian NICs. However, a limited examination of recent evidence shows that, based on strengths in the sectors represented by several of the companies studied (e.g. medical devices, pharmaceutical products and telecommunications equipment) Europe's position in these sectors is reasonably robust.

CONCLUSION

Looking back at the situation now compared with the early days after the introduction of the "open door" policy a clear change with regard to the security aspects can be seen. Often the technologies transferred previously were the older generation types, and the established units were representatives of the lower levels in the Ferdows model, e.g. offshore and server types through the use of Joint Ventures and licences for limited time periods. Over the years the context of operations has evolved, e.g. we see that the business units are now aiming for higher positions in the model implying a greater degree of independence and competence and based on a long-term strategy. This seems to be of mutual interest both to companies and society within the objective of growth in business and the creation of welfare benefits for employees. At the same time it has also increased the sensitivity towards the security issue. Obligations associated with the society side of this equation have included the implementation of Western inspired laws and regulations, while on the company side there is the wish to increase competitive advantage and, at the same time, sharpen the awareness of the security issues. In turn, this seems to have resulted in a change in the form of ownership, e.g. towards the wholly foreign owned

enterprise, in order to structure and manage the organisation and its functions, and ultimately as a way of dealing with the detailed level of knowledge and technology.

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