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INDUSTRIAL PROPERTY RIGHTS AND INNOVATION IN CHINA

Blandine LAPERCHE

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Résumé : La progression du marché en Chine depuis la politique d'ouverture menée par Deng Xiaoping est allée de pair avec la définition de règles et de lois visant à encadrer l'activité de création scientifique et technique, c'est-à-dire de règles de respect de la propriété intellectuelle. Les années 1980 et 1990 ont été celles du rattrapage en matière de propriété intellectuelle, dans la mesure où ce pays s'est doté d'un cadre juridique comparable à celui des pays industriels en adoptant l'ensemble des accords internationaux signés dans ce domaine. Notre objectif est de mettre au jour les conséquences de l'adoption de ce cadre juridique. En particulier, quels en sont les impacts sur l'innovation chinoise ? Est-ce un moyen de favoriser l'investissement local et donc de stimuler l'innovation « endogène » ? Ou bien le respect des règles internationales en matière de propriété intellectuelle et plus particulièrement industrielle (nous nous centrons ici principalement sur le rôle des brevets) a-t-il pour conséquence première de favoriser l'investissement international en Chine ? Nous soulignons dans ce document l'intérêt que constitue une approche systémique du processus d'innovation. Celle-ci découle non pas de la prise en compte d'un seul paramètre - si important soit-il (par exemple le cadre légal de la propriété intellectuelle) - pour expliquer les résultats en termes d'innovation, mais de l'ensemble du fonctionnement du système national d'innovation y compris, dans un contexte de globalisation, ses relations avec les autres systèmes nationaux d'innovation.

Abstract: The market-oriented policy implemented by Deng Xiaoping since the end of the 1970s has led to the determination of laws ruling scientific and technical creation, i.e intellectual property rules. During the 1980s and 1990s, China developed a legal framework of intellectual property (IP) meeting international standards. Our aim in this paper is to discuss the consequences of the implementation of this legal framework. In particular, what are the impacts on Chinese innovation? Is it, as expected by the Chinese government but also as often stressed in the literature on innovation, a way to boost domestic investment and hence endogenous innovation? Or is the implementation of these international rules favouring first and foremost foreign investment in China, as also expected by the Chinese government? This paper supports the idea of the role of a systemic approach to the innovation process as well as the weakness of a too simplistic approach that would consist in linking the IP legal framework to the results in terms of innovation.

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Introduction[1]

« The Emergence of China as a Leading Nation in Science » is the title of a paper published in 2006 in *Research Policy* (Zhou, Leydesdorff, 2006). According to the authors, China is ahead of Europe in the building of a knowledge-based economy, and in the field of nanotechnologies it is just behind the USA. However, the term of « emergence » could be questioned. As a matter of fact, in the fields of science and techniques, China was for a long time far ahead of Europe. In addition to China's three big inventions – printing, gunpowder and the magnetic compass – others such as the mechanical clock, cast-iron, stirrups and harness, the universal joint suspension, the Pascal triangle and quantitative cartography are of Chinese origin and rest on a deep knowledge of mathematics, astronomy, physics, geography as well as biology. However, it was Europe that saw the birth of "modern science" (application of mathematical hypotheses to nature, experimental method). According to Joseph Needham's (1973) thesis, the development of modern science in Europe is not the result of a lack of systematisation or theoretisation of Chinese science but stems from a missing or weakly developed element – compared to the innovation systems that were implemented in many European countries of the Renaissance: the market.

Chinese science has long been organised in a bureaucratic form, under State control: the scientist is a civil servant, the engineer and the craftsman alike are part of the bureaucracy. In this social organisation, the merchant is not in high favour. On the contrary, when commercial capitalism appeared in the European Renaissance, the merchant gained access to political power. This facilitated a close contact between science and market. This connection between scientific and technical knowledge and market explains the birth of modern science, used as a production force in Europe. Then, keeping in mind that the history of China has long been characterised by periods of opening and closure to the markets of industrial countries (Zhang, Krug, Reinmoller, 2005), and flying over the history of the country, we could consider that the irruption of the market into the functioning of Chinese society by 1978 onwards is an explanatory factor of this emergence of China as a great scientific and technical nation.

Deng Xiaoping's implementation of an opening policy and the subsequent progression of the market in China has also been characterised by the determination of rules and laws aimed at framing the activity of scientific and technical creation, i.e. intellectual property (IP) rules. In this contribution, we will particularly focus on this aspect of modern science and technology in China. The 1980s and 1990s were catching up decades in the field of intellectual property rights, as the country implemented a legal framework comparable with the one of industrial countries, adopting all the international agreements signed in this field (2). Our objective is to study the consequences of the adoption of this legal framework. In particular, what are the impacts on innovation in China? Has it been a way to boost local investment and thus to stimulate « endogenous » innovation (3)? Or, is the first consequence of the compliance with international rules in the field of industrial property (we especially focus here on the role of patents) to boost international investment in China (4)?

[1] The author would like to thank Liu Zhan (Master's degree student at ULCO) for his bibliographical research.

1. The Adaptation of China to International Rules of Intellectual Property Protection

1.1. A legal framework meeting international standards

The coming of Deng Xiaoping to power in 1978 marked the building of a modern system of protection of industrial property. This was essential to the policy of opening and attraction of foreign investment to China as from this date. Many disputes and disagreements on the topic of intellectual property characterised the relations between China and industrial countries – and especially the USA – during the 1980s and 1990s and contributed to the determination and the improvement of intellectual property rules (La Croix, Konan, 2002). After becoming a member of the the World Intellectual Property Organization (WIPO) in 1980, the Chinese government promulgated national laws on patents, trademarks and copyrights (table 1), and progressively ratified all international treaties and conventions (table 2). The Chinese Parliament adopted general principles of Civil Law which came into force in 1987 and which contained a first clear definition of intellectual property rights.

The trade-related intellectual property agreement (TRIPS) was the last agreement signed by China, and jointly managed by WTO and WIPO. This agreement, implemented in 1995, is considered as the most advanced one in terms of harmonisation of IP rights worldwide, as it includes minimum rules which have to be complied with by all signatory countries. These countries must also respect the clauses of "National Treatment" (each member-state shall not treat the citizens of other member-states less favourably than its own citizens) and of the "Most Favoured Nation" (any advantage, favour, privilege or immunity granted by a member-state to the citizens of a member-state shall be granted immediately and unconditionally to the citizens of all other member-states). Trade sanctions are provided for when a country does not respect these clauses (Ilardi, 2002). We can notably note that to join WTO (2001), one of the clauses imposed on China was to define, improve and comply with international standards in terms of IP rights.

Table 1: Main Chinese Laws in the field of Intellectual Property

Main Chinese Laws in the field of Intellectual Property	**Date of promulgation and of review**	**Current Content**
Trademark Law of the People's Republic of China	August 23,1982 (reviewed in 1993 and 2001)	Includes product and services marks. Registration is valid for 10 years after approval, with a 10 year renewal option
Patent Law of the People's Republic of China	March 12, 1984 (reviewed in 1992 and 2000)	All types of technological inventions are patentable. Patents can be granted on inventions, utility models and industrial design *validity*: 20 years for inventions, 10 years for utility models and industrial design
Copyright Law of the People's Republic of China	Sept 7, 1990 (reviewed in 2001)	*validity*: no deadline for authors' rights, modification rights and author's integrity. The publication right and the main other rights are valid 50 years after the author's death.

Sources : http://www.sipo.gov.cn/sipo_English/flfg/default.htm (English version) ; OCDE (2004)

Table 2: International Treaties, Conventions and Agreements signed by China

International Treaties, conventions and agreements	**Year**
Convention establishing the World Intellectual Property Organisation and a Contracting Country of WIPO	1980
Paris Convention for the Protection of Industrial Property	1985
Treaty on IP Respect of Integrated Circuits (signatory country)	1989
Madrid agreement Concerning the International Registration of Marks	1989
Berne Convention for the Protection of Literary and Artistic Works	1992
Geneva Convention for the Protection of Producers of Phonograms against Unauthorized Duplication of their Phonograms	1992
Universal Copyright Convention	1992
Patent Cooperation Treaty	1993
Budapest Treaty on the International Recognition of the Deposit of Micro-organisms for the Purposes of Patent Procedure	1993
TRIPS	2001

Source : Yang D., Clarke P., 2005, p. 550

1.2. A legal framework which is still embryonic

Within 20 years, China has adopted a legal framework of IP rights comparable with the one of industrial countries and meeting WIPO standards. National, regional administrative and departmental regulations are added to these laws and aim at specifying the enforcement of IP laws and at imposing heavier penalties on counterfeiting. China has also developed training programs and public awareness campaigns on the subject of IP.

However, the legal framework of intellectual property has some distinguishing features from that of many other countries (Yang and Clarke, 2005, pp.547, 548):

- The Chinese legal framework has been developed concurrently with the formation of businesses. Therefore, it is very new and very different from other legal systems existing in developed countries, which are much older (only in the field of new tehnologies is the situation similar, but it is a very small part of this legal framework);
- Because of the fast implementation of this legal framework, many articles of the different component laws are open to interpretation. Laws and regulations issued by several governenment bodies make it very complex;
- The translation from Chinese to English (and the related ambiguities) also complicates the legal framework of IP;
- The relations between the legal system and the administration are very important, which may reduce the authority of the courts.

Finally, the main limit lays in the difficult implementation of the IP legal framework. In other words, if laws exist, their implementation is far more nebulous.
The impact of the constitution of a modern IP legal framework on the Chinese economy is according to us an interesting issue to raise. In particular, the main traditional argument to justify the implementation of IP rules is the one of incentives (Scotchmer, 2004). The whole economics of innovation, in particular since the works of Schumpeter (see Laperche, 2004a), is based on these incentives. In the field of invention, without a temporary monopoly not a single investor would invest in the design and dissemination of their invention. The risk of opportunist behaviour (*free-rider*) leading to lower-cost duplication would be too high. In a merchant economy, in the absence of patents technical progress would slacken if not become

non-existent, as everyone would adopt a wait-and-see behaviour. Therefore, has the implementation of IP rules created enough incentives to stimulate innovation in China?

2. Is the legal framework of IP stimulating innovation in China?

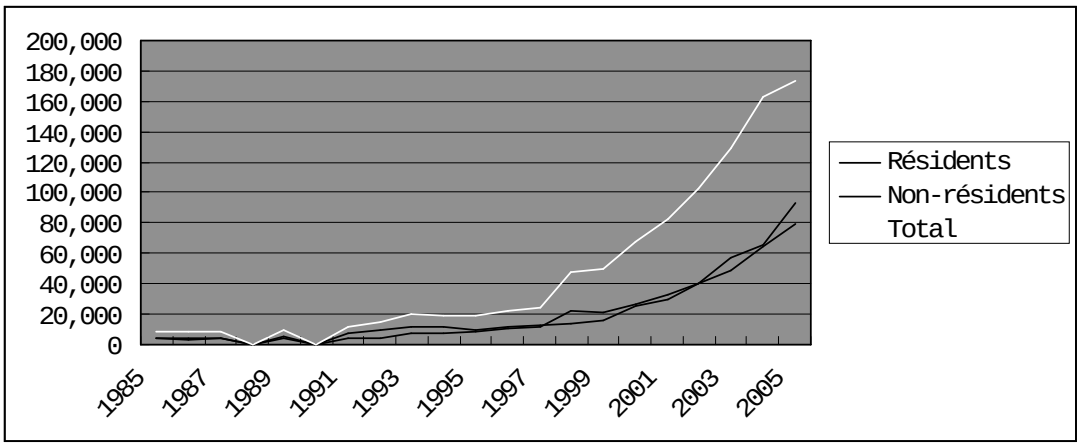
2.1. Differenciated innovation incentives

Since the beginning of the 1980s, statistic data and studies on the evolution of patent applications (a key indicator of the capacity to invent, notwithstanding its limits) have shown a strong increase in patent applications, this increase being even stronger during the 1990s. It is worth remaining that the term « patent » in China includes invention patents, utility models and industrial design. Invention patents give a 20-year protection, and inventions must meet the three criteria of novelty, industrial utility and non obviousness. The invention patent indicates a high level of technology – compared to utility models which refer to the rights for minor technological solutions or to industrial design which protect the shape – design - of products. In order to understand whether the legal framework of IP stimulates or not innovation in China, it is important to study the relative shares of these different types of patents. Moreover, it is useful to distinguish between the origin of applications (from residents and non-residents).

According to WIPO and SIPO (State IP Office in China), there was a boom in patent applications in China during the 1990s. Applications from residents and non-residents accounted for 8,558 in 1985; they reached 51,747 in 2000 and 173,327 in 2005 (fig 1).

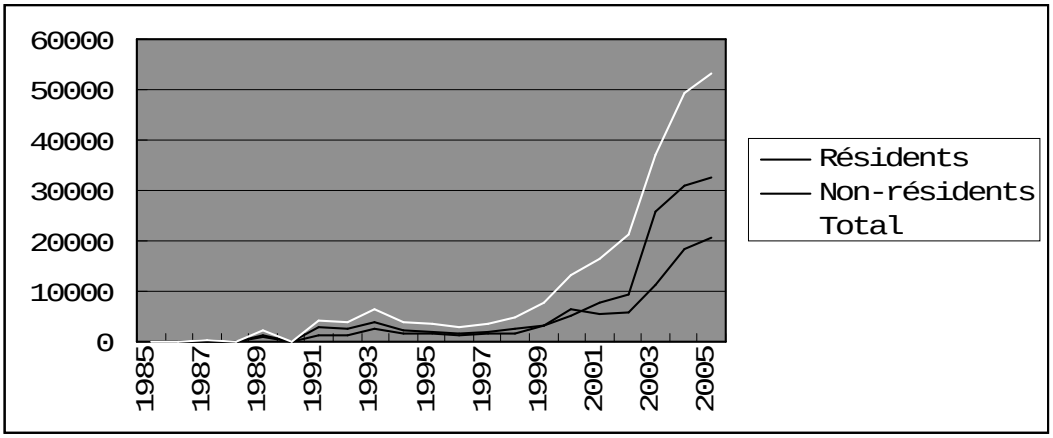
Over the whole period 1985-2005, residents accounted for 50.4% of invention patents against 49.6% for non-residents (see table 3 in annex). These results tend to confirm the idea according to which the implementation of an IP legal framework stimulates invention. However, if we focus on granted patents, during the period 1985-2005 non-residents accounted for 63.4% of all patent granted and their share has tended to increase in the recent period (table 4 in annex and fig. 2).

Fig 1: Patent applications in China (1985-2005)



Nb: data do not exist for 1988 and 1990. Source: author, on the basis of WIPO and SIPO data.
http://www.wipo.int/ipstats/fr/statistics/patents/filed/source.html 1985--2002
http://www.sipo.gov.cn/sipo/gk/ndbg/2005NB/200605/P020060529505722385828.htm 2003--2005

Fig 2: Patents granted in China (1985-2005)



Nb: Data do not exist for 1998 and 1990. Source: author, on the basis of WIPO and SIPO data.
http://www.wipo.int/ipstats/en/statistics/patents/grantedbyoffice/source.html 1985—2002
http://www.sipo.gov.cn/sipo/gk/ndbg/2005NB/200605/P020060529505722702540.htm 2003—2005

So it seems that, in the field of invention, the implementation of an IP legal framework, similar to the one of industrial countries, has given more incentives to foreign inventors than to Chinese ones. How can we account for the substantial share of non-residents in the number of patents granted in China? According to Yang and Clarke (2005) who, with data up to 2002, obtained quite similar results, the substantial proportion of patents granted to non-residents stems from the fact that foreign invention patents are of better quality and also from the better adaptation of their technology to the Chinese market.

Concerning utility models, which require a lower technological level and are also less costly, the dynamism of Chinese residents is perceptible from the beginning of the studied period, while non-residents only account for a low percentage of all applications and grants for utility models (according to our calculations, residents accounted for 99.3% of utility patent applications and grants during the period 1985-2004; see table 3 and 4 in annex). Then we can also stress that the Chinese IP legal system has resulted in China in incentives for a lower level of inventive activity.

Studying the evolutions of the innovation system of China, X. Liu and S. White (2001) came to a quite similar statement. One of the aspects of the evolution of the Chinese system of innovation is the increase in the number of firms that have created research units. In 1998, they accounted for 45% of the national R&D expenditure (about 43% for research institutions and 10% for universities). Their place has also been reinforced in terms of results (number of patent applications). Most of them, however, concern industrial design. In 1996, Chinese enterprises acounted for 98% of industrial design (research institutions accounted for 2%, and universities 0%), 68% of design patents (20% for research institutions and 12 % for universities) and 29% of invention patents (against about 38% for research institutions and 34% for universities). Hence, Chinese residents, and among them enterprises, are not at the origin of the most significant innovations.

Some big groups have started to develop on the international scene (DREE, 2004, p.8) : Petrochina, Sinopec and CNOOC in the oil sector, Baosteel in the steel-making industry, Huawei and ZTE in telecommunication equipment, Lenovo in the computer industry, TCL,

Kejian, SVA, Konka, Changhong for mobile phones and electronic products, Haier and Galanz for domestic household appliances, or Tsingtao in the brewery sector. However these groups suffer from limitations: their size is limited (in 2004, 11 firms ranked among the first 500 global firms, two of them belonging to the industrial sector: Petrochina and Sinopec); their R&D expenses are low (on average, the total R&D expense of the first 500 Chinese enterprises is lower than 1% of their turnover, against more than 5% for the first 500 global enterprises). Their trademarks are not well known abroad (except for Lenovo and Haier, for example). They suffer from management and financing problems, etc.

Some enterprises rank well internationally. According to UNCTAD (2005, p.120), two Chinese enterprises are part of the 20 ones having the highest R&D expenditures. They are Petrochina (USD 263 million in 2003) and China Petroleum & Chemical (USD 161 million). Concerning patent applications, according to WIPO (http://wipo.org), Huawei Technologies Co ranks among the first 50 applicants for PCT patents in the world (rank 37 with 249 patents published in 2005). Since the beginning of 2000, China has also ranked among the first countries using the international patent (PCT). The number of PCT applications was 784 in 2000 and reached 2,452 in 2005. Globally, however, China only accounted for 1.8% of the total number of patent applications in 2005, against for instance 33.6% for the United States. Its progression is nonetheless very strong. The number of patent applications from Chinese enterprises in China is also on the increase in the most recent period, as shown by the results of the first 10 patent applicants in China (national enterprises) (see table 3).

Table 3: First 10 Patent Applicants for National Patents in China, 2003-2005

Enterprise	Number of patent applications (2003)	Position (2003)	Number of patent applications (2004)	Position (2004)	Number of patent applications (first 6 months of 2005)
LGETA (LG electronics Tianjin Appliances Co Ltd)	1,606	1	2,327	1	-
Huawei Technologies Co, Ltd	1,551	2	2,176	2	1,231
Hongfujin Precision Industry (Shenzen) Co Ltd	944	3	1,224	5	642
Chongqing Lifan Industrial (Group) Co	761	4	1,293	4	369
Foxconn (Kunshan) Computer Connector Co.	527	5	-	-	244
Sinopec Co.	500	6	565	7	-
Haier Group	477	7	-	-	355
Au optronics Co.	414	8	-	-	285
BenQ Telecom and Informat Tech Co, Ltd	411	9	416	10	266
Levono China	399	10	-	-	-
Hon hai Precision Industry Co	-	-	1,385	3	-
ZTE Co.	-	-	642	6	342
LGECH (China Holding Company)	-	-	513	8	627
LGESH (Shangai LG electronics Co Ltd)	-	-	448	9	-
QuingDao Kingsea Arts Products Co Ltd	-	-	-	-	244

Source: http://www.cdip.gov.cn. The figures include the three types of Chinese patents.

Notwithstanding the good results of some big Chinese groups, the abovementioned studies and figures might lead us to consider that the implementation of an IP legal framework meeting international standards has mostly favoured foreign inventors. However, it is also

difficult to isolate the IP legal framework as the only justifying factor for Chinese dynamism or stagnation in the field of innovation in China. As we know from the approach in terms of National Innovation Systems (Freeman, 1987, Lundvall, 1992, Nelson, 1993), the incentive to technological innovation and dissemination is dependent on a set of factors much more diversified than the sole IP legal framework, even if the latter has a major role. The functions of the different types of institutions (States, Research institutes, Universities, Enterprises), the sharing of tasks between them, the nature and the intensity of their links contribute as much to it.

Deng Xiaoping's open door policy has transformed the innovation system. But the policy led by the People's Republic of China founded in 1949 also aimed at developing and modernising the Chinese industrial capacity. The policy of the Four Modernisations (agriculture, science and techniques, industry and the military sector) was based on technology transfer from the USSR, on the statistical management of its imitation (reverse engineering) and on its diffusion throughout China. According to Liu and White (2001) few incentives existed for the players of the innovation system to improve the imported technologies, which may explain the relative backwardness of Chinese technology at the end of the 1970s (compared to South Korea which had imitated American technologies but also developed an endogenous own innovation potential). The opening to competition and the introduction of competition into the Chinese society have deeply modified the organisation of its national innovation system. The Chinese innovation system is in "transition". Transition is taken in the sense of Lundvall, Intarakumnerd, Vang (2006), that is a process where one constellation of institutions (related to the production, diffusion and use of knowledge) is turning into a different constellation of institutions : scientific and technological programs have been developed to catch up in the most modern scientific and technological fields, the criteria for evaluating players' activity are more based on economic performance, decisions are decentralised, the labour market is liberalised, the legal framework based on the aknowledgement of private property is taking shape, R&D expenses are increasing (from 0.3% of GDP in the mid-1990s to nearly 3% of GDP today), many industrial technology R&D institutes have transformed to be closely associated with industrial production (see also Sigurdson, 2005) … All those changes create as many incentives to the extension and the strengthening of links between the players of NIS and to the dissemination of innovation. But the speed of change (notably in terms of IP, as we mentioned in the first part), the financial constraints, the lack of technicians, the difficulty in the enforcement of very recent laws, etc., result in a endogenous technical innovation intensity which is still weak in the Chinese society.

Other studies specifically put forward the links between foreign investment and innovation, without under-estimating the other factors of innovation, notably such inputs as R&D expenditures, scientific and technical staff, and economic (international trade, GNP level) and institutional (notably the IP rules) environment. This is the case with Cheung and Lin's study (2004) which aims at assessing the consequences of the increase in foreign investment inflows on innovation (assessed by the number of patent applications) during the period 1995-2000 and uses provincial data. According to the authors, foreign direct investment inflows may have several effects on innovation: first, local firms may copy technologies and then improve them and develop new products. A second type of spin-off ensuing from foreign investment consists in the access of local firms to skilled human resources thanks to turnover (the employees of multinational firms are then employed in local firms). Finally, foreign direct investment may create « demonstration effects ». The presence of foreign products may generate copies or imitation of products and processes. According to the authors' study, there is a strong correlation between the increase in foreign direct investment and invention in

China (as measured by patent applications). Among the abovementioned external effects, the demonstration effect has prevailed in China, as statistical tests show a strong correlation between the increase in foreign investment and the number of low technological intensity patents (notably industrial design patents).

Those studies show that the implementation of an IP legal framework meeting international standards is not a sufficient factor to explain the quantitative and qualitative characteristics of innovation in China. The implementation of the IP legal system has resulted in a parallel increase in patent applications, which demonstrates that Chinese enterprises have integrated the merchant incentive in their operation. However, the qualitative analysis shows that Chinese patents are of a low technological level. The still new IP legal framework may explain that low tech patents, demanding fewer validation studies, are more easily granted. But this explanation does not seem sufficient. A set of factors, including the organisation of the National innovation system and its relations with other innovation systems may also contribute to explain the quantitative and qualitative results of innovation.

2.2. Eviction effects and increasing costs

Today patents are criticised due to the sharp increase in their number since the end of the 1980s and the parallel enlargement of granting criteria in some sectors (Gallini, 2002, Laperche, 2004b). The increase in the number of patent applications in China has originated a lot of litigation for patent infringement. Intellectual property in China is a « new » concept, and imitation and copying have long been common practice (Alford, 1995). The introduction of IP therefore needs a complete modification of behaviours. The amounts of money spent in lawsuits and the amounts to be paid back to firms (often foreign firms) may represent a loss for the Chinese economy. This may be at the origin of an eviction effect: in addition to being used to develop new products, capital is used to compensate complaining enterprises.

Moreover, it is worth discussing the consequences of this legal framework on the cost of innovation. The cost of innovation may increase as much as the number of patents granted in China will augment. As a matter of fact, an enterprise wishing to develop a new product would have to sign costly licencing agreements before starting the innovation process. Thus, we may wonder which –and most of all how many – enterprises will be able to develop new products and processes in China. It is most certain that a greater competition results in the formation of oligopolistic market structures. This is the market's law. But in such a vast economy, characterized by deep inequalities between regions (which are also assessed by patent application statistics), it seems necessary to take account of the impacts of the rapid introduction of the market - and its corollary competition and private property – which would perhaps require some particular policies, not closely inspired by those of industrial countries.

Finally, and in the same line, it seems interesting to study the impacts of the enlargement of patentability conditions – which are noticeable in industrial countries- and of the global harmonisation of IPR (with the TRIPS agreement) on developing countries, which still includes China. The extension of patentability to new subject matter (genetics, software), linked to the clauses of "national treatment" and "most favoured nation", included in TRIPS allow multinational corporations to quite easily patent products or processes ensuing from natural resources, or from traditional and community knowledge, transmitted from generation to generation. These strategies, called "biopiracy" (Shiva, 2002, Mgbeoji, 2005) are seen as a new form of colonialism. Countries like India, Brasil and Mexico are particularly concerned. Is China preserved from these opportunist strategies? And won't the implementation of an IP

legal framework, comparable to the one of industrial countries, favour such kind of practices? This issue which goes beyond the boundaries of this study is nevertheless very important, in the perspective of the Chinese economic and industrial development.

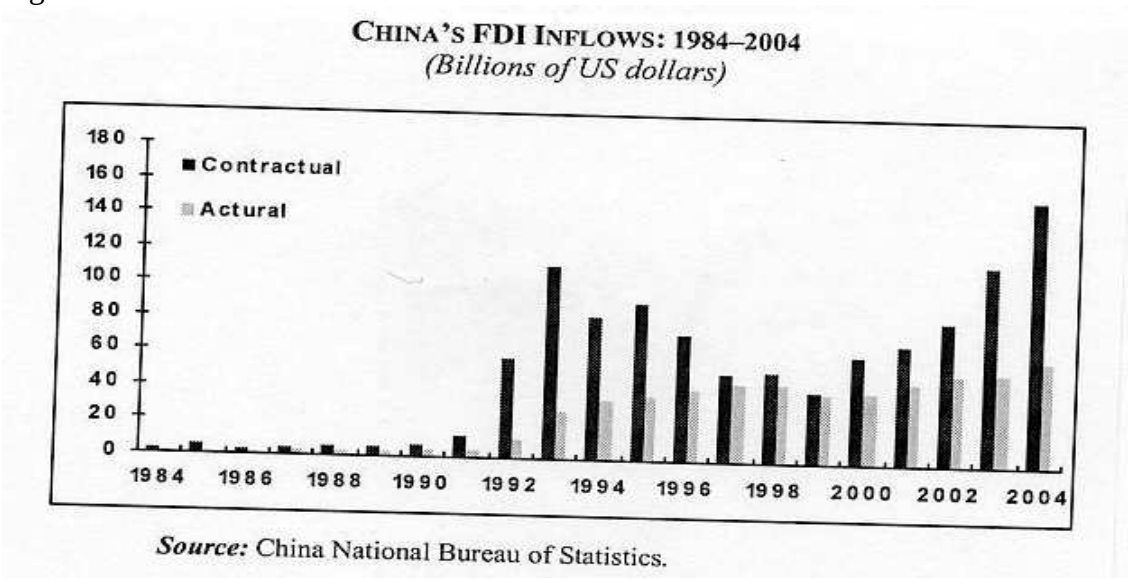
Incentives to innovation through financial reward are one of the main arguments in favour of the creation of a legal IP framework. In the case of China, another argument has also had a strong influence: the reinforcement of foreign investment attractiveness, onto which the growth and development policies implemented since the end of the 1970s are based. In the following point, we investigate this relation between intellectual property and foreign direct investment.

3. A greater confidence for foreign invesment?

3.1. Foreign investment and comparative advantages

The formation of an attractive legal framework for foreign investment has induced their location in China, especially during the 1990s. China is now one of the major host countries for foreign direct investment and the first one among developing countries. From 1984 to 2004, the stock of foreign direct investment in China amounted to USD 562.1 billion with annual inflows reaching USD 2.7 billion in 1984 and USD 60.6 billion in 2004 (see figure 3, Bi, 2005).

Figure 3 : Investment inflows in China : 1984-2004



Source : Bi, 2005

However, some studies, focusing on the nature of investment, demonstrate that although FDI sharply increased during the 1990s, a lot was concentrated in labour intensive manufacturing activities, whereas investment in high tech sectors, and notably in services lagged behind (OCDE, 2004; Dullien, 2005). Thus, according to OECD, the quantitative jump did not go along with a qualitative one.

This statement according to which investment has been mostly oriented towards banal technologies questions us on the key factors of attractivity in China. The IP legal framework which meets the security level required by industrial countries did not go along with

investment in high tech sectors. Do the businessmen of industrial countries lack trust in the enforcement of IP rules? This is without any doubt an interesting explanatory argument, considering the insufficient compliance with IP laws and rules stressed in all existing studies. The figures of counterfeiting in China are high and may lead one to consider that the legal framework is not as efficient as it seems to be on paper. Chow's study (2003) also draws attention on the involvement of local governants, and therefore on the role of corruption in the fraudulent imitation of trademarks and in the dissemination of counterfeited products.

However, other factors may contribute to explain this situation, notably the characteristics of China's comparative advantages during the 1990s. As explained by OECD, and also by S. Dullien for UNCTAD (2005), during the 1990s investors in China were mainly interested in the cheap cost of labour and its quality. Thus, investment was made in assembly units that big groups located in China to export their products to industrial countries (textile, toys, electronics…). In 2003, as stressed by S. Dullien (2005, p.128), more than 50% of China's exports were produced by foreign-owned firms located in China. This investment was characterised by low-tech technology transfers. Moreover, high-tech sectors were almost closed to foreign investment until 2002, which is another fundamental explanation of the weakness of high-tech foreign investment.

3.2. Towards more substantial technology transfers?

During the most recent years, the situation has seemed to change. Notwithstanding the difficulty to know, through data, the aims of investors, it seems that the most recent investors are more interested in the commercialisation of their products on the vast market of China. This is reinforced by the increase in real wages and incomes in China since the end of the 1990s, as businessmen anticipated the purchasing power increase (Dullien, 2005). To spare units, production and assembly factories focused on low labour costs were associated with foreign affiliate companies seeking to take advantage of the market size. The opening of the service sector to foreign investors also offered interesting opportunities to investors in the sectors of banking and insurance.

Moreover, the most recent *World Investment Report* puts forward western R&D globalisation, notably towards developing countries and especially China (UNCTAD, 2005). In 2003, foreign affiliate firms accounted for 23.7% of Business R&D expenditures in China (p.127). American firms spend more and more in developing countries and among them China. R&D expenditures by majority-owned Chinese affiliates of United States parent companies amounted to USD 7 million in 1994 and USD 646 million in 2002 (p.129). About 700 affiliates of foreign companies (not only American firms) specialised in R&D were located in China at the end of 2004. Their R&D expenditures amounted to USD 4 billion in June 2004. The major part of this R&D is focused on adapting products and techniques to the Chinese market, which confirms the evolution of its attractiveness, more and more oriented towards the advantages of its vast market. The key sectors in which multinational corporations choose to perform R&D are technology intensive sectors, i.e. ICTs, the car-making industry, and the pharmaceutical industry. We can thus consider that this investment will result in more technology-intensive technology tranfers. As most of these research labs settled down in China after its accession to WTO, we can also consider that compliance with the most recent international agreements in the field of intellectual property (notably TRIPS) has played an important part in the location of foreign R&D labs by securing their technology transfers.

Concluding remarks: the importance of a systemic approach

To sum up, the implementation of an IP legal framework meeting international standards is not a sufficient element to understand the innovation dynamics in relation to foreign investment. Other attactive factors, the cost of labour and market perspectives, also play a prominent part. However, the recent set-up of many R&D research labs in China can be considered as a sign of higher security for foreign investors, even if many of them are still specialized in technological development. Even if counterfeiting exists and does not seem to decrease, the last international agreements – such as TRIPS - may open up new prospects of technology and knowledge transfer to China.

Investment will, as a matter of fact, increase the Chinese innovation capacity if the absorption capacity of foreign technology exists. And the absorption capacity is closely dependent on the innovation capacity. The definition of IP rules has resulted in low-tech patents or in new shapes – product design. Financial incentives cannot on their own start the innovation process. Only the building of a coherent national innovation system, linked to regional sub-systems can give this impetus. The constitution of such systems does not automatically mean the pure copy of western models. On the contrary, one may consider that the mere transplant of occidental rules into China would be detrimental to the Chinese economy. For instance, the systematic association of science and market may hinder the constitution of a strong scientific and technical capacity in China, because of the orientation of this capacity towards short term accumulation fields. Concurrently, a very strict implementation of intellectual property rights may create eviction effects and increase the cost of innovation and dramatically contribute to the construction or the accentuation of hierarchies between enterprises and regions. As stressed by Lundvall and Gu (2006), the key word for China to develop an efficient innovation base is the one of institutional “learning”, based on international examples and on its own experiences.

Concerning the analysis, our aim in this paper has been to stress the necessity for a systemic approach of the innovation process. This means that focusing on one parameter (however important it may be, as for instance the IP legal framework) is not sufficient to explain the results in terms of innovation. The whole functioning of the innovation system must be taken into account, including, in a context of globalisation, its relations with other innovation systems. In practice, initiative and political will are definitely essential for China to transform foreign technologies into endogenous ones and to develop its own innovation capacity. This statement, based on the experience of other countries, leads to – and faces – other political and geopolitical questions.

Annexes:

Table 3: Patent applications 1985 - 2005

	Total : invention, – utility model –design		Invention		Utility model		Design	
	Total	Proportion	Total	Proportion	Total	Proportion	Total	Proportion
Total	2,761,189	100%	879,025	100%	1,128,501	100%	753,663	100%
Residents	2,257,515	81.8%	442,829	50.4%	1,120,561	99.3%	694,125	92.1%
Non Residents	503,674	18.2%	436,196	49.6%	7,940	0.7%	59,538	7.9%

Source:
http://www.sipo.gov.cn/sipo/gk/ndbg/2005NB/200605/P020060529505722385828.htm

Table 4: Patent grants 1985-2005

	Total : invention - Utility model – Design		Invention		Utility model		Design	
	Total	Proportion	Total	Proportion	Total	Proportion	Total	Proportion
Total	1,469,502	100%	238,717	100%	730,573	100%	500,212	100%
Residents	1,264,887	87.1%	87,365	36.6%	725,326	99.3%	452,196	90.4%
Non Residents	204,615	13.9%	151,352	63.4%	5,247	0.7%	48,016	9.6%

Sources:
http://www.sipo.gov.cn/sipo/gk/ndbg/2005NB/200605/P020060529505722702540.htm

Bibliography

Alford W.P. (1995), *To Steal a Book Is an Elegant Offense: Intellectual Property Law in Chinese Civilization*, Stanford University Press.

Bi J. (2005), "China's New Concept for Development, in UNCTAD", *China in a Globalizing World*, pp.105-124.

Boutillier S., Uzunidis D. (1989), *Chine. Questions sur l'ouverture aux multinationales*, L'Harmattan, Paris.

Cheung K.Y., Lin P. (2004), "Spillover effects of FDI on innovation in China: Evidence from Provincial Data", *China Economic Review*, 15, pp. 25-44.

Chow D.C.K. (2003), "Organized crime, local protectionism and the trade in counterfeit goods in China", *China Economic Review*, 14, pp.473-484.

DREE (2004), Chine, La longue marche vers la société de "prospérité moyenne", *DREE dossier, Les enjeux économiques et sociaux*, Octobre.

Dullien S. (2005), "FDI in China: Trends and Macroeconomics Challenges", in UNCTAD, *China in a Globalizing World*, 125-153.

Freeman C. (1987), Technology policy and Economy Performance: lessons from Japna, Pinter, London.

Gallini N.T. (2002), "The Economics of patents: Lessons from US Recent Patent Reform", *Journal of Economic Perspectives*, vol.16, n°2, spring, pp.131-154.

Ilardi A. (2002), *Propriété intellectuelle. Principes et dimension internationale*, Série cours Principaux, Collection L'Esprit Economique, Paris.

La Croix S.J., Konan D.E. (2002), "Intellectual Property Rights in China: the Changing Political Economy of Chinese-American Interests", *World Economy*, 25(5), pp. 759-788.

Laperche B. (2001), *Propriété industrielle et innovation*, coll. Economie et innovation, L'Harmattan, Paris.

Laperche B. (2004a), « La propriété industrielle : moteur ou frein à l'innovation », in Uzunidis D. (Dir.) *L'innovation et l'économie contemporaine*, De Boeck, Bruxelles, pp. 63-84.

Laperche B., (2004b), "Patentability : Questions About the Control of Strategic Technology", in Shonerigun C.A. et al. (2004), *Questioning the Boundary Isuues of Internet Security*, E-centre for Infonomics, London, pp.117-136.

Liu X, White S. (2001), "Comparing innovation systems: a framework and application to China's transitional Context", *Research Policy*, 30, pp. 1091-1114.

Lundvall B.A. (ed.) (1992), *National Systems of Innovation*, Pinter, London.

Lundvall B.A., Interakumnerd P., Vang J. (2006), Asia's Innovation Systems in Transition: an Introduction, in B.A. Lundvall, P. Interakumnerd, J. Vang (ed.), *Asia's Innovation Systems in Transition* Edward Elgar, Cheltenham, pp.1-20.

Lundvall B.A., Gu S. (2006), Policy learning as a key process in the transformation of the Chinese innovation systems, in B.A. Lundvall, P. Interakumnerd, J. Vang (ed.), *Asia's Innovation systems in transition*, Edward Elgar, Cheltenham, pp.293-312.

Mgbeoji I. (2005), *Global Biopiracy*, UCB Press, Vancouver, Toronto.

Needham J. (1973), *La science chinoise et l'Occident*, Points Sciences, Editions du Seuil.

Nelson R.R. (1993), *National innovation Systems: A Comparative Analysis*, Oxford University Press, New York and Oxford.

OCDE (2004), *Examens de l'OCDE des politiques de l'investissement. Chine. Progrès et enjeux de la Réforme*, Paris.

Sigurdson J. (2005), *Technological Superpower China*, E. Elgar, Cheltenham.

Scotchmer S. (2004), *Innovation and incentives*, Cambridge, MIT Press.

Shiva V. (2002), *Biopiraterie ou le pillage de la nature et de la connaissance*, Le Dauphin, Paris.

UNCTAD (2005), *World Investment Report 2005*, téléchargeable sur : http://unctad.org
Yang D., Clarke P. (2005), "Globalisation and intellectual property rights in China", *Technovation* 25, pp.545-555.
Zhang X., Krug B., Reinmoller P. (2005), *Historical Attitudes and Implications for Path Dependence: FDI Development and Institutional Change in China*, EPCS 2005.
Zhou P., Leydesdorff L. (2006), "The emergence of China as a leading nation in Science", *Research Policy*, 35,1, pp. 83-104.