

University Patenting and Licensing Activities in China: The Role of TTOs and Their Affiliated Universities

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This study aspired to analyse the patenting and licensing activities within the Chinese university system by basing on a reliable set of data. In particular, the aim of this paper was to examine – through the analysis of specific empirical evidence – firstly, the existing agencies of Chinese universities which performed patenting and licensing activities and the number of full time equivalent staffs in technology transfer agencies of Chinese universities, when considering the different context of each university; secondly, the patenting activities in Chinese universities including patent application, patent granted, active patent in patent portfolio and international patent; at last, licensing performances of Chinese universities in the field of the valorisation of the scientific research results from the respective of licensing numbers and revenues. In order to address the research questions, Chinese universities' patenting and licensing performances had been analysed and evaluated with the factors of TTOs existence, TTOs structure and universities orientation.

In particular, detailed data about the most important Chinese universities' TT patenting and licensing activities carried out had been collected by the authors through a specific national survey, with the help of Technology Development Center of Ministry of Education. This was the most updated, complete and reliable existing database on the issue of the research valorisation of scientific research carried out by Chinese universities.

The empirical evidence showed that in spite of TT activities being quite recent in China, patent activities were very dynamic in Chinese universities and licensing activities began to quickly start in some research-oriented Chinese universities, even if the patenting and licensing activities were carried out within different context of the Chinese universities (legislative, financial, organizational framework). In fact, from the data processing, it had emerged that the patenting and licensing performances of Chinese university had a link with the TTOs and the affiliated universities. It revealed the importance of independent agency and full time equivalent staff in Chinese universities to improve the patenting and licensing performances. It also represented that the orientation of universities (Research-oriented) could be another determinant on patenting and licensing performance in Chinese universities.

Keywords: Patenting; Licensing; Chinese Universities; Technology Transfer Office

1. Introduction

In the recent years, there has been considerable research on university-industry Technology Transfer (TT) because the multifaceted characteristics of this fairly recent phenomenon are stimulating scholars' and policy makers' interest (He, 2007; Piccaluga, Balderi, 2006, Paker, Zilberman 1993). But a lot still has to be understood about the pattern and nature of such activities in China. Following this line, the present paper aimed at describing, through the analysis and discussion of specific empirical evidence, the activities of Chinese universities in the field of the valorisation of research results.

The experience of Chinese universities in this field is an interesting case of study, since it highlights a rapid growth in a period of time during when the national university system has been reforming dramatically in the context of a big increasing transforming economy.

The statistics evidences were collected within the national survey on University Patenting Transfer and Industrialization Research Results with the help of Technology Development Center (TDC) of Ministry of Education (MOE), which is a subunit of MOE, aiming for helping Chinese universities valorisation of research results. Such a survey today represents the most detailed source of information about the TT activities operating in Chinese universities and about academic spin-off companies in general.

The Chinese university TT activities began in the 1980s, but just in a very beginning infancy stage. After these spontaneous beginning activities, more and more frequent TT activities attracted the attention of Chinese government. In 2001, Chinese universities have started to invest in the structure of TTO and their staffs with the help of MOE, which is the first time to formalize a national TT agency in Chinese universities (SETC & MOE, 2001). The name of the agencies is "National Technology Transfer Center" (NTTC) and these agencies are affiliated with 6 universities (including Qinghua University, Shanghai Jiaotong University, Xi'an Jiaotong University, East China University Science and Technology, Huazhong University of Science and Technology and Sichuan University respectively). These centers belong to their home universities in managerial respects and they are responsible for the researchers in their affiliated universities to identify, protect and transfer research results. These NTTCs are usually looked as milestones because it is the first time that MOE officially strengthened the role of special TT agency in the Chinese universities. And MOE also use them as the benchmarking for the other universities to learn the successful experience.

As a matter of fact, considering the motivations used by the Chinese legislator to stimulate the patenting and licensing activities (MOE, 1999), cases study of some Chinese universities demonstrate that the increase of patent productivity of Chinese universities has already started in recent years (Rao, Piccaluga, 2009). If we analyse the available data, we easily find out that the TT of Chinese universities has grown in the last five years in terms of both structure and performance. As for the structure, more and more NTTCs or some agencies which

performing TT, like TTOs, were set up in these years and the number of the employees in TTOs is keeping on increasing. As for the performance, the numbers of patents application and granted, spin-offs, TT contracts are increasing dramatically (Rao, Piccaluga, 2009).

Therefore we will describe this growing phenomenon taking into account the two main channels of explicit valorisation of research results which start from inventions, which are (i) patenting-licensing and (ii) (patenting and) spin-off creation, but we will focus attention on the first one, for which, in our opinion, detailed empirical evidences in China are less known.

The article is organised in the following way: in paragraph 2 we describe data regarding the existence and structure of university TTOs in China; paragraph 3 described the activity of research results protection through patenting procedures, and paragraph 4 discusses licence agreements as a tool to transfer proprietary technology towards the market, trying to describe the difficulties which influence success in protection and valorisation. Some conclusions are presented at the end of the paper.

2. Literature Review

With the Chinese economic transformation from extensive economy to intensive economy, building up the national innovation systems is increasingly significant. Building up the national innovation systems is influenced by the characteristics and performances of public research and the capacity of the system of exploiting its research results, through the management of intellectual property (IP) and favouring the birth and growth of high-tech firms, and the consolidation of existing ones. Chinese Higher Education Institutions (HEIs), especially universities, have started to play a more dynamic role in the last few years, promoting specific TT activities and setting up TTOs with specific technical, human and financial resources (Hong, 2008). On the whole, it is undoubtedly a complex activity, characterised by an intense debate between supporters of the so-called "Republic of Science", which advocates the occurrence of spontaneous and independent TT mechanisms, on the one side, and the "entrepreneurial university" often described by the European Commission as a reference point for the future, is characterised by intrinsic difficulties of a legal and administrative nature, mainly connected to the public nature of HEIs and the need that results produced after public investments in research have the highest possible impact on the market, and in general, on society, without negative influences on research processes and on the process of knowledge sharing in the scientific community, or favouring some companies and not others (Pietrabissa, Conti, 2005).

Chinese government acknowledges TT activities as the complementary universities activities whose mainly aims are training and research. However, as a matter of fact, realizing the fact that TT represents a link between public investment in R&D, private investments in R&D and national economic growth, China government pays

much attention to support and promote such an important phenomenon as university patenting, licensing and spin-off company creation. And the TT activities even began to be one of the standards to judge the quality of Chinese universities.

As anticipated in the introduction, the development of systematic TT activities by Chinese universities is something recent and unbalanced. 15-20 years ago, in fact, some elite universities entrusted internal non specialised offices, usually Science and Technology Department, to respond for research activities with tasks related to TT. Take the evolution of spin-off companies as examples, at that time “university-run enterprises”, which includes university-run factories, technology service companies and JVs, were set up, and they were totally owned by universities or shareholding companies in which universities had shares, or companies started with university money but had fuzzy ownership. And the internal non specialized offices had a strong managerial control on these companies. Only in a next phase, and progressively, realizing the difficulties of managing TT activities, some elite Chinese universities have started to set up specific Technology Transfer Offices, albeit with slightly different names (such as Research Results Transfer Center, Science and Technology Cooperation Office, Science and Technology Development Center Office, and so on). It is especially since the year 2001 that the phenomenon has started to diffuse more intensively in China due to the advocating for special professional management office from Chinese government. While as for other universities in China, internal non specialised offices, usually a subunit of Science and Technology Department, are in charge of the TT activities in Chinese universities still now.

According to the western literatures, usually TTO structures definitively allows them to perform some tasks through which TT is strongly fostered, such as: (a) supporting in the identification and protection of research results; (b) finding companies interested in the patents and signing licence contracts with them; (c) supporting researchers in starting and growing spin-off companies; (d) developing of complimentary and important activities, such as the recognition of the patent scenario within R&D projects and the management of IP in research contracts and national R&D projects. Each one of these tasks is characterised by specific technical aspects and the need to have interdisciplinary competencies which allow the TTO to handle managerial issues, law issues and – inevitably – technological aspects. From this point of view the phase of growth of TTOs has also been accompanied by growing qualification of the personnel and the production of teaching material, articles and books (Balderil C, Conti G, Granieri M, Piccaluga A. 2009).

In the China case, some characters of TTOs is quite different from the western countries. For example, the TTOs vary a lot in their independencies on the universities because of the different university context, although the transformation of TTOs from a subunit of the universities to a more independent agency has been started in general. Moreover, a very high share of the staffs in TTOs has a permanent contract with the universities, and the salary of the staffs has little relation

with the performance of TTOs. So their motivation and identification with the university TT mission is not fully activated. Furthermore, without an association for TT in Chinese universities, the annual meeting organized by TDC is the only platform for TTO staffs to participate in training programmes, which help them to understand and share the knowledge related to TT. But this frequency is quite low, and it doesn't construct a platform to communication on UTT among the universities, the TTOs staffs have few chances to learn from each other.

3. Research Focus and Methodology

To facilitate technology transfer (TT) process, setting up TTOs has become popular in developed countries. This paper aims at investigating whether the newborn promising Chinese TTOs and their affiliated universities play a significant role on the universities patenting-licensing activities in an empirical approach. More specifically, in this study, the number of applied patents, licensed patents and licensing revenues accrued have been analyzed with the factors of TTOs existence, TTOs staff number and universities orientation.

According to the statistic in 2006 from Chinese Education Economy Information Net, there were 569 Chinese universities which distributed all around China. But whenever thinking about the possibility of university performing TT activities, the universities which had good quality of research were considered in the paper. In China, 2 well-known standards are used to judge the universities. One is whether the universities join the “211 Project” or not. If the universities join the “211 Project”, then the other standard is whether the universities join the “985 project” or not. According to this division, MOE assumes the former ones (which only join “211 Project”) are Research & Teaching Universities (R&TUs) and the latter ones (which both join “211 Project” and “985 Project”) are Research-Oriented Universities (ROUs). As for the non- “211 Project” universities, they are usually teaching-oriented universities. According to MOE, the number of ROUs and R&TUs in China is 39 and 73, individually.

In order to investigate the TT activities in Chinese universities, questionnaire was sent to 60 universities. These universities locate in 23 provinces, almost all around China (31 provinces in all). If considering the division of MOE, in the survey 29 universities (74.4% of all the ROUs) belong to the former group, and 31 universities (42.5% of all the R&TUs) belong to the latter group. With the help of TDC, the questionnaires were sent by administration order. Owing to this, we got all the feedback from the 60 universities. But because of the imperfection of Chinese universities statistics, 48 universities (80% of all the universities surveyed) answered the questions related to licensing activities, although all the universities answered the questions related to the questions related to TTO. Besides, the information on patenting activities in Chinese universities was collected by web search of Database of National Bureau of Statistics of China (2009) and by a book named Intellectual Property Report of Chinese Universities

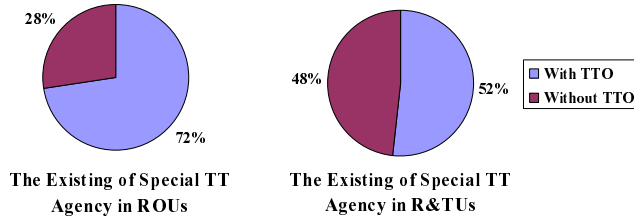
(2008).

4. Technology Transfer Offices (TTOs) in Chinese universities

According to the survey, among these 60 universities, there is only one university without any special agency or staffs perform TT activities, and the university doesn't have other agencies or staffs closely related to TT specifically, either. As for the universities without any special agency or staffs performs TT activities, but have other agencies or staffs closely related to TT specifically, the number is 22, which accounts for 36.7% of all the universities. As for the universities with a special agency or staffs performing TT activities, the number is 37, which accounts for 61.7% of all the universities.

When thinking about the impact of research orientation of Chinese universities on the existence of TTOs, it draws the conclusion that 21 universities among the 29 ROUs have a special agency or staffs performing patenting TT activities, which accounts for 72.4%, and 16 universities among the 31 R&TUs have a special agency or staffs performing patenting TT activities, which accounts for 51.6%. So it reveals the formalisation of TT activities through the setting up of TTOs is more popular in ROUs than R&TUs. And with the more and more research results in universities, the potential to valorisation is increasing, so setting up a special agency should be a wise way to manage the TT activities.

Figure 1 – The existing of Special TT Agency in Chinese Universities- source: TDC survey (2009)

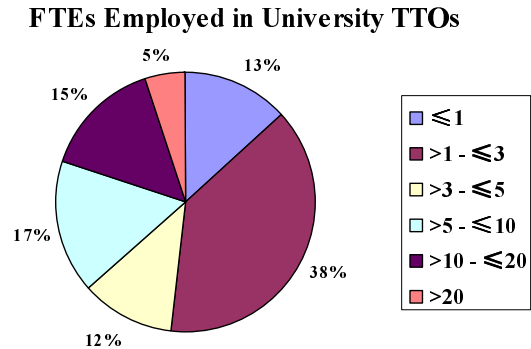


Beyond the formal setting up of a TTO, specific relevance is connected with the real existence of a group of people which are constantly working in the office and are not involved in other tasks too. From the survey, we investigate the number of Full Time Equivalent (FTE) people involved in Chinese universities TTOs (usually Chinese universities don't have non-full-time people working in the offices). In 2009 a total of 448 people were working in the 60 respondent universities, with an average value of 7.4 people. More precisely, besides one university without any specific employees who is performing TT activities, in 8 universities the number of employees is not more than one, in 23 universities it is between 1 and 3; 7 universities employ between 3 and 5 people; 10 between 5 and 10 people, 9 between 10 and 20 people, and in 3 universities more than 20 people are employed in the TTO.

It seems that the number of FTEs in TTOs is linked to the universities orientation division by MOE. Usually the FTEs number of ROUs is much more than the FTEs

number of R&TUs. For example, all the 3 universities which have more than 20 FTEs are ROUs. As for the average staff of both groups, the ROUs are 11.5 people and the R&TUs are 4.2 people. This phenomenon may attributed to the higher R&D level of ROUs than R&TUs, then more people are required by the TTOs of ROUs.

Figure 2 – Personnel (FTEs) employed in university TTOs - source: TDC Survey (2009)



5. Patenting activities in Chinese universities

IP management is undoubtedly one of the main activities of TTOs from universities and other PROs. The process of identification, analysis, protection and valorisation of the invention is at present quite codified within Chinese universities. Each university has its own procedures for the TT activities to follow with. However, the most important aspect related to the number of patent grants, further than the merely quantitative considerations, is the actual capacity to valorise an invention, even by enacting marketing techniques which are suitable to the peculiarities of the transferred object.

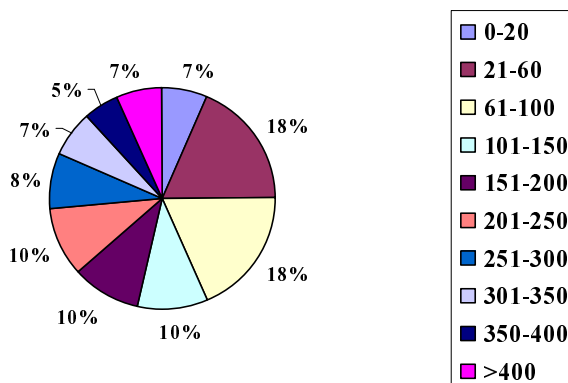
In spite of all the difficulties in selecting the inventions and in carrying out the evaluation and estimation procedures which may be inconvenient, as well as of the traditional way of publishing papers for the researchers in universities, patenting performances of Chinese universities is constantly growing in the recent years. In 2008, the total number of national patent applications (including invention patent, new utility and outlook) filed was 12412, with an average number of 206.9 patent applications per responding university. The maximum application number was 1517 from Zhejiang University, while the minimum number was only 2. So from this point of view, it reveals the unequal patenting performance among Chinese universities.

From the data collected, if we still consider the number of patent application filed from 2 universities groups, we can draw the conclusion that the ROUs ones (which applied 9453 in total and on average 350.1 per university) performed better than the R&TUs ones (which applied 2959 in total and on average 89.7 per university). If we consider the factor of the existence of a special TT agency in the university, it shows that the universities with special TT agency (which applied 9188 in total and on average 248.3 per university) had better performance than the universities without special TT agency (which applied

3224 in total and on average 140.2 per university), it reveals the link between the number of patent applications and the special units which devoted to TT activities in the universities. And if we consider the TTOs' structure, in terms of human sources, (the staffs number of the people who perform TT activities) and divide the universities into 2 groups (the number of FTEs in TTO is more than 3 people is one group and the number of FTES in TTO is not more than 3 people is the other group), it is therefore observable that the universities with more than 3 people who perform TT activities (which applied 9025 in total and on average 311.2 per university) had better performance than the universities without more than 3 people who perform TT activities (which applied 3387 in total and on average 109.3 per university). Quantitative analysis observes that the number of patent applications is related to the number of staffs in TTOs. The reasons for the last two phenomenon maybe that, for example, the filing of a patent application presupposes the TTO carrying out of an intense interaction with the researchers and with the patenting agents editing the forms, this responsibility needs special agencies to perform, and the different complementary disciplines background of the staff can integrated firmly, which help the TT activities in the universities.

Figure 3 – Annual number of patent applications filed - source: Intellectual Property Report of Chinese Universities (2008)

Number of Patent Applications



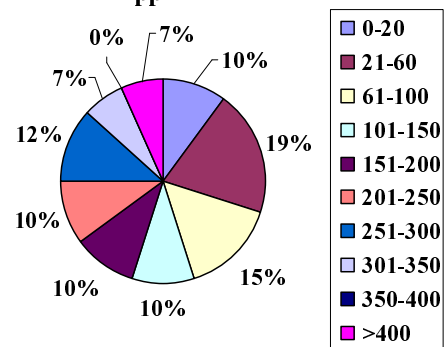
When realizing the invention patents having the most industrial potential (Intellectual Property Report of Chinese Universities (2008)) and accounting for the major part of all the three types (which is 92.3% among all the patents application), we investigated the invention patents in particular. From the survey, the total number of national invention patent applications filed was 11459, with an average number of 191.0 patent applications per responding university. The maximum application number was 1400, also from Zhejiang University, while the minimum number was also only 2.

From the figure above, if we still consider the number of invention patent application filed from 2 universities groups, we find that the ROUs ones (which applied 8766 in total and on average 324.7 per university) had better performance than the R&TUs ones (which applied 2693 in total and on average 81.6 per university). As for the existence of a special TT agency in the university, the universities with special TT agency (which applied 8519 in total and on average 230.2 per university)

performed better than the universities without special TT agency (which applied 2940 in total and on average 127.8 per university), it also reveals the linkages between the number of invention patent applications and the special units which devoted to TT activities in the universities. When considering the TTOs' structure, the universities with more than 3 people who perform TT activities (which applied 8358 in total and on average 288.2 per university) still performed better than the universities without more than 3 people who perform TT activities (which applied 3101 in total and on average 100.0 per university). Quantitative analysis observes that the invention patent applications number is also related to the number of staffs.

Figure 4 – Annual number of invention patent applications filed - source: Intellectual Property Report of Chinese Universities (2008)

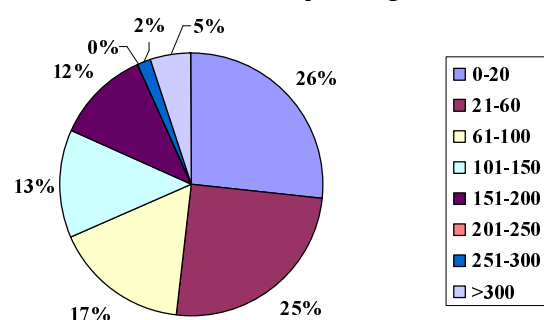
Annual number of invention patent applications filed



After a certain period of time (around 3 years), the application filed may flow into the actual grant of a patent. For the same reason, we only used invention patents data here. In this respect, in 2008 a total number of 6018 patents had been granted to the responding universities, for an average number of 100.3 patent grants per university.

Figure 5 – Annual number of invention patents granted - - source: Database of National Bureau of Statistics of China (2009)

Annual number of invention patents granted

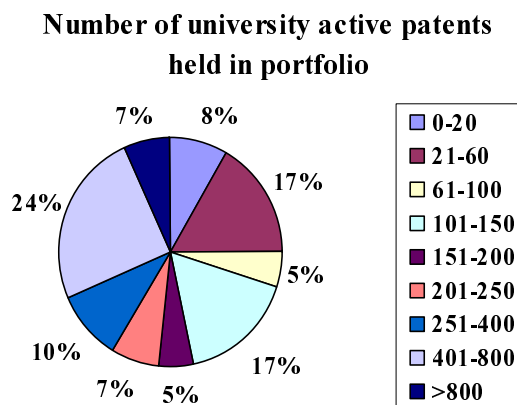


It is therefore observable a quite obvious advantage for the Chinese ROUs. ROUs ones (which were granted 4834 in total and on average 179.0 per university) performed better than the R&TUs ones (which were granted 1184 in total and on average 35.9 per university). When compared with the patent application data, it also revealed the ROUs were more skilled to select the patents application than R&TUs because the granted rate of patents was relatively higher in ROUs (55.1% to 44.0%). When considering the existence of a special TT agency, the universities with special TT agency (which were

granted 4662 in total and on average 126.0 per university) had better performance than the universities without special TT agency (which were granted 1356 in total and on average 59.0 per university), it reveals that the number of patents granted has a link with the special units which devoted to TT activities in the universities. As for the TTOs' structure, the universities with more than 3 people who perform TT activities (which were granted 4569 in total and on average 157.6 per university) performed better than the universities without more than 3 people who perform TT activities (which were granted 1449 in total and on average 46.7 per university). Again, quantitative analysis observed the linkages between the number of patents granted and the number of staffs in TTOs.

An active patent portfolio was deriving from a relevant set of academic research activities. At the end of 2008 the total number of national patents (both applications and grants) held in portfolio by Chinese universities was equal to 20,308 patents. And the average number of active patents held in portfolio included was over 338.5 patents.

Figure 6 –Number of university active patents held in portfolio on December 31st, 2008 - source: Intellectual Property Report of Chinese Universities (2008) & Database of National Bureau of Statistics of China (2009)



It is to see a quite obvious advantage for the Chinese ROUs. ROUs ones (which had 16023 in total and on average 593.4 per university) had better performance than the R&TUs ones (which had 4285 in total and on average 129.8 per university). And if we consider the factor of the existence of a special TT agency in the university, we find that the universities with special TT agency (which had 15257 in total and on average 412.4 per university) performed better than the universities without special TT agency (which had 5051 in total and on average 219.6 per university), it reveals that the number of patents granted is related to the special units which devoted to TT activities in the universities. If we consider the TTOs' structure, it is observable that the universities with more than 3 people who perform TT activities (which have 15273 in total and on average 526.7 per university) had better performance than the universities without more than 3 people who perform TT activities (which have 5035 in total and on average 163.0 per university). It also shows the linkage between patent portfolio and the number of staffs in TTOs.

However, considerable management costs are related to this portfolio (and must be monitored constantly).

Therefore, it is essential to valorise the patent portfolio by the adoption of qualified procedures and competencies, in order to avoid it to become a patent portfolio “casted into oblivion”, heralding costs, but unlikely to generate revenues. In fact, the absence of valorisation results, in conjunction with the management costs related to the active patent portfolio weighing on the university budget, would cause in the long term serious doubts about the legitimacy of the carrying out of TT activities within universities, leading finally to an involution process in the policy measures pursued up to now.

6. Licensing as a tool for the valorisation of results from public research

At the moment, Chinese universities are well aware of the importance to be involved more and more in licensing their intellectual property and they know well difficulties that such channel of valorisation implies. A few elite universities have accumulated their own internal professionals and skills for this kind of activities, whereas the largest part of Chinese universities try their best to strive to manage their patents portfolios, to find the solution of valorisation based on the promotion of spin-off companies, and to build the cooperation with a selected number of industrial partners to work with in order to transfer specific inventions.

In light of the issues raised, it is important to note that only 48 respondent Chinese universities answered the questions related to the licensing activities. The reason why the rest of Chinese universities didn't answer this part of questionnaire was that these universities usually didn't do this kind of statistic activity. According to these universities that answered the questions, they entered an overall amount of 729 license agreements and/or options, with an average of almost 14.9 agreements for each university in general. It is well known that the execution of license agreements is probably the most difficult action that TT staffs carrying out to pursue their mission, thus the relative low percent of universities (6.1%) with no license agreements can be interpreted as a consequence of relatively successful specialization of competences within TT staffs of Chinese universities.

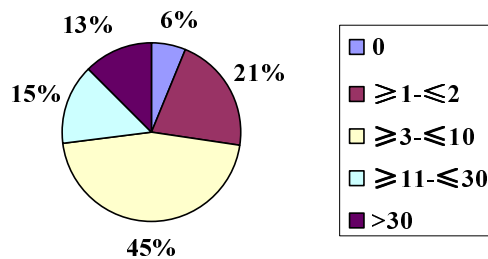
Out of the 48 universities that in 2008 signed agreements, 10 entered no more than 2 agreements each, 22 entered between 3 and 10 contracts, 7 entered between 11 and 30, and 6 universities executed more than 30 agreements.

If we consider the division of the universities, a lot of licensing activities were performed by ROUs (541 among all 729 licences, which accounts for 74.2%). The average number of licences entered in 2008 in ROUs was 23.5, while average number of licences entered in 2008 in R&TUs was 7.5, far less than the ROUs. As for the existence of special TT agency in the universities, the universities with special TT agency (550 licences which accounts for 75.4% and on average 19.6 per university) performed better than the universities without special TT agency. And if we consider the TTOs' structure, it is therefore observable that the universities with more than 3

people who perform TT activities (which is 567 in total and on average 27.0 per university) had better performance than the universities without more than 3 people who perform TT activities (which is 162 in total and on average 6.0 per university). So from the point of view of licensing activities, the performance of licensing is still related to the TTOs (existence and staffs) and their affiliated universities.

Figure 9 –Number of licences and/or options entered in 2008 - source: TDC survey (2009)

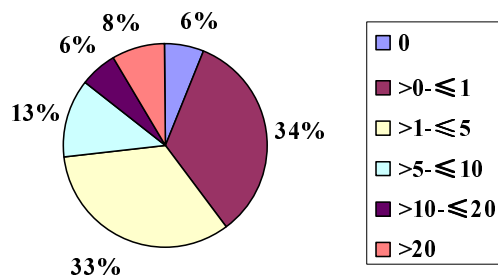
Number of licences and/or options entered in 2008



As for the revenue from licences and options signed in 2008 by the Chinese universities, they amounted to slightly more than 400 million Yuan, while its average value amounted to 8.3 million Yuan per universities.

Figure 10 –Revenues from licences and/or options executed in 2008 - source: TDC (2009)

Revenues from licences and/or options executed in 2008



If we consider the division of the universities, a large part of licensing revenues concentrated on ROUs (286.3 million Yuan in all, which accounts for 71.4%). The average number of licences revenues executed in 2008 in ROUs was 12.4 million, while average number of licences entered in 2008 in R&TUs was 4.6 million. As for the existence of special TT agency in the universities, the universities with special TT agency (299.1 million Yuan in all, which accounts for 74.6%) performed better than the universities without special TT agency (101.7 million Yuan in all, which accounts for 25.4%). And if we consider the TTOs' structure, it is therefore observable that the universities with more than 3 people who perform TT activities (which is 303.6 in total and on average 14.5 million Yuan per university) performed better than the universities with not more than 3 people who perform TT activities (which is 97.3 million Yuan in total and on average 3.6 million per university). The licensing revenues, again, is linked to the TTOs (either existence or

staffs) and their affiliated universities.

Therefore in the survey considered, the patenting activities were far active than licensing activities in terms of both numbers and revenues in Chinese universities. Considering this phenomenon in advance, a question (multiple choices) about the reasons for licensing activities was included in the questionnaire. And 56 feedbacks were obtained. The top 3 reasons for rather low licensing activities were: 80% universities pointed out there was a lack (in universities) of fund for developing the patenting inventions to mature products ("middle-stage-test research" funds). 52% universities strengthened one of the reasons for university patenting was to defend the research rivals, although there was no possibility for licensing activities. 48% universities pointed out that the intention of pursuing higher professional title of the inventors. And if the question changed into a single choice question, 64% universities chose the first reason (lacking fund for developing the patenting inventions to mature products, especially "middle-stage-test research" funds) as the primary reason.

7. Conclusion

Now, in general, the TTOs of Chinese universities are still on their infancy stage, although some TTOs from ROUs begin to move into a more mature stage and there are still quite a few universities which don't have special TTOs at the same time. The reasons for identifying the TTOs in their infancy stage is that a) the capability of managing IP rights and valorisation the research results (for example, licensing and spin-off companies) are still relatively low, although a lot of patents were granted to the Chinese universities each year. The TTOs of Chinese universities still are needed to improve their skills and knowledge; b) the numbers of TTO staffs are far less to be efficient. Their background should be complementary to each other and the mission of TTOs should transform from administration-oriented to market-oriented; c) ss for the national level, the culture of TT in Chinese universities is not really constructed, although TDC begins to realize the importance of training the people who work in TTOs in order to protect and explore research results. Prizing the good performance TTOs and publishing their experience have just started with the help of TDC. d) besides daily management of patents and spin-offs, Chinese TTOs should know to appropriate raising the ability to face to complex situations with high potential, which occurs gradually with the intensification of contacts with industry and the greater articulation of cooperative research agreements. TTO shouldn't be a department in the universities, but a more open and active agency to build the bridge between academy and industry.

In fact, in the university system have been increasingly changed in recent years, situations characterized by particular levels of complexity (in terms of ownership, interaction with external industrial and financial partners, and so on), which often seems to born license agreements and the creation of spin-off with the greatest economic potential. The ineffectiveness of their

actions of licensing reflects the limitation of Chinese universities TTOs ability. This activity should be carried out increasingly in collaboration with industrial partners and not in opposition or competition with them.

The next step of evolution, the TTO will become not only able to better interpret the mission of the TT, but also suggest - with a point of view inevitably technical and practical - the choices can bring better results in terms of transfer technology to the market, suggesting TT strategies that should not lack in the long term university development strategy.

In spite of the infancy stage of Chinese universities TTOs in general, some TTOs performed obviously better than the others. In this article we have focused on protection of inventions and related licensing activities, which together represent one of the two main drivers of the use and exploitation of research results. Through data analysis from source TDC, Intellectual Property Report of Chinese Universities (2008), Database of National Bureau of Statistics of China (2009) and other data sources, we firstly investigated the impact of universities division on TTOs. It drew the conclusion that ROUs usually had a special agency to perform TT activities and had more people working there. It showed that Chinese universities with more R&D funds and higher R&D quality required more professional agency and staffs to promote TT. Then by presenting the patenting data with TTOs information, it revealed the linkage between TTOs (existence, structure and their affiliated universities) and patenting activities, no matter on the number of patent application or patent granted or active patents. It showed the importance of independent agency, full time equivalent staff in Chinese universities and the orientation of universities to improve the patenting performances. When presenting the data of international patents, the phenomenon was much more obvious. Specialization of TT activities was found out to increase the quality and quantity of the patents, as well as a significant role in commercial channel licences. The linkage between TTOs (existence, structure and their affiliated universities) and licenses activities, no matter on the number of licences and revenues was more obvious than patenting activities. The skill of finding the “middle-stage-test research” funds was emphasized. From this respect, it also presented the lack of seed funds in TTOs of Chinese universities and the juvenility of TTOs ability to perform TT activities.

6. References

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