CHAPTER 8

Japanese University Reform seen through Bureaucratic Reform and Changes in Patterns of Scientific collaboration

Yuko Harayama and René Carraz

INTRODUCTION

In order to understand the radical changes that Japanese universities have been undergoing in recent years, the observer has to keep in mind three essential facts: the demographic factor as an engine behind the changes, the ongoing political drive to a reorganization of the university management structure and the need to improve and facilitate the link between university and industry. On a wider perspective, we can add the challenge induced by global competition. Whichever view you take — fearful, constructed by the political sphere or based on real facts — you have to keep in mind the role that global pressure plays on the idiosyncrasies of the Japanese system. The reasons Japanese universities are increasingly facing global competition are that students are increasingly mobile (even though, as for 2005, there were only 79,000 Japanese students studying abroad and 120,000 foreign students in Japan [MEXT, 2006]), that professors and ideas can travel, and that industries choose the best colleges worldwide to cooperate with.

To begin, here are a few figures in order to visualize essential aspects of the Japanese university system. In 2005, there were 726 universities and junior colleges, of which 87 were public national universities. The number of national universities is down from 99 in 2001 due to the merging of several institutions. A large majority of the students are enrolled in private institu-

tions, but the lion's share of the research is conducted in public institutions. This is the reason why we will mainly focus on the national university reform process as a major element of the Japanese effort to reform its scientific system. Historically, while the private universities have been responsible for the massification and extension of the higher education system, national universities have provided academic research and graduate education.

As for education spending, Japan is below the OECD average. It corresponds to 1.1% of growth domestic product of which 0.5% comes from public expenditure and 0.6% from private spending, mainly from households through tuition fees. Households bear a considerable share as scholarships and grants are relatively small compared to the OECD average (OECD, 2005).

Furthermore, one has to keep in mind the demographic downfall pressure on the Japanese higher education system. Indeed, enrolment is doomed to decrease; the total fertility rate has been in decline since the 1970s. As of 2005, it stood at 1.25 [1]. In addition to a matured rate in higher education (Japan's entry rate to higher education is high at 74.1%, with 49.8% of students going on to universities, junior colleges or colleges of technology [four-year institutions]), these factors are pushing the universities to review their recruiting methods through modifying entrance exams, enriching curriculum and finding new kinds of students (for instance, foreigners or working people).

The aim of this article is to consider whether the changes that the Japanese universities have undergone in recent years are responding to the challenges entailed by global competition or are a mere ritual reform. We will also focus on the reinforcement of university-industry links induced by the change in the pattern of scientific endeavours, specifically the expansion of knowledge-intensive investments and activities [2].

This article is organized in two parts. First, we will analyse the major organizational changes that the national universities have undergone. Second, we will examine how major changes in Japanese Science and Technology policy have implied reciprocal transformations in the universities.

A REFORM AND GOVERNANCE CHANGES

A process of administrative reform

One of the anchoring points of the university reform is the Toyama Plan, 2001, named after the Minister for Education, Culture, Sports, Science and Technology (MEXT) Atsuko Toyama. This plan proposed three major reforms: the reorganization and incorporation of national universities, the development of

1 http://www.stat.go.jp/English/data/handbook/c02cont.htm

2 See Foray (2003) for a seminal contribution to the subject.

universities that conform to the highest international standards by using third party evaluation, and increasing the proportion of competitive funding.

We will first explain the sequence of events that led to the reform and then state legislative changes. Our intention is to investigate whether the reform was intended to downsize or to enhance the autonomy of national universities.

In 1996, the Liberal Democratic Party (LDP) made a campaign pledge to incorporate or agentificate public service. After their re-election, the Hashimoto Administration set up a Council for Administrative Reform, chaired by the Prime Minister. As a result, a new organizational structure was created to comply with the agentification process: Independent Administrative Institutions (IAI), a structure created with relative autonomy from the government. During the discussions the Ministry of Education [3] defended the view that national museums and training centres for the youth should be transformed into IAI, but that national universities should remain under the Ministry's jurisdiction. This was a sensible move as the budget for national universities amount to ¥270 billion, compared to ¥5.5 billon for national museums. It can be assumed that the Ministry had a preference to maximize or at least preserve its budget and its realm of power (Yamamoto, 2004). In April 1999, a cabinet meeting decision made the transformation of national universities into independent administrative institutions an urgent matter. In July 2000, the Ministry established a study team concerning the transformation of national universities into IAI. The MEXT led the reform process. The study team was composed of members from academia, business people and experts. The majority of the team members were from national universities.

The launch of the Koizumi Cabinet in 2001 caused the Ministry to lose the leadership: the Prime Minister asked the Minister for Higher Education, Ms Toyama, to hasten the university reform process. This was part of Koizumi's actions to reform the public sector. In parallel, the Ministry of Economy, Trade and Industry (METI) called for greater flexibility in university management, and recommended the restructuring of the university system [4]. This led to the Toyama Plan, officially entitled "The Policy of Structural Reform of University". The main points of the plan are the following:

- The plan recommended that national universities should be transformed into national university corporations (NUC), a legally separate institution from the government.

3 In 2001, the Ministry of Education, Science, Sports and Culture (*Monbush*) merged with the Science and Technology Agency to become the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

4 Priority Plan towards Creating New Markets and Jobs, see http://www.METI.go.jp/english/information/data/c2001polie.html

- Universities should prepare mid-term plans (6 years) to be submitted to the Minister.
- Universities should be evaluated by an independent institution, the National University Evaluation Committee (NUEC).
- Personnel matters should be carried out independently and autonomously by the university itself.

Following these lines, in April 2004, the Japanese government incorporated the national universities as "independent administrative entities". We can comprehend this move as double-edged; on one side appears the rhetoric for reform of the public sector coupled with downsizing elements, and on the other side this reveals a move towards more autonomy of the universities in order to achieve excellence and favours internationally competitive universities. To visualize this move towards more autonomy and excellence, we will take three examples. First is the Center of Excellence (COE) program, which is based on a MEXT report entitled "A Policy for the Structural Reform of Universities". The COE program was established in 2002 to cultivate a competitive academic environment among Japanese universities by giving targeted support for the creation of world-standard research and education. It aimed to promote through competitive funding a first-rate academic environment among Japanese national, public [5] and private universities. The project applications are screened by a committee outside the MEXT: namely the Global COE Program Committee, a structure within the Japan Society for the Promotion of Science (JSPS). The funds are given for a period of five years, and the scale of the funding ranges from ¥100 to ¥500 million a year per project. In FY2003, 113 projects of 50 universities were selected, 133 projects of 56 universities in FY2004, and 28 projects of 24 universities in FY2005. The eligible fields of research are defined by the government on a year-to-year basis (life science, interdisciplinary fields, material science, etc.) [6].

On a similar ground, the FY2004 budget allocated to the national universities (operational grant) was unchanged from that of FY2003. Furthermore, resulting from negotiations between the Ministry of Finance and the MEXT in winter 2003-2004, it was agreed that the operational grant would subsequently be reduced by 1% each year except for the component provided for faculty members' salaries. This could be seen as an indirect way to push the universities to look for alternative revenue sources, such as from industry.

5 Public universities are different form national universities as they are managed by local governments and not from the State.

6 See for an exhaustive list of the fields: http://www.jsps.go.jp/english/e-21coe/02.html, http://www.jsps.go.jp/english/e-globalcoe/01_outline_eligible.html

Finally, the management structures of universities are supposed to be centralized around the newly empowered university presidents. They are responsible for the management of the organization, including appointment of staff, as well as education and research matters. They are supported by the Management and Academic Councils. This gives the universities a potentially strong leadership to implement coherent educational and research policies. However, the level of their real power is still under scrutiny as the MEXT keeps considerable influence through the dispatch of former MEXT senior bureaucrats to the universities. In addition, the new members of the councils may lack management skills as they are mostly university professors.

We could refer to Goldfich (2006) to propose a critical assessment of the reform. Indeed, he argues that the university reform is rather symbolic. "Despite the rhetoric of independence and autonomy, MEXT has not given up its control over the university system — rather it has adopted the rhetoric of agentification to enable it to exert control through other means, with the mechanism of control changing largely to indirect ones." (Goldfich, 2006, p. 599). Yamamoto (2004) argues that the corporation process has a dual meaning, enhancing autonomy of the universities and a downsizing of the public sector.

In terms of global performance, we still have to wait to see whether or not the new law will improve governance and subsequently performance. The new structure is still difficult to read as the president's realm of power is still up for debate. What the effect of the evaluation system will be is another question. In order to conclude upon the reform, we will have to judge on how universities will use the newly available tools provided to them. For instance, the incorporation of national universities in 2004 meant that they would own all inventions made subsequently by their employees under commissioned and joint research. This gives the universities a strong policy instrument to manage their own knowledge base.

Epitaph or Epilogue

The reforms have just been enacted, and it is still not known exactly how it will affect university governance. However, some voices have already been rising for more changes. The new Abe Government wants to push for new reforms of the university system. The Council on Economic and Fiscal Policy (CEFP [7]) on its fourth meeting (27 February 2007) has enacted a plan to boost productivity in Japan by 50% within five years. The idea is to enhance Japanese growth potential. This will be done in three ways: developing growth areas, increasing venture capital, and university reform. According to experts of the CEFP, Japanese universities have been left far behind in the global trend. In order to

7 The Council on Economic and Fiscal Policy is a consultative organ placed within the Cabinet Office.

improve the university system they favour three reform paths. First, universities should concentrate on selected research areas. Second, funding should focus on the selected research areas. Finally, the CEFP is proposing to increase the proportion of competitive funds and reform rules concerning allocation of administrative expense subsidies for national university corporations.

Looking at the different waves of legislative reforms, the university looks like a sheep sacrificed on the altar of change. Different layers of reforms are overlapping. In a world where science and technology are taking an ever-increasing importance, universities are major players in societies based on science. The question is whether all the reforms are helping to create an institution that nurtures talent, technology and invention. This leads us to the broader picture of the Japanese Science and Technology (S&T) policy. We will in the next section examine how the S&T field has become central in the policy debate and what the implications are for universities.

A CHANGE IN SCIENCE AND TECHNOLOGY POLICY

A Big Bang

The most radical change in the Japanese S&T policy is without any doubt the 1995 Science and Technology Basic Law (hereinafter referred to as "the Basic Law"), and the subsequent changes it brought about. In the previous section we have mainly looked at the university reforms' political push; now we will focus on the S&T drive. Our aim is not to be exhaustive on the subject, but rather to highlight the implications of this S&T shift on university structures and missions.

The Japanese government has emphasized the need to promote basic research since the mid-1980s. The general guideline for science and technology policy, which expresses an agreement of all ministries in the Japanese government to promote science and technology, was adopted by the Cabinet in 1986 and reiterated in 1992. This general guideline for science and technology was defined by the Council of Science and Technology (CST), which was composed of cabinet ministers and agency heads, as well as representatives from university and industry. The enactment of the Science and Technology Basic Law on 15 November 1995 symbolized a firm commitment towards the promotion of research and development, determined its basic principles, and required the Japanese administration to raise science and technology related spending for five consecutive fiscal years. In response to the Basic Law, the Japanese government was required to develop and implement two successive five-year Science and Technology Basic Plans: the first effective from FY1996 through FY2001; the second from FY2001 through FY2006. The third one was drafted by the Council for Science and Technology Policy (CSTP) and enacted by the government — it will be effective from FY2006 to FY2010.

The Basic Law had some major policy implications for the universities as it shapes the formulation of the basic plans. Below are summarized the main implications for the universities of the successive plans:

1st Science and Technology Basic Plan

- Expansion of R&D Investment by the Government.
- Expansion and financial support for international exchange programs.
- Achieving a program to support 10,000 post-doctoral students by FY2000 (achieved).

2nd Science and Technology Basic Plan

- Doubling the amount of competitive funds and allocating funds (increase by 30%) for indirect expenses.
- Reinforcement of industrial technology and reform of industry-academia-government collaboration.

3rd Science and Technology Basic Plan

- Suppressing the rate of inbreeding within universities.
- Enhancing the human resource development functions of universities
- Human resource development by industry-university partnership.
- Developing smooth intellectual property (IP) activities.

We can see that the measures of the first and second plans are mainly clustered around the improvement of infrastructures and important financial efforts toward research. But we can only consider this as a first step, many scholars of the innovation process stress that the interaction of people, structures, and properly designed incentives are at the centre of the innovation matrix. Fortuitously, the 3rd Plan goes a step further, as it beckons universities to an improvement of their human resource and IP management. The human resource side is an important issue that Japanese universities will have to face if they intend to be internationally competitive. Improvement of women's opportunities, increasing the share of international staff, and the diversification of the recruitment procedures to stifle inbreeding practices within the universities are major issues for the university to face. Indeed, the incorporation of national universities gave them new prerogatives on their human resource management. The incorporated universities can decide who they will recruit, and how they will pay them, as the salary structure of the personnel is no longer directed by the National Public Service Law. Hence, presidents of universities and the board of directors, whose powers have been reinforced, have an important role to play in shaping the research potential of their universities. The third plan reveals a shift from a perspective centre for infrastructures and financing to the one based on human resources.

Together with the Basic Law, three other laws reshaped the face of Japanese transfer technology framework.

- The 1998 Law to Promote the Transfer of University Technologies (the TLO Law) legitimized and facilitated transparent and contractual transfers of university discoveries to industry.
- The 1999 Law of Special Measures to Revive Industry (the Japan Bayh-Dole Law).
- The 2000 Law to Strengthen Industrial Technology established procedures, through which university researchers can obtain permission to consult for, establish and even manage companies. It also streamlined the procedures for company sponsored commissioned and joint research.

This leads to the next section which will focus on the university-industry link's gained momentum.

The strengthening and officialization of University-Industry linkages

Japan, among other countries, is aiming to increase its national competitiveness by establishing new Industry-Science relationships. Japan tries to move out from in-house R&D type of organization to a more decentralized system. It is often seen giving strong support to "private" companies' science laboratories and minor encouragement to academic science (Nakayama & Low, 1997). One of the initiatives to attain such a goal is to improve the quality of the research done in Japan and strengthen university-industry linkages. American successes in the fields of IT and biotechnologies and the relative failure in these fields of Japan is one of the reasons to ameliorate the industry science relationship.

Fransman (1999, pp. 245-247) interviewed six biotechnology companies in order to assess their different sources of external knowledge. He found that Japanese universities are the most important source of external knowledge for these firms, more than other companies or non-Japanese universities. On the same token, Cohen *et al.* (2002) argue that open publication of university research results is important for private sector innovation.

The two original missions of universities are to provide education and to conduct research, a third one is now emerging: establishing a spirit of entrepreneurship [8]. We will now focus on the third emerging mission while looking at the technology transfer mechanisms of Japanese universities.

8 See Etzkowitz (2002) for further discussions on the subject.

University-Industry technology transfer

University-Industry collaboration has evolved recently in order to facilitate interaction between the two entities. Until 1980, restrictive government regulations have caused low level of university-industry collaboration. In 1983 the Ministry of Education relaxed its rules through which national universities could cooperate with industry. However, it is only after the S&T Basic Law and the TLO Law that we have seen real changes.

The important thing to note is that there is an ongoing change in the technology transfer procedure. Up until recently the links have been mainly informal; a teacher basically having networks of client companies he deals with. The pattern was the following: in exchange for donations, professors would inform donors of their research progress and let the donors file patent applications. They would also encourage qualified students to consider the donors as future work places upon graduation [9]. The system was fast and low-cost, but was lacking incentives for the industry to develop all the technologies given by the university, and missing the transparency necessary for global technology transfer management by a university. The TLO Law was one of the steps towards a more coherent policy.

In 1997, the MITI (now METI), in coordination with the Ministry of Education, proposed to extend the support of university-industry cooperation. A major element of this initiative was the creation of TLOs. The Technology Transfer Law authorized universities to establish semi-independent TLOs that could sell or license inventions and distribute royalties to inventors and the university. However, academic inventors are not obligated to assign their inventions to the TLOs and can continue to transfer their inventions directly to companies. Kneller (2003b) suggests that inventors often turn to the TLOs only when an invention has no takers. In order to boost the efficiency of TLOs, the MEXT went a step further.

In 2003, just before the incorporation of the national universities, MEXT established and began to subsidize 34 IP Management Offices within universities in order to bolster the TLOs and to give universities in-house IP management expertise. But their responsibilities overlap those of the TLOs, and they have final authority over patenting and licensing decisions. In some universities, relations between the IP Management Offices and TLOs have been managed smoothly, but in others there has been friction. The problem is that there is a conflict of interest between the two structures. The inventor has many people to deal with, and the delimitation of power is not clear between the TLO and IP management Offices. An important issue for the newly incorporated universities to address is to resolve these problems of competency between the two structures in order to create synergies.

9 See Kneller (2003b) and Kneller (2007) for a discussion on the subject.

Another policy initiative designed to encourage university-industry linkages was the "Hiranuma Plan", initiated by the METI in 2001. This plan included a goal of establishing 1,000 university start-ups in three years (as well as subsidies designed to foster that goal), sending a clear signal to universities. This movement was salutary as the number of start-ups increased from 26 in 1998 to more than 1,000 in 2005. METI has budgeted ¥47.6 billion (2002), ¥47.4 billion (2003) and ¥61.7 billion (2004) for the Hiranuma Plan.

This initiative can be seen as a way to increase the chances of talented young scholars. Indeed the relation between university and industry in Japan is biased towards big companies. As an example, the data show that big companies account for around 70% of joint research projects (MEXT, 2005). Therefore, as some evidence shows [10], if you buy the argument that small companies are needed to develop certain kinds of technologies, nurturing start-up from universities becomes essential.

Overall, the scale of the cooperation between industry and university has been magnified, for instance the number of joint research contracts jumped from 1,139 in 1991 to 9,378 in 2004, the amount of these contracts increased from less than ¥4 billion to ¥20 billion in 2004. Through different means the interactions are increasing, creating a new research environment for conducting scientific research at universities.

CONCLUSION

To conclude, we will take the case of Tohoku University to illustrate two points we have discussed in this paper: the changes in IP policy, and the organizational *millefeuille* of the newly created university structure.

Tohoku University was founded in Sendai in 1907 as Tohoku Imperial University. It was the third Imperial University in Japan. It is located in Sendai, the most important city of the Tohoku Region (North-East of Japan). It is known as a strong research university; the 2006 Shanghai academic ranking put it in the 4th place among Japanese universities and 76th in the world. The Thomson ISI list of most cited papers in the world ranked Tohoku University 2nd for material science, 13th for physics and 22nd for chemistry [11].

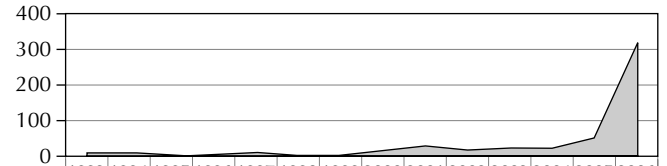
The graph below shows the three steps upward hike of the university's patenting activity. The activity was very low up to 1999, in 2000 the trend started to increase slowly and from 2004 onward the numbers skyrocketed.

We can relate these trends with the different policy changes; we see a huge surge of patent applications after 2004 and the introduction of the incorporation of Japanese national universities. The upward trend is following the

10 For instance, see Motohashi (2005).

11 Figures collected from Tohoku University internal documents.

Figure 1: Tohoku University patent application



	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Tohoku University Patents	6	6	1	1	5	1	2	18	29	17	23	22	51	315

Figures compiled by the authors

major policy changes regarding the push to market of Japanese inventions: TLO Law (1998), Japanese Bay-Dole Act (1999), and the Corporatization of National Universities (2003). Anecdotally, Tohoku University became the university which patents the most in Japan in 2006.

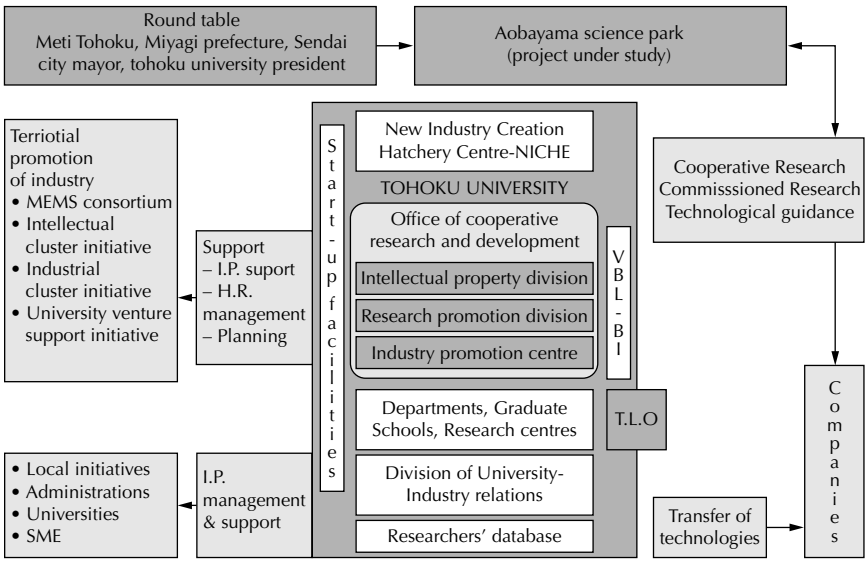
Moreover, we can notice an important change of structure of the applicant's profile before and after the incorporation. Indeed, previously, the majority of applicants were not the university itself, but were rather faculty members, but this pattern changed after 2005, and the number of applications by the university started to increase. Before the reform national universities did not have a status distinct from the government, and they could hardly apply for a patent by themselves; with the incorporation they became an independent legal entity. The universities' change of status gave them more power to manage their IP. Since 2004, the inventor has to transfer its IP rights to the university property rights centre which decides whether to apply for a patent. An identical trend can be seen in all the former national universities, with a jump of the number of patent applications starting from 809 in FY2003 to 4,171 in FY2006.

The figure above shows the complexity of the cooperative research structure at Tohoku University. At the centre, there is the Office of Cooperative Research and Development; it is at the centre of a nexus of supporting institutions. The links between all the elements are not straightforward, and the powers and prerogatives are entangled. The reform of the university and technology transfer system opened a Pandora's Box. Many supporting structures, often overlapping, have sprouted.

To illustrate our argument, looking at Figure 2, we could consider merging the missions of the TLO and the Intellectual property division. Simplifying the structure would make more flexible supporting activities and could promote a further promotion of technological transfer from industry to university and vice versa. Such relation should be based on our view on three concepts:

- Favour local and small entrepreneurial companies.
- Encourage mobility and creativity of the university personnel.
- Support the poles of excellence of the university and have a redistributive strategy among the faculties.

Figure 2: Tohoku University cooperative research structure



Source: Tohoku University internal documents, translated by the authors.

The Japanese university system is at a crossroad. It is therefore an adequate time to scrutinize the process of change; squeezed between a politically driven agenda and the urge to adapt to the changes of the scientific enterprise. It is at a crucial point in time, and the university has to adapt its structure and to respond to new scientific ethos. The difficult choices lie here and it is like facing the two mythological monsters Scylla and Charybdis on the way to progress. The university has to confront them to continue its journey towards modernity.

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