Competence Center money trade finance and development

Berlin Working Papers on Money, Finance, Trade and Development

Working Paper No. 04/2013

Technology Transfer from Publicly Funded Research in Germany: A Note on Patenting and Licensing Practices

Sabyasachi Saha

October 2013

In cooperation with

DAAD partnership on economic development studies

Hochschule für Technik und Wirtschaft Berlin
University of Applied Sciences

Technology Transfer from Publicly Funded Research in Germany: A Note on Patenting and Licensing Practices[*]

Sabyasachi Saha[#]

Abstract

This paper explores patenting and licensing of public funded inventions in Germany in order to capture nuances underlying the institution of IPR in the context of public funded research. We look at two mechanisms in Germany that concerns patenting and licensing of publicly funded science. The first is the operations of Ipal GmbH which undertakes patenting and licensing of technologies originating in the universities in Berlin and the second is that of the Max Planck Innovations (MPI), nodal centre for technology transfer of the Max Planck Society (Max-Planck-Gesellschaft-MPG). Accordingly, our paper presents case studies of patenting and licensing practices at the Humboldt University of Berlin (against the Ipal GmbH model) and that of the MPG (the MPI model). The analysis is structured around core issues pertaining to IPR and academic research, science-industry interface and technology transfer.

I. Introduction

Germany has a very strong presence in the manufacturing landscape of the world specializing in technology intensive industries like automobile and rolling stock, machinery and machine tools, energy and power plant equipments, communication and medical devices and chemicals among others.[1] Germany has also been a leading innovator and nurtures a vibrant small and medium enterprise sector. The outstanding importance of German economy is obvious given that it is presently the most robust economy of the European Union. While industrialization has over the years driven the German economy, Germany has been equally successful in R&D and higher education. Science and Technology has often received high esteem in the public opinion and it is seen as an outcome of collective motivation of the society. Innovations from public funded science research have been instrumental to a large extent in giving Germany its well known industrial competitiveness. Germany has followed deliberate government patronage of research programmes that are sectoral in spirit and aimed at facilitating industrially useful technology. For this, it has actively promoted research at public funded institutions and universities and sought collaborative research projects with the industry.

Intellectual Property Rights (IPR) for academic and publicly funded science research has been instituted in various forms across the industrialized countries since the passage of

[*] This research was undertaken under a DAAD fellowship in 2012 (DAAD Partnership on Economic Development Studies). The support received is gratefully acknowledged.

[#] Consultant, Research and Information System for Developing Countries (RIS), New Delhi; Email: sabyasachijnu@gmail.com

[1] However, Germany has so far lagged in new high technology industries like semiconductors, nanotechnology and computer science. See EFI Report (2013), Porter (1998) p. 371

the Bayh-Dole Act in the US in 1980. Germany, introduced such legal changes over the last decade or so but was active in technology transfers from publicly funded science research even earlier. In this paper, we intend to look at patenting and licensing practices in the context of publicly funded science research in Germany in order to capture nuances underlying the institution of IPR in the context of public funded research. Our objective is to understand the technology transfer paradigm for academic science research in Germany and draw indicative lessons for such efforts in other parts of the world.

The Bayh-Dole Act had led to the creation of technology transfer offices at US universities. Academic institutions in the US were mandated to seek IP protection of their research outputs and promote technology licensing. However, the mandate and operations of technology transfer or any such offices have not been uniform. Often the scope and mandate were widened to comprehensively promote industry interface (through industry sponsored research, consultancy assignments, transfer of know-how and licensing); though, dedicated offices for intellectual property (IP) management were not unusual. The US stance of institutionalizing IPR for academic research has been emulated elsewhere, so are the models of technology transfer offices. This is a growing club consisting of countries of the European Union as well as some of the emerging economies. In this paper we look at two mechanisms in Germany that concerns patenting and licensing of publicly funded science. The first is the operations of Ipal GmbH which undertakes patenting and licensing of technologies originating in the universities in Berlin and the second is that of the Max Planck Innovations (MPI), nodal centre for technology transfer of the Max Planck Society (Max-Planck-Gesellschaft-MPG). We intend to present case studies of these two models in order to come up with a nuanced picture of IP management and technology transfer from publicly funded science research in Germany. We do acknowledge the limited nature of the evidence. However, in field visits and interviews we have attempted detailed and comprehensive understanding of the aforementioned models and have structured our analysis based on the core issues pertaining to IPR and publicly funded research. While, such an analysis could be useful to both academics and policy makers, we do not infer direct policy recommendations.

After this introductory section I, in section II we highlight some evidence pertaining to IPR and academic research. In section III we elaborate the basics of the German Innovation System covering innovation policies and public funded research. Section IV forms the core section of our paper that presents analytical case studies of patenting and licensing practices at the Humboldt University of Berlin (against the Ipal GmbH model) and that of the MPG (the MPI model). Based on our case studies we also discuss some additional insights concerning innovation and technology transfer in the context of academic research. Section V presents our concluding remarks.

II. IPR and Academic Research

The US experienced a slackened economy during the 1970s. This period therefore witnessed several policy initiatives in the US focused on economic resurgence and competitiveness. One pertinent concern was the huge pool of unused patents lying with federally funded research laboratories and universities in the US. There was a general

consensus that with prevailing ambiguity over ownership of inventions and strict requirements of non-exclusive licensing, industry was unwilling to come forward and pick-up (and develop) university inventions for commercialization. Moreover, it was found that in several cases scientific departments and funding agencies of the US government may have played an obstructive role in the process of patenting and licensing. US lawmakers therefore sought to amend legal provisions to transfer all rights of federally funded inventions to the institution/university and allow exclusive licensing. A new law called the Bayh-Dole Act 1980 was enacted with such provisions.

Often, these changes were viewed as unwarranted imposition IPR priorities on academic research. It has been found that patenting and licensing varies significantly across institutions and there are numerous and more important systemic impediments than IPRs that come in the way of knowledge creation and transfer. Therefore skeptics have argued against such 'one-size-fits-all' approach and have warned of possible 'cart before the horse' consequences. It has been argued that premier institutions are nonetheless capable of showcasing their research potential and demonstrating capabilities in terms of generating ideas. And, commercialization of ideas with promise of new and useful innovations is expected to be spontaneous as the industry would also be keen on exploring such ideas. Moreover, generation of innovation ideas is likely to be spontaneous because traditionally, public funded science has moved on its own wheels of motivation and societal obligation towards knowledge creation.

However, commercialization of public funded inventions has been more difficult than said given reluctance of the private industry in exploring nascent technologies without well defined intellectual property rights. Ideas generated from public funded science research is often embryonic or at best at the proof-of-stage that require huge investment for scaling up and commercial application. Property rights are therefore necessary to induce industry to come forward and explore public funded technologies. This forms the key argument behind institutionalizing IPR for public funded research. But, whether it necessarily leads to the desired results has been inconclusively testified. The US evidence shows wide divergence in the experience of academic institutions post Bayh-Dole. Overall, spurt in patenting was not altogether matched with licensing of proportionate magnitude or significance in the US. Technology transfers through the patenting-licensing route is effective only in a limited number of fields and that knowledge transfers occur through more than one channel is well established. Further, it has been alleged that in encouraging patents at academic institutions one ends up with numerous yet marginal innovations that fail to make it to the marketplace resulting in pool of 'useless' patents.

III. The German Innovation System

III.a Innovation Policy

Innovation policies and public funding of research in Germany are implemented both at the Federal level and at the level of the Länders (states). However, there is a very strong bias in favour of decentralized policy making in science with significant regional

implications. For example Baden-Württemberg, North Rhine-Westphalia and Hamburg were the first to create industry-oriented technology promotion programmes in the 1970s. Länder policies also shape industrial development (like those of sunrise industries, new technologies etc.) with very strong implications for knowledge networks as well as public and private research infrastructure.[2] However, Edler and Kuhlmann (2008) argue that knowledge policy in Germany suffers from coordination challenges of fragmented systems, inconsistent policy direction and dispersed orientation.

Germany pursued a policy regime that concertedly promotes high levels of investment in human capital, science base and industrial infrastructure and support for both large and small firms.[3] Such consistent policy endeavour laid the foundation for Germany's strong competitive position in manufacturing and high value added goods and services. Apparently, such an understanding continues to inspire policy making at the Federal level. The Federal Government adopts a concerted and overarching policy framework cutting across all domains of science, technology and industry to create a firm link among these and ensure Germany's competitive advantage in the long-run. This feature of German policy making has attracted academic attention leading to numerous scholarly commentaries. Although, science and technology has been vigorously pursued as government policy in rest of the world, the link with the larger economy has always been fragile and elusive. Apparently, Germany has uniquely attained fair amount of confidence in translating research into economic benefits. The present priorities of Federal policy on S&T may be understood from the diverse range of policies and programmes concerning higher education, S&T and industry.[4]

In so far as market failure in technology development is concerned policies necessarily play a vital role in the German Innovation System. Apparently, there are clear differences in the nature of public funding of research by various government agencies. Most striking is the difference between the Federal Ministry of Education and Research (BMBF) and the Federal Ministry of Economics and Technology (BMWi). While the first is mandated to support public funded institutions, the later expects that benefits of public funded research should extend beyond public funded institutions to the domestic industry to boost national competitiveness. However, both these departments might want the public funded institution to collaborate with the industry while they draw up a research project. Evidently, the German government wants to ensure that the industry benefits from its S&T policies and reportedly goes beyond the interests of the public funded institutions in enforcing collaborations on many occasions. Such explicit policy stance of the German

[2] Wilson and Souitaris (2002)

[3] Interestingly, Germany does not pursue some of the more direct policy instruments like R&D tax credits, employed by majority of OECD and EU member states.

[4] "The *Higher Education Pact*, for example, is meant for fostering university research, while the *Excellence Initiative* is intensifying competition between universities to achieve outstanding results in all higher education disciplines. Although they have different emphases, both the *Joint Initiative for Research* and *Innovation and the High-Tech Strategy* are focusing on networking and interchange. They also encourage cooperation between science and industry. Furthermore, the Federal Government is devoting greater attention to the important subjects of international exchange and cross-border networking in its *Internationalisation Strategy* and *Research and Academic Relations Initiative*." – Research in Germany Portal: http://www.research-in-germany.de/dachportal/

government has been traditionally effective in reaching out to the industry and hence mitigating market failures beyond the stage of knowledge creation/invention.

In the recent years the Federal Government has initiated a series of projects aimed at creating knowledge networks and clusters to promote new technologies. Again, such policy initiatives renew emphasis on pooling research capabilities of the industry and the academic institutions. Needless to mention, the German innovation system has so far thrived on pervasive science-industry interface at various levels.[5]

III.b Public Funded Research

Public funded research in Germany is spread across universities, technical universities, polytechnic institutions (now called universities of applied sciences) and non-university research organizations. In 2010 the Gross Domestic Expenditure on Research and Development (GERD) was 69.9 billion EUR of which nearly 30 percent came from federal and state authorities that patronize nearly 750 public funded research institutions and about 100 innovation clusters. There are around 390 universities that include 200 universities of applied sciences. GERD with respect to institutions of higher education was 12.7 billion EUR in 2010 and over 80 percent of this was publicly funded. Accordingly, one calculates that around 50 percent of all government expenditure on R&D is bestowed on R&D at institutions of higher learning. Such figures speak for the importance of the publicly funded research system in Germany in general and that of universities in particular.

Apart from the universities, Germany is known for its research organizations of the highest caliber. These institutions draw significant public funding and mainly fall under the following systems namely, Fraunhofer-Gesellschaft, Helmholtz Association, Leibniz Association, Max Planck Society (Max Planck Gesellschaft) and include several other federal and provincial (Länder) institutions. To understand the diversity of research mandate one may consider the extremes, namely, Fraunhofer-Gesellschaft has the mandate to undertake applied industry oriented research in totality while Max Planck Society focuses on basic science research only. Interestingly, Fraunhofer-Gesellschaft is therefore mandated to raise fifty percent of their fund from the private industry.

It has been exemplified in a number of occasions that academia in Continental Europe (including France and Germany) are governed by traditional norms that are distinct from that of the US or the British academia. Employment norms in these countries are considered liberal even though employability parameters are set at high standards. In case of Germany this is evident from the fact that although tenured academic employments are forthcoming, professorships are rather hard earned.[6] Also, academia in Germany is somewhat distant from overt display of academic aspirations as in the US (often referred

[5] Robin and Schubert (2013) using Community Innovation Survey data for France and Germany find that cooperating with public research increases product innovation, but has no effect on process innovation which depends on firm's openness. They also find that between 2004 and 2008 increase in product innovation is much higher in Germany than in France.

[6] In Germany, often Professorships require fulfilling requirements like *habilitation*.

to as publish or perish kind of culture by critics). However, we believe, Germany in the recent years has started opting for "mainstream" academic practices engineered primarily by the US academia.

We perceive that there is a difference in approach to publicly funded research between the US and Germany. Public funding of research in the US has been less directed compared to Germany.[7] While pervasive faith in laissez faire in the US possibly motivates arms length transactions in knowledge outcomes (inventions), necessitating larger role of intellectual property rights even in public funded research, we are not sure if Germany posits a different context. It is apparent that universities and research institutions in Germany have maintained a collaborative relationship with its industry and channels of knowledge exchange between the industry and the academia does not necessarily give impressions of arms length transactions in knowledge involving intellectual property rights. Nevertheless, patenting as a vehicle of technology transfer was implemented in several cases by some of the publicly funded R&D institutions in Germany since the 1970s. Patenting of research outputs by universities was however streamlined with the abolition of professor's priviledge in 2002.

Germany presents an excellent example of an innovation system where public and private organizations involved in R&D come together in more than one ways to facilitate knowledge transfer, backed by government policy support. As elaborated in Robin and Schubert (2013) knowledge and technology transfer has been a primary concern for the German federal government since the 1980s. According to them, German governments followed a three dimensional approach to promote technology transfer from public funded research. These may be summarized as (1) reducing the costs of knowledge and technology transfer, (2) incentivising universities and research institutions to engage in technology transfer activities, and (3) incentivising the industry to collaborate in technology transfers.[8]

IV. Public Funded Research in Germany: Patenting and Licensing Practices

In this section we present explorative case studies on patenting and licensing practices of the Humboldt University (HU) in Berlin and that of the Max Planck Society (MPG). While the Max Planck Society has its own technology transfer office called Max Planck Innovations (MPI) based in Munich, Humboldt University outsources most of the activity to a common agency called Ipal GmbH. As mentioned earlier, Ipal GmbH is responsible for patent management for most universities in Berlin namely Frieie University, Technical University Berlin, Charité Medical School and some other universities of applied sciences and research organizations in and around Berlin. This necessitates a detailed case study of the Ipal GmbH model as well. Technology transfer mechanisms are often diverse based on local perceptions about division of tasks and responsibilities involving management of technology transfers. Public funded institutions usually

[7] *see* Giesecke (2000)

[8] The states have implemented policies which are similar in spirit, even though such policies appear to be widely scattered.

undertake technology transfer activities through subsidiary companies or external agencies to avoid direct involvement in activities that are purely commercial.

IV.a Institutions: A Brief Profile

Humboldt University of Berlin

Humboldt University of Berlin (HU), established in the beginning of the nineteenth century, is well known the world over as a premier institution of higher learning. It is regarded as an outstanding university not only in Germany but also in all of Europe. Till date 29 scholars belonging to the Humboldt University have been awarded the Nobel Prize, which stands as a testimony of its rich intellectual tradition. The University pursues all major academic disciplines in the Arts and Humanities, Social Science, Medicine, Agricultural Science, Mathematics and the Natural Sciences. HU is internationally acclaimed for its research in Mathematics, Medicine, Physics, Chemistry, and Biology among sciences and also in History, Cultural and Art Studies, Scandinavian Studies, Economics and Law. Presently, there are eight Collaborative Research Centers at the university and sixteen graduate colleges. Numerous projects have been implemented with support from the European Union. The university participates in numerous special research projects of other universities, and makes significant contribution to various research groups funded by the German Research Association (DFG). Presently, Humboldt University registers 20 invention disclosures on an average per year of which 10-12 usually qualify for patent filing. Humboldt University with its average of 20 invention disclosures a year is reportedly ahead of Frieie University Berlin. However, by all accounts, TU Berlin and Charité are frontrunners among all universities in Berlin in this regard.

Over the last two decades most departments in natural sciences have been shifted to a new campus (at Adlershof Berlin) which has been built has an urban district where industry is located close to university departments to promote effective science-industry interface. Such deliberate attempts to bring the university and the industry together are a reflection of measures that nurture the innovation system in Germany. The relocation of departments and institutes has facilitated development of new areas of interdisciplinary research in materials science, environmental technology, biophysics and biotechnology. The Adlershof campus not only aims at developing new technology led products and new technologies but also intends to help the university in improving its training modules and research profile. Adlershof is a robust science cluster which offers direct benefits in terms of research facilities (at the university and the industry) available for mutual use and provides a platform for exchange of ideas. Often, scientists are able to perform shop floor tests/trials of their ideas making use of industrial facilities located in the vicinity.

The age old professor's priviledge norm for university inventions in Germany was abolished in February 2002 (passed as law on 18.1.2002, BGBI 2002 part I no. 4, p.414; amendment to § 42 employee inventors' act "Gesetz über Arbeitnehmererfindungen – ArbEG") which transferred the responsibility of patenting/licensing of inventions from the scientists to the universities. Clearly, this new legal reform in Germany was inspired by the US Bayh Dole Act and incorporates similar provisions. The Humboldt University

set up the office of the patent and licensing officer (we may call IP office for simplicity) in 2001, a year before the official enactment of this law given strong anticipation about the imminent legal changes. Since then, this office has been placed under a senior professional who specializes both in science and law. This office has a well defined yet a limited mandate. This is the nodal office for reporting disclosures at the level of the university which are then passed on to Ipal. However, this office maintains a constant liaison with Ipal for all activities related to patenting and licensing of HU technologies.

Secondly, this office strives to provide comprehensive and unambiguous information related to IPR, detailing norms and clarifications of clauses pertaining to IP policy. It also orients the university academic community on the modalities of technology transfer. To this end, members of this office (along with Ipal office bearers) try to personally visit the scientists instead of asking them to come to the IP office for queries related to patenting and licensing. The process of orientation is reportedly a continuous process and is evident from the fact that whenever a new faculty member joins the university, the team approaches the person to make her aware of the IPR issues and the functioning of the office.

Apart from this IP office, there is a 100 percent susbsidary company of the university called Humboldt Innovation (HI) that serves as the nodal agency for all industry sponsored projects and is mandated to undertake industry interface activities. HI is allowed to function with more flexibility than usual university bureaucracy in order to meet the expectations of the industry. HI in many cases also manages sponsored research projects of the government (DFG) as well as the European Union.

Max Planck Society and Max Planck Innovation

Max Planck Society (MPG) established in 1948 is the foremost non-university research organization in Germany responsible for basic research across disciples and is largely funded by federal and state grants. MPG has a network of 82 specialized institutions in natural sciences, life sciences, social sciences and humanities. So far, MPG has been home to no less than 17 Nobel Laureates. Its enormous potential is evident from the fact that MPG comes up with over 15000 high quality journal articles every year.

Max Planck Innovations (MPI) based in Munich is the nodal agency of the MPG responsible for technology transfer, patenting and spin-off creation. MPI is a subsidiary company of the MPG and serves as its technology transfer agency, connecting science and business. MPI was founded in 1970 as Garching Instrumente GmbH and operated under the name of Garching Innovation from 1993 to 2006. Presently, it has a sizeable team of professionals as patent and license managers, start-up managers, patent attorneys and legal experts. MPI negotiates all technology transfer agreements on behalf of the MPG. Moreover, all shareholding and equity investments are carried out on behalf of the MPG. However, other industry interface activities are looked after by dedicated departments of the MPG and MPI is consulted on IP matters only.

MPI in many ways may be one of the most successful technology transfer institutions in the entire world. MPI currently oversees more than 1,190 inventions and has

shareholdings in 16 companies. Since 1979 MPI has managed about 3,400 inventions and have licensed 2000 technologies. MPI has so far promoted nearly 100 spin-offs. One may not ignore strong support from the central administration of the MPG which has always been keen on achieving technology commercialization.[9] The total proceeds for inventors, the Max Planck Institutes and the MPG currently amounts to about 280 million EUR. About half of the proceeds originate in the US, the other half in Germany, Europe and Japan. Until the 1990s the focus of Garching Innovations was on developing prototypes that could be put up for sale. However, Garching Innovations was only modestly successful and could achieve commercialization of a handful of technologies.

MPI receives its operational funds from the MPG. In turn, all revenues generated by MPI go to the MPG. Nevertheless, MPI may be regarded as a self-sustaining model in-principle given its ability to generate revenues higher than its operational costs. MPI is an effective mechanism that connects the scientific community with the industry and has a strong network comprising of investors, lawyers, patent attorneys and tax consultants, as well as scientific experts and company representatives from various industrial sectors. The extent of MPI's success in its initiatives is evident from the fact that it has negotiated seed funding for spin-offs with over 35 investors and has entered into contracts with more than 200 companies.

Ipal GmbH

As Germany sought to adopt a proactive patent regime for universities (similar to that in the US) since 2002, it was clear that universities and research institutes lacked professional expertise to manage commercialization of their research results and hence the Federal Ministry of Education and Research encouraged patent valuation agencies across Germany to facilitate evaluation, protection and commercialization of university inventions.

Ipal GmbH is a similar agency. Ipal GmbH, founded in 2001 is a company of the Investitionsbank Berlin (IBB) and Berlin´s universities. The shareholders include the main universities in Berlin and it has several other small research institutes and non-academic research institutions as cooperation partners. The shareholders are the Investitionsbank Berlin (IBB), Freie Universität Berlin, Humboldt Universität Berlin (HU), Technische Universität Berlin (TU Berlin), Hochschule für Technik und Wirtschaft (HTW Berlin), Beuth Hochschule für Technik Berlin and the Charité Medical School while the German Heart Institute Berlin and the Robert Koch Institute are among the cooperation partners. Ipal is primarily funded by public money, by the federal state of Berlin through the IBB. It is a fully owned subsidiary of IBB.[10] Ipal is a for-profit

[9] MPI acknowledges the fact that patenting is not uniform across fields. For example, basic research may not always lead to patentable results. Similarly, patentable innovations are more frequent in life sciences than other disciplines in physical sciences separately. It is only natural that research groups focused on applied research are more likely to come up with patentable innovations and some of them could be better than others on this count. MPI informally refers to such groups as hotspots.

[10] IBB is a public funded bank. IBB's mandate is stated as – "In its capacity as the development bank, Investitionbank Bank Berlin (IBB) actively supports the development of business in Berlin. Against this background, our social commitment focuses on areas like innovation and business start-ups because these are closely linked to IBB's subsidy and support mission."

company (limited liability company – Gmbh) and hence revenue generation through licensing, royalty and equity share holding in start-ups is the primary objective. However, Ipal has so far not claimed to be a self-sustaining model and considers licensing driven revenue generation to be only one among its objectives.[11] The principal objective is perceived in terms of facilitating application of new technologies and towards promoting widespread absorption of technologies by making them available. The secondary objective was stated as creating start-ups to promote techno-entrepreneurship and job creation.[12]

The company provides an extensive catalogue of services ranging from assessment of patentability and commercial viability of technologies to comprehensive patent protection, technology development and commercialization along with administration of IP portfolios, and IP Consultancy.[13] Apart from academic institutions, Ipal also operates for non-academic research institutes, start-ups, small and mid-sized enterprises as well as for patent and technology funds, significantly bridging the communication and informational gap between science and industry. Ipal presently has a portfolio of nearly 230 patented technologies and over 450 patent applications. As of December 2011, Ipal has been successful in licensing 117 of these technologies and has earned over 16.5 million EUR as sales proceeds. Between 2002 and 2011 Ipal generated revenues in the tune of 2.3 million EUR. Ipal reportedly strives towards break even revenue generation.

IV.b Patenting and Licensing

Institute IP Policy

Humboldt University was one of the first universities in Germany to publish its patent policy after the relevant legal amendments in 2002. This policy clearly lays down the objectives and norms with regard to patenting and licensing. The university believes that scholarly quality of research results is also reflected in optimized patent protection by the university and patents are equally as effective in upholding the quality of university research vis-à-vis publications. This is largely a view that dismisses any conflict between free dissemination of research results through scholarly publications and proprietary ownership of knowledge outcomes in case of public funded research. The university aims at commercialization of inventions and intends to add to the financial resources of the university. As stated, the central idea of patenting at the HU has been to expand the patent portfolio and promote licensing.

[11] Moreover, Ipal appears to operate under the presumption that licensing as the sole performance parameter may be a very narrow way of assessing the role and objective of a TTO.

[12] Technology Development Fund (IBB TEF) focuses on a few promising patents with high innovation potential. A revolving corpus of 10 million EUR is used for supporting 4-5 projects annually with an average direct investment of 200,000 EUR and for a duration of1-2 years.

[13] Ipal has a patent portfolio of 243 technologies as of May 2012 and 118 licensing and patent sales agreements. Total revenue since 2002 is around 3 million EUR. Ipal's portfolio reveal a great variety and is composed of technologies covering pharma and biotech (28%), medical devices (19%), chemistry and environment (12%), optics and semiconductors (14%), machine & plant technologies (9%), ICT and software (7%), diagnostics (8%) and nutrition (3%).

The Patent Policy of HU states that activities related to commercialization like granting of licenses or sale of patents, patent applications and know-how shall be handled by a patent valuation (exploitation) company. And, inventors will receive the statutorily stipulated amount of 30 percent of the proceeds from technology licensing. The patent policy also states HU's intention to support spin-off creation by making university inventions (rights held by the university) available to their inventors for such purposes. The patented technology may be used to raise venture capital and the university would grant an option on the rights over the relevant technology to the inventor. The university therefore would be entitled to shareholding in spin-off companies. Moreover information dissemination is made easier at the university through illustrative documents on clauses and break-up on reward share. It is generally true, that every new policy is made public through the website and maximum transparency is ensured.

MPG on the other hand, appears fully aware of conflicts between patenting and publishing as perceived by faculty scientists. Scientists are often driven by non pecuniary motives of research and hence prefer dissemination of research results through publications. Proprietary ownership is often rejected in favour of free and wider dissemination of research results by the academic community. Even when scientists are keen on protecting their research results through patents they are usually reluctant to do so not only due to lengthy patent filing process but also because they are concerned about unavoidable delays holding up publications.[14] There have been very conscious attempts by MPI to adopt a pragmatic approach in its IP policy and IP management to instill confidence among scientists and make them more willing towards patenting inventions. Accordingly, MPG's IP policy states that patents are most suitable protection for 'inventions' and highlights that a patent excludes all third parties from commercializing a patented inventive idea for a limited period only.[15] It also states that, all patent applications are disclosed after 18 months which effectively makes it public knowledge. Further it has been stressed that, after priority has been ensured under the patent law, there is no legal impediment to publications.

Inventions of MPG scientists have always been treated equivalent to "employee inventions" distinct from "professor's priviledge" that existed in universities prior to 2002. In accordance with the Employee Inventions Act, the employer, i.e., the MPG, is entitled to such inventions. Therefore, employee scientists are obligated to report all results, innovations and ideas, which may have inventive characters. The scientists are also expected to cooperate with the MPG management in the process of patent application and commercialization. MPG regulation stipulates up to 30 percent of the gross license income for the inventor (or inventors).[16] Moreover, about one third of the license income is made available to the MPG institute for additional 'expenditures for matériel'.

[14] Publications are considered very important not only for career progression but also for academic prestige.
[15] Hence, MPG encourages protection of marginal and minor innovations through utility patents that expire after 10 years. This is also meant to avoid mindless patenting of minor innovations and uphold a less aggressive posture in so far as IPRs are concerned.
[16] This regulation dates back to 9 March 1967, which testifies that MPG has been one of the early proponents of knowledge transfer practices for public funded research.

Patenting Process

We have already discussed that the IP office of the HU does not have a full mandate of a university TTO and effectively liaises with Ipal for evaluation of patent applications and for all processes involving patenting and licensing. Nevertheless, patenting process begins with this office and there are some distinct features about the functioning of this office. This office is the primary channel of communication between the university and Ipal and is responsible for all negotiations with Ipal. This includes communicating all views expressed by the inventors and upholding the priorities of the university. Generally a meeting with Ipal is scheduled every two months. Ipal carries out a primary evaluation of invention disclosures and could also seek inventor cooperation (through the IP office) in improving patent applications. Ipal and the IP office would jointly guide faculty scientists in tightening patent applications and might ask the inventors to undertake additional experiments to improve the quality of the invention.

Faculty at HU apparently shows similar levels of interest in patenting as in any other large university and is not necessarily extra averse to the idea. Disclosures are random and overall trend in patenting at Ipal for all Berlin universities taken together does not give any impression about either extraordinarily low or high patenting rates. Nevertheless, rejection rate at Ipal is high. Commercial viability of an innovation is considered to be the most important criterion while deciding on patent applications. The technological merit of a patent application is only judged in terms of any specific technological solution it may offer. Such considerations may be distinct from inherent academic merit or technological beauty of an invention.

At HU, advising faculty scientists on matters of patenting involves helping them to identify patentable components of their research ideas. This may be communicated after the invention has been disclosed and generally a 4 page feedback is sent to the scientist. Even when an idea may not be readily acceptable to Ipal for patenting they might offer suggestions on potential improvements. Patent attorneys usually hold separate sessions with the inventor scientists while Ipal guides patent attorneys on technological components relevant to an invention that require adequate protection. Ipal tries to address issues of patenting versus publication conflict by filing a provisional application so that inventors can go ahead with publications.[17] Ipal tries to make this a prudent practice by deciding on the prospects of patenting an idea prior to filing of provisional applications given that provisional applications also entail costs. This reportedly is not a standard practice in other technology transfer agencies elsewhere in the world where decisions on formal patent applications are often made after provisional applications.

HU ensures close association with Ipal to avoid communication gaps and operational frictions. Patenting costs are shared between Ipal and the HU, but Ipal necessarily bears the larger share. The reward share norm is, 30 percent of the proceeds go to the inventor, the rest is divided between Ipal and the university, where Ipal's share is calculated on the basis of the cost borne by Ipal. In most cases Ipal retains a 40 percent share and the

[17] Ipal, like HU is also apparently less considerate towards issues of conflict between patenting and publishing.

remaining 30 percent goes to the university. The inventor(s) is entitled to some additional share if the university is able to generate a surplus. The faculty can flexibly use this additional amount for their research, conference participation etc. We note that government sponsoring agency does not stake claim on the intellectual property.

The first patent filing by Ipal is done mostly with the German Patent Office and then with the EPO or with the USPTO or through the PCT route. Patent regimes are yet to be harmonized across Europe and hence while filing for EPO the destination country needs to be specified and country specific fee needs to be paid. Ipal is entrusted with deciding on patents that are to be renewed based on annual maintenance costs. In case Ipal decides not to go for patent filing after priority registration is done, Ipal and IP office at HU is obligated to notify the inventor well in advance/before the priority year ends so that the inventor, if she wishes, can file patents in individual capacity. However, in cases where the inventor scientist expresses her desire to file patent application in countries other than those decided by Ipal, the IP office tries to accommodate the inventor's preference and might unilaterally go ahead with such patent applications. Such contingencies might arise because Ipal is strictly guided by database search and market assessment and mostly prefers the jurisdiction under EPO.

At MPI rejection rate of invention disclosures is as high as 50 percent. However, at MPI patent evaluations are not arms length dealings. MPG scientists in many cases are already in touch with MPI experts from the time they embark on a research project. Such continuous collaborations help the scientists learn about the market potential and the scope of a prospective research agenda. This also widens their knowledge about a particular genre of technology and makes them aware of experiences associated with technology commercialization. Such mechanisms help the scientists in carefully selecting patentable components as well as in timing their publications without necessarily getting into a conflict of patents versus publications. MPI earnestly ensures that patents do not hold back publications.

Licensing Strategy

Licensing of patents of the Humboldt University and for that matter of other universities in Berlin is carried out by Ipal. So far Ipal has only pursued single patent licenses and is taking steps towards bundling of patents. Ipal licenses patents on exclusive terms in order to generate more income. Ipal considers that its strategy of exclusive licensing may not be in conflict with the public funded nature of the inventions because although Ipal is a for-profit company, it is a fully owned subsidiary of IBB which is a publicly funded agency. So, maximizing revenue through exclusive licensing in essence improves earnings and resources of the government.[18] However, the general experience of Ipal has been that in case of fairly standard technologies, industry may not seek exclusive licenses. In some such cases non-exclusive licensing is pursued. Non-exclusive licenses are also considered optimal when a single firm is unable to pay the right price for a

[18] Nevertheless, exclusive licensing of public funded inventions could make resultant products dearer resulting in double taxation of taxpayers. However, it may not be true when a technology is licensed to a foreign company and when products are not sold locally.

technology. Reportedly, on some occasions start-ups promoted by partner universities are given priority in technology licensing.

Any technology sale is acknowledged to be a step-by-step process and this guides overall licensing strategy of Ipal. The process of looking for licensees starts right from filing of patent applications and a patent application is pursued with potential licensees in mind. Ipal appears to be convinced that technology sales can hardly take place through arms length transactions. Rather, potential licensees are first made to enter into a contract of intent which enables them to arrange for loans and draw up development plans. Ipal reportedly guides industries on such matters as well. Technology sale is not implemented in the first step, however, with an initial agreement in place both parties can negotiate with funding sources and convince them of the prospects of developing a technology. Often, Ipal technology managers participate in industry and academic conferences mostly in Europe, attended by industry representatives from other parts of the world. Such platforms are utilized for the cause of building networks, technology promotion, and technology transfer.

At MPI instances of exclusive licensing surpasses non-exclusive licensing as well. However in most cases of licensing of research tools non-exclusive licensing is encouraged. While licensing strategies at MPI depends on the type of technology, in pharmaceuticals technologies are usually licensed to bigger companies. Moreover, for platform technologies spin-offs are considered to be the more effective route of technology sale. Income from license agreements is almost completely transferred to the inventors and the MPG institute where the technology originates.

MPI also believes that exclusive licenses are unavoidable since companies have to incur significant costs on developing a technology. MPI suggests that for many pharmaceutical and medical technologies (like in oncology) bigger companies are best placed to undertake scale-up and standardization experiments of the concerned technologies. In these fields, bigger companies also engage with the MPG in collaborative research corroborating the fact that in pharmaceutical research collaborations with public funded institutions have been crucial all over the world. MPI reportedly is not dependent on any science cluster for licensing partners. However, some MPG laboratories are individually part of some of the science parks which facilitates licensing in some cases. In so far as locating and identifying licensing partners are concerned MPI first explores possibilities in Germany with the intention of helping the domestic industry (given MPG is federally funded). MPI has an impressive track record of licensing and licensing partners are spread across US, Europe, Japan and also China. It is in this context one notes that MPI still does not have any guidelines for exploring developing country markets.

MPI also reports co-development of technologies with the private partner upon licensing of a technology. Generally in case of exclusive licenses the company undertakes the development and only in some cases they seek scientist's collaboration through separate consultancy agreements. Big pharmaceutical companies usually perform technology development themselves while only small companies seek co-development collaborations.

IV.c Academic Research and Technology Transfer: Lessons

Our case studies of patenting and licensing practices of the two institutions further offer some useful lessons for some of the core (and contentious) issues pertaining to public funded research, IPR and technology transfer. We focus two such issues: 1) market failure in late stage technology development[19] (and commercialization of public funded technologies) and 2) innovation priorities and academic freedom of scientists.

Market failure in late stage technology development

We cite one specific example with reference to MPG which would illustrate how public funded research institutions have at times stretched to unconventional domains of organizational activities to promote technology commercialization. Originally, Garching Instruments was focused on a particular area of technology and was engaged in developing prototypes and selling a particular kind of instrument based on a MPG technology. MPG as a public funded institution also took it upon itself to manufacture certain components that had their origins in MPG laboratories. This presents an example of early experiments at MPG to mitigate market failure during later stages of technology development and commercialization. It was reported that an institutional experiment of this kind was initiated with the understanding that patents carry raw ideas which are not saleable unless workable prototypes are developed and demonstrated. However, the proposition never worked out well and the company failed in the long run. Nevertheless, such not-so-recent initiatives show commitment of public funded research in Germany towards commercialization of its technologies. There is also widespread acknowledgement of dampening effects of potential market failures on the prospects of technology development and transfer. Further, MPG scientists are believed to have a good perspective of the industry and they appreciate limitations of an early stage technology. This prompts scientists and MPI to engage in conversation on means of developing an idea into a commercializable technology. Such conversations take the form of project appraisals and presenting status reports to MPI.

One very important trend concerning licensing of patents is to create patent pools to overcome difficulties of selling single patents and finding potential licensees for each patent. However, neither MPI nor Ipal currently reports pooling of patents. Nevertheless, given very wide variety of research outputs originating in their hinterland both the technology transfer agencies foresee such possibilities in the near future. In recent times, absence of markets for technology trade arising out of serious informational gaps

[19] The problem of market failure in case of late stage technology development may be different from similar problems affecting early stage research. Early stage research would lead to knowledge outcomes with pure public good characters. Therefore, early stage research faces market failure given the innovator's inability to obtain full value of the innovation from potential users. However, in case of late stage technology development, an agency undertaking near-market applied R&D is close to supplying a private good with externalities (Christine and Rogers, 2010). Therefore, one of the likely sources of market failure in technology development is externalities arising out of innovative activity, even as investment requirements for technology development are substantial due to indivisibility of investment and uncertainty of returns.

between the creator of knowledge and the potential end user (the industry) have led to new business models at the behest of private patent management companies. These companies buy patents from inventors and create a patent pool to be sold to potential licensees. They solicit inventions from public funded institutions and at the same time proactively seek potential buyers. However, MPI has shown little interest in such mediated technology commercialization which allegedly has its own flipsides.[20] Ipal with its overarching jurisdiction over academic institutions and the industry may be better placed for transacting in innovations. It operates not only for the main academic institutions in Berlin but also for non-academic research institutes, start-ups, small and mid-sized enterprises as well as for patent and technology funds. This creates strong linkages and network of clientele that serves to bridge the gap between science and industry and at the same time improves prospects of technology transfer.

Innovation priorities and academic freedom of scientists

Often, innovation priorities are considered contrary to the objectives of academia that is primarily engaged in basic research and unencumbered knowledge creation. However, for many, any distinction between basic research and innovations is artificial, and that academic research has a definite obligation towards society's immediate and long term technological needs is undisputed. Nevertheless, technology transfer offices have traditionally tried to strike a balance between both these objectives.

It is aptly clear from the functioning of the IP office of the HU that this office does not interfere with the academic freedom of scientists. We have already mentioned that scientists are rarely asked to report in person for their patent related queries and the IP office makes every effort to reach out to them. There is no direct auditing of faculty research, but research teams are expected to report mature and ripe research results to the IP office. It is then that the IP office initiates the process of patent application in its own wisdom or if so desired by the inventor(s). However, research results may be shared during occasional meetings rather than by way of formal reporting of research outcomes. Interestingly, even when faculty members do not have a patentable idea they are encouraged to discuss their IP related queries. In cases where there is apparent disagreement and discontent over Ipal's assessment of a patent application, the IP office might try to accommodate the interest of the university inventor. However, the IP office is obligated to go by Ipal's suggestions in most cases and by doing so it necessarily safeguards the interests of the university as a shareholder of Ipal. Apparently, there is a well defined regulatory framework which guides all process of IP protection and reward sharing. This regulatory framework is comprehensive in terms of covering the variety of contingencies that may arise and leaves little room for arbitrary operations.

The HU experience suggests that sometimes a professor's interest in patenting could be linked to her intentions of raising project funding in the future. On other instances academics are unduly hesitant towards patenting because they are ignorant of commercial prospects of their research results. Such ignorance could extend to unavailability of

[20] Such patent management companies have often been accused of being patent trolls – who use patents only to generate revenues through infringement litigations. Moreover, summary sale of a technology could mean complete alienation of the inventor who is kept in the dark about how her technology is being used.

information about potential industry partners reinforced by prior unwillingness to reach out to the industry. Even when faculty scientists engaged in basic research are keen on diversifying into applied areas they are probably caught in the inertia of not having done the same earlier. There is always a fraction of scientists who are averse to the idea of patenting. Overall, publications are considered to be overwhelmingly important by academic scientists at HU. Faculty members are therefore asked to submit their timelines and indicate their priorities and the IP office reportedly not only adheres to a faculty member's priorities but also ensures expeditious processing to allay fears about patents coming in the way of publications. Therefore, the IP office seems to accommodate potential conflicts between patents and publications in practice despite the stated IP policy of the university that appears to downplay the extent of such a reality.

As a non-profit research organization MPG is statutorily obliged to make the research results accessible to the general public. However, MPG also considers industry collaboration, patenting and licensing, and spin-off creation as important elements of its knowledge transfer activities. Therefore at MPG, which had its own law that established employer's first right of refusal over all IP originating in its institutes much before the ArbEG 2002, scientists are obligated to disclose their inventions. Invention disclosures are solicited by individual institutes and not by MPI directly. In any case, it is to be noted that at MPG institutes, the academic community is well informed of the mandate and activities of MPI. The respective directors of the MPG institutes are expected to play necessary leadership roles and motivate the scientists towards technology transfer.

V. Concluding Remarks

Evidence suggests that IPRs are but one of the many channels of knowledge transfer from public funded research. There is significant heterogeneity in the spontaneity and frequency of patenting activity across different scientific fields. These hold true in the German context as well. We come across interesting models like non-IP spin offs. Humboldt Innovations promotes university spin-offs independent of the IP office of the HU when such spin-offs involve minimum IP management. Spin-offs may not always be based on patentable technologies as in software. However, adequate support is needed for transforming an idea into business concepts. Once the commercial viability of an idea is ascertained intellectual property protection may be invoked. Humboldt Innovation is mandated to provide support in seeking venture capital for any such spin-offs. At MPI it was suggested that licensing serves a very minor role in the entire life cycle of an innovation. While innate potential of the seed idea is extremely important, ability of the industry to develop an idea into final product is no less crucial. This prompts MPI to license its inventions in life sciences either to established companies or to a university start-up with verifiable capabilities.

However, there has been a general perception that on a significant number of occasions German inventors (in public funded institutions) have seen technology transfer agencies as an obstruction. This has lead to individual patent filing by scientists, justifiably so because individual patent filing costs less. There are issues of attitudinal differences between technology transfer offices and the academic community. Nevertheless, there is

a significant fraction of scientists in Germany who are willing to cooperate with respective technology transfer agencies in all matters of patenting and licensing.

Acknowledgments

I have immensely benefitted from all personal interviews at different institutions in Germany. I remain grateful to all office bearers and faculty members who had spared their valuable time. Some of the insights on issues of IPR and academic research discussed in this paper draw upon my earlier research in this area. I have also made extensive use of resources available online on the websites of organizations relevant for this study. The responsibility of the analysis presented in this paper rests with me.

References

Christine, G. and Rogers, M. (2010) "Innovation, Intellectual Property and Economic Growth," Princeton, New Jersey: Princeton University Press

Giesecke, S. (2000) "The contrasting roles of government in the development of biotechnology industry in the US and Germany," *Research Policy*, 29, pp. 205-223

EFI (2013) "Report of the Expert Commission on Research and Innovation," Federal Ministry of Education and Research, Germany

Porter, M.E. (1998) "The Competitive Advantage of Nations," London: Macmillan Press

Robin, S and Schubert, T. (2013) "Cooperation with public research institutions and success in innovation: Evidence from France and Germany," *Research Policy*, 42, pp. 149-166

Wilson, D. and Souitaris, V. (2002) "Do Germany's federal and land governments (still) co-ordinate their innovation policies?" *Research Policy*, 31, pp. 1123-1140

Publisher: Competence Center "Money, Finance, Trade and Development "
HTW-Berlin – Treskowallee 8, 10318 Berlin
Prof. Dr. Sebastian Dullien, Prof. Dr. Jan Priewe

http://finance-and-trade.htw-berlin.de

Hochschule für Technik und Wirtschaft Berlin
University of Applied Sciences

ISSN: 2192-7790