PRIVILEGED OR NOT PRIVILEGED ACADEMICIAN – VIEW ON INTELLECTUAL PROPERTY MANAGEMENT AT UNIVERSITY

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Abstract: In European universities can be met intellectual property (IP) regimes based on IP ownership by professors – professors’ privilege, but predominant is employment regulation of IP ownership by universities. Which of these options is more beneficial for university and society is the question of R&D and innovation policy on the state level. The paper aims to compare productivity of knowledge production at universities of different small countries with different IP regimes. Empirical research explores academic publication and patenting comparing universities from the Netherlands, Sweden, Finland and Estonia. The paper ends with conclusions drawn about the impact of IP regime and university environment on academic knowledge creation and technology transfer (TT) in a small transition country on the example of Estonia.

Keywords: knowledge production, intellectual property (IP), IP ownership, academic patenting, technology transfer (TT).

1. Introduction

The former roles of university – teaching and research, have been complimented with the new one: contribution into economic development and social capital of knowledge-based society (Raivio, 2008). That means producing new knowledge to be transferred into industry or public sector. Successful universities in knowledge transfer (KT) to industry and other activities towards society are called entrepreneurial universities (Clark 2001). Although patenting of own inventions is not the only indicator of entrepreneurial behaviour, incl. KT by the university (Von Ledebur 2009) there can be seen some very drastically different patterns in protection of academic inventions in different countries (Mets 2010). But the differences can be seen even between the universities of the same country as found in Germany by Von Ledebur (2009).

Comparing knowledge production by some Swedish, Dutch, Finnish and Estonian research universities I have found that if productivity of publications per researcher is differing maximum 1.9 times between universities, then productivity of patenting by academic personnel can differ up to 13.5 times (Mets 2010). The phenomenon could be partly explained with the entrepreneurial behaviour of personnel and interdisciplinary character of the relatively new University of Linköping generally (Klofsten, Jones-Evans, Schärberg 1999; Ferrer-Balas et al 2008). But this cannot be the only explanation as patenting activity is very high in the old traditional Uppsala University too (Mets 2010). There is one more important factor influencing patenting activities of Swedish academicians – so called “professors’ privilege”, which means ownership of academic inventions by academic personnel (Lissoni; Llerena; McKelvey; Sanditov 2009). As the other countries of origin of the sample universities have employment regulation of invention ownership it could be supposed that the main reason for drastic differences between universities comes from legal regulation of patent ownership. On the example of Germany changing its professors’ privilege regime to university ownership on invention in 2002, could be expected that besides legal issues, other factors can be in effect: tradition of academic invention, expansion of patentable research fields (biotechnology) as well as growing experience of technology transfer offices (TTO) at universities (Von Ledebur 2009). Even different patterns of IP behaviour between universities of West and East Germany (ibid) can be identified. The latter refers to the need to study the impact of transition processes. This last aspect has not studied in post-socialist countries at all.

The paper aims to identify the factors influencing productivity of academic patenting and knowledge production at universities of a small transition economy country in comparison with universities of different IP regimes.

For that purposes, first, the impact of IP ownership on academic patenting is analyzed. The general theoretical framework of IP production related to different regimes is studied in the next section. Second, sample and methodology of current research is introduced. Third, results of the empirical research and discussion are presented and the article ends with a conclusion.
2. Developments in academic knowledge creation and patening

Since the beginning of 1990-ies after regaining independence, just like in other post-socialist countries, Estonian R&D system was transferred from the ministry-type Academy of Sciences into the university-centred form. International peer-review and performance-based funding of research has been implemented now in most European countries (Allik, 2008; Glänzel, Schlemmer, 2007; Sörlin, 2007). Estonia has been a success story in Eastern Europe (Nature 2009a,b). As a result of that R&D system transition process has been more focused on publishing than on industrial application and patenting the results of R&D (Bartlett, Bukvič 2008; Mets 2009).

Only in the last ten years patents and knowledge transfer are also among academic evaluation criteria, although somehow in a hesitant way and frequently believed that patenting is disturbing research quality and publication productivity as well is opposing academic freedom (Van Zeebroeck, Van Pottelsbergh, Guellec, 2008). This opinion is disclaimed by several researchers. From the research of Breschi, Lissone, and Montabbio (2007) comes out that academic inventors exhibit superior productivity in publishing, even in basic-science-oriented journals, and benefit from financial or cognitive resources of technology-oriented projects. If restructuring of R&D and science funding in transition countries is treated by researchers more, the issues, especially ownership of IP are lightened less. Only partly the topic is covered with the comparative survey in Eastern and Western part of Germany (Von Ledebur 2009). Until 2002 academic persons in Germany had the right to transfer inventions to industry by licensing it as their own, since 2002 universities could get the ownership on invention like private companies (Goddar 2005). The main aim for legal reform can be seen in enhancing technology transfer although transaction costs increased due to a third party – university (Von Ledebur 2009).

Patent activity of Eastern universities after the reunification was much higher than of universities of West Germany (ibid). The reason for that could be seen in tradition of university ownership on IP (coming from laws from socialist time: GDR) and former experience of TTO-s in East Germany although legal regulation was now the same for both sides of Germany (ibid). Since abolishing professors’ privilege in 2002 patenting intensity of universities grew remarkably to the average annual levels between 3.6 and 11.1 patent applications per 1000 professors depending on experience of the university in IP field (ibid).

Another study of professors’ privilege (Litz et al 2009) involving smaller countries demonstrates that over the years following abolition in Denmark in 2000, a considerable amount of patenting activities have moved out from the professors’ hand into universities, total share of university ownership on academic patent applications grew from 5.6 to 20 %, but more considerable share remained at companies – 72.9 %. In Sweden, still continuing professors’ privilege, universities’ share was 4.9 %, companies – 81.1 % and individuals – 13.5 % (ibid). Universities’ or other research institutions’ share in ownership of academic patents in Germany grew to appr. 70 % after 2002 (Von Ledebur, Buenstorf, Hummel 2009) reaching similar numbers like data from US (Lotz et al 2009). But there is no evidence of systematic increase in the numbers of academic patenting after 2002 and this legal reform could even create new obstacles to technology transfer (TT) as found by Von Ledebur, Buenstorf and Hummel (2009): if before bigger share of academic patents belonged to the companies – that means, main knowledge was already transferred into industry, then now, many patents belonging to universities never meet industrial partner any more.

But besides, not all universities have tradition and competencies enough for patenting and TT as seen on the example of West Germaun universities (ibid). Because of GDR regulations former traditions of university ownership on inventions in the pre-unification period East German academicians continued patent applications with their universities even under professors’ privilege regulation in 1990-ies (Von Ledebur 2009). From the study in Denmark which abolished the privilege in 2000, the share of company-owned academic patents depending on technology sector vary between 62.5 and 86.7 per cent (Lotz et al 2009).

In conclusion of the overview we can suppose that there exists quite a wide range of factors having impact on new knowledge production. Ownership of IP seems to be only one of them, and these factors can have a combined influence on the final result – protected IP.

3. Sample and research methodology

The sample universities of current study are mainly participants of Uppsala Round-table, connecting innovation specialists from five European universities initiated by the head of Uppsala University Innovation AB dr. Lars Jonsson in December 2007. Into so called Uppsala Round-table belong four old classical universities: Uppsala (Sweden, founded in 1477), Groningen (the Netherlands, 1614), Helsinki (Finland, 1640) and Tartu
(Estonia, 1632), and one much younger University of Linköping (Sweden, 1975). Three of them (Groningen, Uppsala and Tartu) belong to Coimbra Group of European multidisciplinary universities of high international standard (http://www.coimbra-group.be/index.html). Besides, in order to widen the sample with one more Estonian representative, Tallinn University of Technology was included for studying knowledge creation and patenting environment in Estonian universities. Common feature of these universities is their small country origin. Main topic of the Uppsala Round-table is enhancing commercialization system of universities’ research.

In the current study all main publicly (for example on webpage) available indicators describing R&D productivity and its environment were mapped (partly given in Table 1):
- size and age of the university;
- funding of R&D;
- publications;
- academic patents on inventions, etc.

Patent family information was mapped using search engine esp@cenet, worldwide databases of the European Patent Office (2009) and the web Patent Genius. First, the patent documents according to the university as applicant, and after that the documents related to involved persons were searched. Especially person search was necessary for Swedish universities because “professor’s privilege” – that means university members are the owners of their inventions and have freedom to decide the way of IP protection. Patent families were analyzed to explain the geographical range of IP protection. Here raised the question which type of patent document(s) – application(s) or issued patent(s) – characterize(s) better knowledge creation processes at universities. As known, patent application publication period can be even longer than of papers in some peer-reviewed journals. Due to the time lag between application filing and its publication by patent office the numbers of the last periods may not reflect real knowledge creation by university members. Therefore it was decided to use data of patents issued. If university member was in the list of inventors, the patent was counted as of his/her university’s. There raised the question how to differentiate the namesakes among the Swedish inventors. Here the analysis of academic profile and residence (partly using the site Patent Genius: http://www.patentgenius.com/ if patented in USA) of the Swedish inventor was used. Of course, the patent data gathered in that way cannot pretend on absolute accuracy.

The facts describing university internal environment were gathered from interviews with academics-inventors of the university without indicating concrete facts from the interview giving possibility to identify interviewee.

4. Results of empirical research

Hereby should be mentioned that the findings described below are preliminary and in the final process of validation and critical analysis they can partly change and add the context as well specify the data and conclusions. Especially, the numbers of patenting by professors of Uppsala University can grow, because part of professors’ list is still not analyzed. But this fact does not prevent presenting some characteristics already found.

4.1. Survey of academic IP of the Uppsala Round-table universities

As for the period 2000-2008 besides publication and patenting other information was not available for the most of the sample members, additional data for the last year was fixed. As indicator of patents received was quite small and unstable for some universities in annual measurement, average value of the period is used. Table 1 gives general understanding about academic productivity of university members. We can see the highest efficiency in publication by University of Helsinki in two means: number of publications per researcher and expenses per publication. The figures about production and productivity of patented IP by members of Swedish universities are much higher than others. Academic inventing is extremely effective in the Linköping University, even if considering that data for some other sample universities (Helsinki and Groningen) is related only to university-owned (or university as applicant for) patents. General data about patenting in Table 2 confirms intensity of IP production and patenting by Swedish academic personnel.

Quite interesting are trends of scientific publication in ISI Web of Knowledge by universities shown as results of the survey of the first type of knowledge production (Figure 1). University of Tartu demonstrates the highest rate of growth and has doubled its absolute number of publications in 9-year period, but efficiency per researcher (Table 1) is still until 1.9 times lower from leaders’ (Groningen and Helsinki) result.

Interpreting that indicator could reflect lower level of research as well lower resources for support personnel, or peculiarities of research fields, and that the topic needs further elaboration.
<table>
<thead>
<tr>
<th>University</th>
<th>Founded</th>
<th>Students</th>
<th>Teachers &amp; researchers</th>
<th>R&amp;D funding 2008, M€</th>
<th>ISI publ. No.</th>
<th>Patents per year (2000-2008)</th>
<th>Expenses per ISI publication, 1000 €/publ</th>
<th>ISIs per person</th>
<th>R&amp;D expenses per patent, M€/pat</th>
<th>Patents per 100 publ.</th>
<th>Patents per 1000 persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Tartu</td>
<td>1632</td>
<td>17100</td>
<td>1412</td>
<td>41.9</td>
<td>630</td>
<td>2</td>
<td>66.5</td>
<td>0.45</td>
<td>21.0</td>
<td>0.32</td>
<td>1.42</td>
</tr>
<tr>
<td>University of Helsinki</td>
<td>1640/1828</td>
<td>35200</td>
<td>3845</td>
<td>193</td>
<td>3183</td>
<td>8.7</td>
<td>60.6</td>
<td>0.83</td>
<td>22.2</td>
<td>0.27</td>
<td>2.26</td>
</tr>
<tr>
<td>Uppsala University</td>
<td>1477</td>
<td>19900</td>
<td>4000</td>
<td>290</td>
<td>2610</td>
<td>24</td>
<td>111.1</td>
<td>0.65</td>
<td>12.1</td>
<td>0.92</td>
<td>6.00</td>
</tr>
<tr>
<td>Linköping University</td>
<td>1975</td>
<td>16900</td>
<td>1064</td>
<td>1134</td>
<td>37.7</td>
<td>116.4</td>
<td>0.58</td>
<td>3.5</td>
<td>3.32</td>
<td>19.20</td>
<td></td>
</tr>
<tr>
<td>University of Groningen</td>
<td>1614</td>
<td>25167</td>
<td>2082</td>
<td>2506</td>
<td>0.79</td>
<td>30.2</td>
<td>0.36</td>
<td>3.05</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For Swedish universities and the University of Tartu all academic patents counted, for others – only if university is applicant

<table>
<thead>
<tr>
<th>University</th>
<th>Year</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Tartu</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>University of Helsinki</td>
<td>2</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>16</td>
<td>9</td>
<td>12</td>
<td>7</td>
<td>6</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>Uppsala University</td>
<td>17</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>19</td>
<td>17</td>
<td>28</td>
<td>22</td>
<td>29</td>
<td>216</td>
<td></td>
</tr>
<tr>
<td>Linköping University</td>
<td>9</td>
<td>39</td>
<td>38</td>
<td>62</td>
<td>42</td>
<td>45</td>
<td>31</td>
<td>36</td>
<td>37</td>
<td>339</td>
<td></td>
</tr>
<tr>
<td>University of Groningen</td>
<td>5</td>
<td>9</td>
<td>8</td>
<td>11</td>
<td>9</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>

* For Swedish universities and the University of Tartu all academic patents counted, for others – only if university is applicant
Growth has been more intensive also in University of Groningen (1.6 X) than in Helsinki (1.3 X), Linköping (1.36) or Uppsala (1.2 X) universities. As absolute numbers of publication and patenting by universities differ quite drastically between each other, it should be useful to reduce these indicators to some kind of relative value. For that purposes is used ratio of patents to 100 ISI Web publications as presented in Figure 2.

The share of patent-protected IP among research results is highest in Swedish universities, but particularly outstanding are the indicators of academic personnel of Linköping University being 3.2-13.5 times more productive than others. Here should be mentioned that the data for Swedish academic personnel was collected as the result of person-based search, but for others – search for university as patent applicant. A quick search for academic personnel of Tartu University with the search engine esp@cenet gave only five patents which applicant was other than university.

From Figure 2 should be mentioned that relative productivity of patented IP production by non-Swedish universities has more smooth distribution than absolute indicator of publications in Figure 1.

4.2. Findings from interviews

The interviewees were found among academic inventors of two leading Estonian universities. Their names were found from several patent descriptions, which applicants were universities as well companies or other institutions. Questions asked were related to their experience with different patent applicants and their attitudes and services towards inventors.

Especially good was description of experience with a bigger foreign company, which IP department worked professionally, giving good help in general patent description as well as in formulating patent claims and contracting with inventors. No forced inventorship or any other unfair suggestion.

Another style was met among university IP personnel. The professor together with co-inventors from another state institution according to professors’ employment regulation decided to make (Disclosure) application of invention to university IP unit. Mostly because of the modest experience of IP specialists: their technical competence was low. The process was drawing out. Finally the professor and other inventors from outside the university were asked to fund the patent application as well as fees for themselves. They were debtors in the eyes of the university because they transferred their invention to the university. Besides, there was no any hope that IP unit is able to find real business partners for the implementation of invention – that means no TT perspectives either.

Similar experience was described by another professor, mentioning that university IP unit has very small competence for his own field and he prefers to make application from other institutions with more liberal IP policy.

The problem with funding of patenting costs was met in some other cases as well.

The professor-entrepreneur described how only his own and his team systematic marketing helped them to reach to potential licensees. But this was complicated case, which cannot be the task for inexperienced university TT.

All these cases and interviews indicated that Estonian universities are too small; their potential inventions’ fields are too wide and different from each other to have excellent competencies, and cover necessary patenting and TT activities. But the similar thoughts about capability to cover all technology fields have been raised by the Uppsala
Roundtable members having much longer and rich experience in TT and innovation.

5. Results and conclusions

The survey about production of knowledge as public good (ISI Web publications) in the sample universities demonstrates quite an intensive growth, especially University of Tartu, which started from the lowest level in 2000. Comparing patented IP production, it seems that more technology oriented younger Linköping University is more active and entrepreneurial than old traditional ones as it could be supposed from literature review on the topic. But here raises another conclusion: Swedish professor’s privilege IP regime supports strongly academic inventing and patenting as could be seen also on the example of Uppsala University. Although patenting statistics for non-Swedish universities besides University of Tartu do not include non-university patents, the difference between academic patenting is drastically big. When productivity of publications per researcher differs 1.9 times between universities, then productivity of patenting by academic personnel differs approximately 13.5 times.

This cannot be explained only with business or individual ownership of academic patents. In some cases, especially in countries with short period of experience and traditions the situation can be different. As based on the German example authors cannot be sure about positive effect of changing legislation in three-year period after abolishing professors’ privilege (Von Ledebur 2009). Partly, it can be speculated, that patenting by local applicants in Germany is much easier process as sometimes operating on their home market and it is already enough to cover R&D expenses and produce profit. For a small country, patenting is practically the rule if trying partly to earn R&D costs back. But there can be obstacles like: low competencies as well as lack of resources in a small (post)transition country as reflected in interviews above. As a result, the IPR system with „non-privileged professors“ makes TT more unefficient if infrastructure is generally weak. That means, strict legal regulation of IP ownership can reach aimed goals only if being supported by the relevant technology transfer system and infrastructure.

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