Research Policy 42 (2013) 564–576

Contents lists available at SciVerse ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol

Patent quality and ownership: An analysis of UK faculty patenting

Valerio Sterzi[a,b,*]

[a] GREThA, Université Bordeaux IV, CNRS, UMR 511, Avenue Léon Duguit, 33608 Pessac, France
[b] KITeS, Bocconi University, Milan, Italy

ARTICLE INFO

Article history:
Received 19 September 2011
Received in revised form 23 July 2012
Accepted 24 July 2012
Available online 3 September 2012

JEL classification:
L33
O33
O34

Keywords:
Academic patents
Patent ownership
Patent quality
Citations

ABSTRACT

The relationship between ownership structure and the quality of academic inventions has not been deeply analysed, despite its relevance for the literature on IPR and university–industry knowledge transfer. This paper fills the gap by using a novel dataset of academic patents in the UK, both university-owned and corporate-owned for the period 1990–2001.

The main results may be summarized as follows. (1) Controlling for observable inventor and patent characteristics, academic patents owned by business companies receive more citations in the first years after the filing date than those owned by universities or other public research organizations, but this difference diminishes when considering a longer time window, and it disappears when considering only later citations. Interestingly, (2) change of ownership is an indicator of patent quality: academic patents owned by companies but originally assigned to universities or other public research organizations show a noticebly higher quality premium. Finally, (3) professor's scientific quality appears slightly correlated with patent quality.

1. Introduction

Knowledge produced by academic scientists has been identified as one of the most important inputs for technological progress and economic growth. Publicly financed science feeds and supports the innovation in the private sector, which in turn creates new jobs and generates income (the so-called Third Stream Activity in the UK).[1] According to this view, academic scientists contribute to the innovation activity not only by broadening the science base, but also by producing (patentable) inventions suitable for industrial application. Science policies have paid special attention for a long time to the most efficient tools for improving the exploitation of knowledge created in universities and public research institutions. In particular, in Europe many governments have introduced legislation inspired to the introduction in 1980 of the Bayh-Dole Act in the USA in order to increase the level of university involvement in the exploitation of inventions produced by their staff.[2]

At the same time universities have been characterized by substantial changes in terms of research funding and have been gradually obliged to diversify their income sources. In many countries block grants funds have significantly declined (especially in the UK since the mid-1980s)[3] and have to some extent been substituted by competitive funds either public or private (Geuna, 2001).

Greater emphasis on IPR issues and the financial straits of public research funds have gradually changed the incentive structure for academic scientists and led them to face an increasing pressure to patent. In addition universities have set up their own technology transfer unit and, in many countries, they have been called to retain the ownership on the faculty inventions, based on the rationale that the university ownership model operates efficiently the transfer interface between scientists–inventors and companies.

Much of the debate on university patenting has investigated the question as to whether or not the results of university research should be patented. To the extent that patents have become an important issue for universities, there might be an incentive to shift the resources towards more applied research and to those areas where patents are easily obtained (Henderson et al., 1998; Mowery et al., 2002; Verspagen, 2006). Nevertheless less attention has been paid on the consequences of moving away from inventor ownership

* Correspondence address: GREThA, Université Bordeaux IV, CNRS, UMR 511, Avenue Léon Duguit, 33608 Pessac, France. Tel.: +33 556844051.
E-mail addresses: valerio.sterzi@u-bordeaux4.fr, valerio.sterzi@unibocconi.it

[1] For instance, among others, Narin et al. (1997) show that the majority of industrial patents are based on findings generated within public research labs: the 73% of papers cited by US patents owned by the private sector are in fact public in nature, being authored at academic, governmental, and other public institutions.

[2] See Geuna and Rossi (2011) for a description of the changes in university IPR regulations in Europe, and Meyer and Tang (2007) for a UK policy context.

[3] Primarily as a result of budget cuts during the Thatcher government (Meyer and Tang, 2007).

0048-7333/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.respol.2012.07.010

of patent rights (e.g. professor's privilege) towards different forms of institutional ownership (e.g. the ownership model).[4]

This paper intends to contribute to this debate by analysing the quality determinants of a sample of UK academic patents and, in particular, by investigating whether the ownership structure is to some extent correlated with patent quality. Possible changes of ownership from university to the private sector are also considered.

The sample used in this paper is composed of 1376 patent applications at the European Patent Office (EPO) and invented by academic scientists in the UK between 1990 and 2001.

Patent data cover inventions produced by UK academic scientists in active service in 2001, for which a patent application was filed at the EPO. Data contain applications submitted not only by scientists and their universities, but also by companies, governmental and non-profit organizations, as long as they cover academic scientists' inventions.

The main interest in studying UK academic patenting resides in the institutional features of British universities, which place them in between the two extremes of state-run, highly centralized university systems typical of a large part of continental Europe, and the highly decentralized, largely private US system. While UK universities lack the financial power of private and large public US universities, they are closer to the latter in terms of administrative autonomy, access to a flexible academic labour market for scientists, and expertise in dealing with IPR issues.

In what follows, we define academic patents as those related to universities through their (academic) inventors rather than university ownership. In particular, we always consider *academic patents*, and among them we define *university patents* as those owned by universities, and *corporate patents* as those owned by private companies. Patent applications assigned to individuals (professors) are categorized as university patents as some universities in the period under scrutiny followed different strategy in the intellectual property management and did not fully enforce the university ownership right (Geuna and Rossi, 2011).

Empirical results show that patent quality, approximated by the number of forward citations, is positively correlated with the inventor's scientific productivity. More interestingly, corporate patents are mainly associated with short term returns as they have more forward citations than university patents in the first years after filing, but this difference declines when considering a longer period of time, and it disappears later (i.e. 6 years after the patent priority year). In this vein we speculate that patents assigned to firms are more directed at commercial success in the short period, while those assigned to universities focus more on long run scientific questions (Czarnitzki et al., forthcoming). Interestingly, we also find some evidence of "cherry picking" by companies as corporate patents which are initially assigned to universities or other public research organizations display even higher quality.

The paper is structured as follows. Section 2 summarizes the existing literature on the ownership of academic patents. Section 3 illustrates the data on UK academic patents used for the empirical analysis. Section 4 presents variables and empirical strategy, and Section 5 discusses empirical results. Section 6 concludes.

2. The ownership of academic patents

The most recent research on the phenomenon of university patenting in Europe reveals high levels of participation of academic scientists in patenting activity (Meyer, 2003; Geuna and Nesta, 2006; Iversen et al., 2007; Lissoni et al., 2008, 2010). The evidence for countries such as France, Italy, Sweden, Finland and Norway highlights that European universities' contribution to patenting is not much inferior (in terms of percentages over national activity) to that of their US counterparts.

However, little evidence is provided on the quality of academic patents, and even less on the relationship between patent quality and ownership. Remarkable exceptions are to be found mostly in the US context (Henderson et al., 1998; Mowery and Ziedonis, 2002; Sampat et al., 2003; Thursby et al., 2009), where the debate is mainly concentrated on the effects of the Bayh-Dole Act which made it significantly easier for universities to claim property rights to discoveries deriving from federal funds, and only more recently in the European context (Crespi et al., 2010; Lissoni et al., 2010; Czarnitzki et al., forthcoming; Von Proff et al., 2012; Della Malva et al., forthcoming).

The UK and many countries in Europe follow the Bayh-Dole Act and propose similar laws which enshrine institutional ownership of university inventions (the so-called "university ownership model"). The rationale of the university ownership model is the belief that patents invented in universities are insufficiently utilized and unexploited due to insecurity regarding their ownership (Berman, 2008; Eisenberg, 1996). However, at a theoretical level, the university ownership could be preferred mainly for three reasons. First of all, private (corporate) ownership is inefficient as long as the academic researcher does not have incentive make high-quality contribution (Aghion and Tirole, 1994): the non-university ownership model may be associated with market failure to the extent that, once the contract between academic scientists and company is signed, the latter is not able to control whether or not the former is maximizing the effort, due to the information asymmetry and incompleteness of research contract. Second, university ownership, through an intermediary agency such as the internal technology transfer office, may help to reduce the information asymmetry between inventor and investors by screening and providing a minimum quality control of the transferred inventions (Hoppe and Ozdenoren, 2005; Macho-Stadler et al., 2007). Third, academic scientists usually ignore both the commercial value of their inventions and what firms might be potentially interested in and, in the same vein, companies may find difficulties in selecting most profitable ideas. The university ownership may be preferred to the extent the technology transfer office (tto) is specialized and characterized by lower searching costs (Hellman, 2007).

At an empirical level, in the US context, the most influential paper on the university patenting quality claims that the importance of overall US university patents decline after 1980 (Henderson et al., 1998), but that this effect would vanish by controlling for the new entry of inexperienced patenters (Mowery and Ziedonis, 2002) and for changes in the intertemporal distribution of citations to university patents (Sampat et al., 2003). However the relationship between patent quality and ownership is not studied in depth as they consider only patents owned by universities. Thursby et al. (2009) fill the gap and, using a sample of 5811 US academic patents, find that 26% of them were assigned solely to firms rather than to the faculty members' university. More in detail, on the one hand, by estimating the assignment probability as function of patent, university and inventor characteristics, they do not find any significant correlation between patent ownership and patent quality. On the other hand, they highlight that the difference between academic patents assigned to universities and those assigned to companies resides in the lower originality of those assigned to companies as, they infer, they mainly derive from consultancy activities.

Some correlation between patent quality and ownership is found at the European level. Czarnitzki et al. (forthcoming), using a sample of 4973 German academic patents, approximate the patent quality with the number of forward citations and find that short term citations (up to 5 years after publication) are associated with corporate ownership, while long term citations (more than 5 years)

[4] For a discussion on the university and inventor ownership models see Kenney and Patton (2009).