World Patent Information 45 (2016) 47–54

Contents lists available at ScienceDirect

World Patent Information

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

Measuring patent quality: A claim and search report approach

Mark James Thompson [1]

Swiss Federal Institute of Technology, Zurich, Switzerland

ARTICLE INFO

Article history:
Received 26 August 2014
Received in revised form
6 March 2016
Accepted 7 March 2016
Available online 26 March 2016

Keywords:
Patent quality
Search report
Patent strategy
Patent standards

ABSTRACT

This paper presents a new prospective metric for assessing the novelty and inventiveness of patents. It does this by using initial patent search reports and examiner's intuition about the impact of adverse citations on patent claim survival. The paper then demonstrates the metric by evaluating the quality of Switzerland's national patent stock using a selection model, finding that between 84 and 90% of the country's national patents would likely not survive examination at the European Patent Office. In doing so, it contributes to the larger literature on patent assessment, underscores the relevance of patent strategy in the observed characteristics of patents, and removes some of the ambiguity in the academic literature about backward citations.

1. Introduction

Statistical ways of assessing the quality of patents "appear indispensable in order to provide a firm basis for decisions on matters such as whether and to what extent the abandonment of an old system in favor of a new one is justified." [1] As patent statistics have become more readily available to economic researchers through new data sets like PATSTAT and the general standardization and expanding collection of bibliographic information on patents, have allowed us to make good on what was a relatively distant proposition in 1982. With the strong growth in patenting and corresponding documentation, assessing quality statistically becomes an important approach for policy-makers to find the balance between externalities of the patent right and the system's incentive to innovate.

In this paper, "patent quality" is understood to be the novelty and inventiveness of the patent application's claims, as opposed to the legal defensibility, technical merit, or clarity and disclosure. However, one of the major problems of traditional quality metrics for assessing novelty and inventiveness, such as forward citation counts or oppositions, is their timeliness. There is usually a considerable lag between the first application and these observed bibliographic traits. One challenge is thus to find a prospective metric of patent quality. This paper develops such a metric using the citations of prior art found in the initial search reports issued for the patent applications filed via Switzerland's Institute for Intellectual Property (IPI).

The metric presented here is based on the examiner's *claim-by-claim* assessment in a patent application's initial search report. The strong and intuitive assumption behind this approach is that the citation categorization found in the search report correspond to the underlying quality of the invention and have subsequent patent grant. The notion of using backward citations is not new, but the literature on their use has led to some mixed results in terms of their theoretical interpretation for patent quality and value.

Harhoff et al. rightly note that "[b]ackward citations reflect broad scope as well as the existence of subject matter that may restrict the scope of the patent [...] it is therefore not clear whether the coefficient should be positive or negative [for a patent's value]."[2] [2] Lanjouw & Schankerman find that backward citations are not salient in patent litigation [3]. In more recent unpublished work for the OECD presented in Milan, Harhoff, Hoisl, and Webb find that the share of the X-citations is a very weak,[3] but statistically significant predictor of both the likelihood of opposition during examination and subsequent negative outcome [4]. This finding stands in somewhat contradistinction to Harhoff et al. where: "[b]ackward citations either to the patent or to non-patent

E-mail address: mark@thompson.ch.
[1] Swiss Federal Institute of Technology, Zurich, Switzerland.

[2] Squicciarini provides a recent overview on the use of backward citations to evaluate quality [8].

[3] They report that raising the share of X-citations from 0% a 100% increases the likelihood that the patent will be challenged by 1.3% (t = 8.7; N = 594,647) (Harhoff et al., 2006, 34).

http://dx.doi.org/10.1016/j.wpi.2016.03.003
0172-2190/

literature (e.g. scientific papers) have been found to be positively related to the value of a patent." [2] A small but *positive* association between backward citations and the value of a patent was found to be statistically significant by Gambardella et al. [5].

We see the search report as a measure of the novelty and inventiveness of a patented invention, which may or may not engender economic value or incite litigiousness. Yet, part of the ambiguity in the literature about the interpretation of backward citations is also likely attributable to the measurement error when the metric is operationalized as a mere count, count/claim ratio, or citation-code weighted fraction. Careful examination of the typical search reports reveals that each of these approaches is an inadequate approximation.

A pure backward citation count typically does not respect the fact that patents with more claims will have more citations because a typical search procedure is a best-effort attempt of the examiner to find prior-art for each claim. Indeed omitting the number of claims likely led to the spurious conclusion that "[b]ackward citations are positively correlated with the patent's value in our study, and that the coefficient is again estimated with high precision."[4] [2] Lanjouw & Schankerman correctly fix this correlation by normalizing the backward citations against the number of claims, but unsurprisingly find a null result on infringement and patent challenges [3]. Here, it would be important to note that backward citations are not homogenous in their implications for technical innovation (nor legal assailability). Furthermore backward references to non-patent literature (NPL) and the number of "A" citations, which merely reference the state of the art, usually bode well for a patent grant and underlying quality. Hence patents, which have NPL and "A" citations mixed with "X" & "Y" citations that have negative implications for novelty and innovation, jointly lead to an ambiguously defined variable. Even where citations are adjusted for these attributes, such as by Harhoff et al., the authors implicitly neglect the fact that many of the adverse citations often load on just a couple of claims, which often get shed during examination [4]. This is probably why they are also a weak predictor of a grant because the patent attorney files broadly and narrows the patent during procedure.

Not all studies conflate the types of backward citations. Schneider uses a trivariate probit model, which controls for claims, to show that both "X" and "Y" citation types lead to application withdrawal [6]. More recently, Schettino and Sterlachinni show, using a probit model, that the combined number of "X" & "Y" citations leads to premature application withdrawal, supporting Schneider's findings [7].

The tact taken in this study is to look at the patent as a composite of claims, and a particular citation as addressing a given claim rather than the patent as a whole. That is to say we assign a citation value to each claim of a patent. The type and number of citations in aggregate will induce the applicant to proceed or withdraw from prosecution, and govern the patent grant.

Since Switzerland has a dual patent system where applicants can either obtain a national patent from the IPI, which is not examined for novelty and inventiveness, or a European patent, which is examined for novelty and inventiveness, investigating the most recent quality of the Swiss national population in the face of applicant filing strategy and choice of search report presents an empirical challenge, which is addressed using Heckman's selection model and the applicants' characteristics [11].

The plan of the paper is as follows: the nuts and bolts of the metric and data are discussed in Section 2. Section 3 then tests the measure for plausibility. Finally, after having accounted for quality using the search reports and the selection effects, the paper moves on to infer the unobserved novelty and inventiveness of the Swiss national patent stock.

2. The quality metric and data

Aside from the applicant and application characteristics, the core of the data is derived from both the EPO and IPI search reports that are obtained during the early period of the application process. EPO and IPI search reports were chosen for reasons of data availability for our Swiss population.[5] Given that IPI policy is essentially to apply the EPO's search standard, the reports are largely comparable, boosting the sample size.

2.1. Search reports

Typically during examination, patent offices do prior art searches, and summarize their findings in the form of a search report. A search report attempts to find documents that would either destroy novelty, inventiveness, or otherwise pose a legal threat to the patent application. These documents are typically very well structured, and the patent examiner uses citation codes (X, Y, A, E, P) to qualify the type of threat a citation poses to a specific patent claim.[6] Aside from these qualifications, a citation can refer to a wide range of documents, including patents and scientific journal articles. These citations have a number of other attributes, which convey a fair amount of information, hence citations often provide a rich basis for studying a wide variety of phenomenon such as geographic flows of information, speed of technological innovation, or a patent's worth. Here, we shall be using the citation codes as an assessment of inventive quality.

In the context of the Swiss patent system, where there is no obligatory examination for novelty and inventiveness, rather applicants can choose: to have their patent researched for novelty and inventiveness, either by the IPI for a fee that at the time of writing was CHF 500 or the EPO for approximately CHF 1400; or dispense entirely with a search. As of this writing, about 17% of the sampled applications had some type of search report, either done by the EPO ($N = 890$) or by the IPI ($N = 1150$). The IPI search report is cross-subsidized through renewal fees, and represents about 3000 francs worth of search services, i.e. it is cheaper and broader than the EPO's quicker and narrower search.[7] Hence the search fees, patent quality, and applicant filing strategy engender possible selection effects with regard to choosing where to obtain a search report. Both the report and its mere existence contain information about the patented invention's novelty and inventiveness. How the information in the report itself is exploited is discussed in the next section.

[4] In that study, Harhoff et al. did not have access to the "[t]he number of claims in our data is due to the fact that PATDPA did not include claims in their database in 1977 (pg. 1350)."

[5] No doubt some applicants request search from other offices, but these are likely to be very untypical applications and unrepresentative.

[6] To wit: X = Particularly relevant documents when taken alone; Y = Particularly relevant if combined with another document of the same category." A = Documents defining the general state of the art; P = Documents published between the date of filing and the priority date; E = Potentially conflicting patent documents published on or after the filing date of the underlying invention, cf. pg. 120 [9].

[7] The IPI's former EPO personnel report that they are afforded much more time to evaluate the merits of a patent application than at the EPO. Because the EPO has more specialized personnel their reports tend to find more specific prior art, whereas the IPI's more general personnel tend to find pertinent prior art outside a narrow technological domain. But, even when an IPI search report is of good quality in that it cites relevant prior art, the lack of obligatory examination for novelty and inventiveness of Swiss patents can lead to invalid claims being granted because the claims have not been amended in the light of the cited prior art.