The causal effect of including standards-related documentation into prior art: evidence from a recent EPO policy change

Rudi Bekkers¹, Arianna Martinelli², Federico Tamagni³


Abstract

The aim of this paper is to investigate the causal effect of a recent attempt undertaken by the EPO to improve the quality of the patent granting process. To do so we examine a policy change that aimed at including the information revealed during the standardisation-setting process into the official definition of prior art. All the empirical analysis consistently support that the policy was successful. Indeed, we find a negative and strongly significant reduction in the granting rate, suggesting that the process of patent granting has become more careful and selective after the policy implementation.

1 Introduction

One of the most important criteria to receive a patent is novelty. To determine novelty, patent examiners investigate the state of the art (the so called “prior art”) at the time of the patent application or the patent priority date. Therefore, the identification of the complete prior art, both in terms of previous patents and scientific or other literature (known as non-patent literature, NPL) is of pivotal importance for the quality of the granting process and eventually, of the quality of the granted patents themselves. However, there are differences around the

¹ School of Innovation Sciences, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands. E-mail: r.n.a.bekkers@tue.nl; Dialogic Innovatie & Interactie, Utrecht, The Netherlands
² IBIMET-CNR (Florence), Institute of Economics, and LEM, Scuola Superiore Sant'Anna, Scuola Superiore Sant'Anna, Piazza Martiri della Libertá 33, Pisa, Italy. E-mail: a.martinelli@sssup.it
³ Institute of Economics and LEM, Scuola Superiore Sant'Anna, Piazza Martiri della Libertá 33, Pisa, Italy. E-mail: f.tamagni@sssup.it
world in what exactly is considered to be prior art and thus what to be searched for and considered by patent examiners. Also, there are differences to what extent applicants have a duty to disclose relevant prior art to the patent office (Cotropia, Lemley, and Sampat 2013).

In the early 2000s, some examiners with extensive previous industry experience increased the awareness in the European Patent Office (EPO) that many innovations in the area of mobile telecommunications were already been discussed in standardisation setting organisations (SSOs) before being applied for as patents. While such discussions and technical contributions are usually documented by the SSOs, they were up to that point in time not considered to be part of the prior art at the EPO, as these meetings were not considered to be public.

In the following years, a significant and not anticipated policy change occurred at the EPO. Several patent opposition cases that went to the EPO Board of Appeals made clear that documents from standardisation setting should be regarded as prior art after all (Willingmyre, 2012). It was argued that, as long as the SSO had open membership, any party with reasonable interest could have come to these standardisation meetings and get access to this information (like any party that is willing to pay the subscription fee can also access papers in a academic journal). After these cases, EPO entered into extensive collaboration with several SSOs and implemented a platform ensuring easy and prompt access to all the relevant documents to the examiners (Willingmyre, 2012). This has clearly enlarged the basis for judging prior art potentially limiting what can be considered truly new. To be precise it is worth to note that this policy change is not one in which a new law or rule is institutionalised; it is one in which jurisdiction lead to a different interpretation of the concept of prior art with impact on the way it was used before. Interviews with representatives of the EPO revealed that this policy change had significant effects: in some specific technological areas, up to 40% of the documents that “influence the decisions on the
applications’ come from standardisation-related documents.” Yet, even though EPO sustained effort for the cooperation among major Patent Offices (IP5, composed of USPTO, JPO, KIPO, SIPO, EPO) to adopt a coordinated approach in this field (including a common, standards-related documentation database), EPO’s policy change is for the time being an isolated one. The USPTO, for instance, does not yet consider prior art coming from SSOs.

The patents with standardization-related prior art are of specific interest. These patents are likely candidates to become ‘standard-essential patents’ (SEPs) (Kang & Bekkers, 2013). Such patents are indispensable to any implementer of a technical standard and therefor can lead to hold-up scenarios and royalty stacking (Lemley & Shapiro, 2007). For that reason, they are not only considered particularly valuable – two portfolios of mainly SEPs have recently exchanged ownership for over 4 billion Euro – but have also been the subject of many conflicts in the telecommunications industry, and the core of several high profile court cases (including Microsoft Corp. v. Motorola, Inc., and In re Innovation IP Ventures). So, it is much more important than for an ‘average’ patent outside standards, that standard-related patents really meet the conditions for patentability.

This paper aims to provide a better understanding of the impact of the above-policy change at the EPO. This impact can have different forms:

a). The EPO rejects patents because of identified standardisation-related prior art

b). Patents granted by the EPO have a reduced scope, because claims are removed because of identified standardisation-related prior art

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4 Interview with EPO, 5 December 2014. Note that ‘influence the decision’ does not necessarily mean that the patent gets rejected, it could also be that during the following part of the patent prosecution phase, the scope of the patent is significantly reduced.

5 Goudelis, 2012.

6 In 2010 a consortium that included Apple, Microsoft, Ericsson, Sony, and BlackBerry acquired an important part of the former patent portfolio of the now-defunct Canadian telecommunications firm Nortel for US$ 4.5 billion. This portfolio is believed to contain a large number of essential patents for 4G mobile telecommunications. A year later, Google purchased Motorola Mobility for US$ 12.5 billion, and thus acquired a patent portfolio valued by Google at US$ 5.5 billion (Data on the basis of Google’s Securities and Exchange Commission (SEC) filing; see CNET, July 25, 2012, “Google: Motorola’s patents, tech are worth $5.5 billion.”).


c). Companies and other applicants chose not to apply for EPO patents when they anticipate they might not obtain the desired patent because of the presence of standardisation-related prior art (but might still apply for such patents in other countries).

This paper offers an empirical investigation on the rejection rate, thus the impact of category (a) above. Our identification strategy exploits an interesting feature of the patent system: to protect an invention in several legislations, applicants have to file a patent application in different patent offices. As the policy change occurred at the EPO but not at the USPTO we are able to observe the same unit of analysis (i.e. the patent application for the same invention) both with and without the policy treatment.

The reminder of this paper is organised as follows. Section 2 provides more detailed information about the EPO policy change we are examining. Section 3 presents the data sources, the outcome variable, and the treatment group definitions. Section 4 presents the empirical analysis. Finally, Section 5 offers conclusions and discusses the implications of our findings.

2 Standards-related prior art at the European Patent Office

Patent quality, understood as the legal and procedural aspects of patent granting (opposed to patent value, representing the private or public value that these patent confer to their owners), has been an important topic on the agenda of patent offices. Both the USPTO and the EPO are working at improving patent quality, both in the pre-grant and post-grant procedure. In Europe, it is an important part of the mandate of the EPO Economic and Scientific Advisory Board (European Patent Office, 2012), and in the US, reform of the U.S. patent system has been the focus of two reports recently issued by the Federal Trade Commission (FTC, 2003) and the National Academies of Science (Merrill et al., 2004).

Because novelty is a fundamental requirement for patentability, the identification of relevant prior art is of key importance during the patent
prosecution procedure. Also for the determination of another fundamental requirement, novelty (i.e. the presence of an ‘inventive step’), prior art documents play an important role. In a search report, patent examiners report what prior art they believed to be relevant in order to assess a patent application. An important question, then, is what exactly constitutes prior art. While the precise definition of prior art may (and does) differ per legislation, the WIPO handbook on IPR describes it as follows: ‘Prior art is, in general, all the knowledge that existed prior to the relevant filing or priority date of a patent application, whether it existed by way of written or oral disclosure.’ (WIPO 2004). The disclosure element here refers to whether it is in the ‘public domain’. The definition used at the EPO specifically refers to the public domain: “the state of the art shall be held to comprise everything made available to the public by means of a written or oral description, by use, or any other way, before the date of filing of the European Patent Application.” (Article 54 (2) of the European Patent Convention9). Note that ‘public’ here does not necessarily means it is available for free; even though journals can demand a subscription fee (and some academic journals demand a steep subscription fee), the information contained in articles published in such journals is generally considered to be in the public domain and can as such for prior art. This is confirmed by decisions of the EPO Technical Board of Appeal: “A document is made available to the public [...] if all interested parties have an opportunity of gaining knowledge of the content of the document for their own purposes, even if they do not have a right to disseminate it to third parties, provided these third parties would be able to obtain knowledge of the content of the document by purchasing it for themselves.” (EPO Technical Board of Appeal decision T0050/02)10. Information shared in a confidential setting however (e.g. where participants may have signed agreements not to disclose this information) does generally not quality as prior art.

A second important question here is what documentation patent examiners actually have at their disposal to search for prior art. Given the need for very effective, efficient and conclusive searches of prior art (something for which the

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10 All EPO appeal decision are available at the EPO website at Home | Law & practice | Case law & appeals | Search the board of appeal decisions database (http://www.epo.org/law-practice/case-law-appeals/)
internet would be ill-fitted for), patent offices provide their examiners with very extensive, well-structured databases. Obviously, these include databases containing existing patent applications (in the US these databases are known as PubEast and PubWest).\(^{11}\) But, in addition, the USPTO makes non-patent literature available to the examiners in a database known as STIC (Scientific and Technical Information), offering access to an extensive number of electronic books, periodicals, conferences, standards, dissertations, and more.\(^{12}\) Similarly, the EPO’s developed its EPOQUE databases, containing a total of 12 million documents of non-patent literature (NPL), i.e., secondary (commercial and non-commercial) publications such as journals, conference material, books, thesis, technical reports and monographs. EPOQUE allows for very effective search operations throughout its whole collection (see European Patent Office, 2003).

Prior art as meant in patent law is of course not restricted to only that what is available in the internal databases of the patent offices (a humorous example of that being a 1949 Donald Duck story being used as prior art against a patent on a method of raising a sunken ship),\(^{13}\) and thus patent examiners may also search elsewhere, but this is often not so easy and effective, and also the precise dating of documents (which is essential when considering them for prior art) is not easily guaranteed.

In an increasing number of technological fields, technical standards play a central role, and a lot of technology development takes place in the context of the standards development processes. However, documentation created or shared in that process, for instance technical proposals by participants for inclusion in a standard, draft standards, etc., are not made publicly available by SSOs and thus not available by patent examiners. Moreover, even if they were available, the question would be raised whether such documents meet the requirements for prior art because of the non-public character of SDO drafts. At the EPO, over time, examiners working in fields such as mobile telecommunications started to get increasingly concerned net being able to use this growing body of possibly very relevant literature. In addition, not considering this literature also creates

\(^{11}\) [http://www.uspto.gov/products/library/ptdl/services/PubWest_and_PubEAST_at_PTRCs.jsp](http://www.uspto.gov/products/library/ptdl/services/PubWest_and_PubEAST_at_PTRCs.jsp)


\(^{13}\) [See http://www.iusmentis.com/patents/priorart/donaldduck/](http://www.iusmentis.com/patents/priorart/donaldduck/)
the risk that one company shares innovative ideas in a standards-setting context, and another company subsequently takes that idea and files a patent on it, feeling safe by knowing the shared information is not considered as prior art.\textsuperscript{14} Such behaviour practically constitutes stealing of ideas. In fact, companies have been accused of such behaviour in the context of standards setting (Granstrand, 1999, p. 204).

In the late 1990s, however, some interesting developments took place at the EPO. At some point, a company opposed\textsuperscript{15} an EPO decision to grant a certain patent. In this particular case, the opposing party cited preliminary documents and minutes of the meeting of a standard-developing working group (in this case, ISO/TC22/SC3/WG9, which was developing a plug for an electrical connection between a truck and a trailer) and argued that these documents killed the novelty of the patent. In fact, these were documents that were not at the disposition of the patent examiner at the time the search report was written. While the opponent initially lost its opposition, it then decided to turn to the EPO Technical Board of Appeal (Case T 202/97). In its 1999 ruling, this Board came to the conclusion that a proposal sent to the members of an SSO working group in preparation for their meeting, does not usually underlie an obligation to maintain confidentiality, and is therefore to be considered as being available to the public. As such, EPO acknowledged that information shared in the standards-setting context is part of the prior art.\textsuperscript{16} In a 2005 decision on another appeals case (EPO - T 0273/02) on a preliminary standards document came to an opposite decision, and decided that a specific preliminary standards document produced by the opponent was not publicly available. But it appears this is

\textsuperscript{14} And now the USPTO recently moved away from its "first to invent" system, virtually all patent offices around the world have a "first to file" system that assigns patents to the entity to file, not to the one found to be the real inventor.

\textsuperscript{15} In contrast to most other patent offices, the EPO has an opposition procedure, allowing any person from the public - no commercial or other interest whatsoever need be shown – can challenge a grant decision. This happens often when some prior art was not found during the grant procedure, but was known by third parties.

\textsuperscript{16} The Court's decision in this case offers the following summary "Mit einer Tagesordnung an Mitglieder einer internationalen Normenausschussarbeitsgruppe versandter Normungsvorschlag zur Vorbereitung einer Normen-Sitzung unterliegt gewöhnlich nicht der Geheimhaltung und gilt daher als der Öffentlichkeit zugänglich." (Translated: "A proposal for a standard, send along with the draft agenda to members of an international standards body, is generally not subject to confidentiality and should therefore be considered as publicly available.") Decision of 10 February 1999 of EPO Technical Board of Appeal Case T 202/97.
mostly so because of some particularities of the case in question. In December 2008, the Technical Board of Appeal issued another decision on a case involving preliminary standards documents (Case T 0738/04). Again, the board decided that the preliminary standards documents put forward by the opponent were not to be considered public. But again, this decision was seemingly the result of particularities of the case in question: uncertainty remained about the actual publication data of the preliminary standards documents (because the cover page was missing, among other things) and because of procedural irregularities.

To summarize: while in one case preliminary standards documents were indeed found publicly available, and two other cases such documents were not, the overall conclusion is nevertheless that generally speaking such documents of open standard-setting organisations are indeed to be considered publicly available, but different situation may emerge when such documents are (a) incomplete or not properly dated, (b) when they carried explicit notices that these were confidential documents and (c) when, in case of an opposition case, the relevant documents are correctly and timely produced. Note however, that in some private standards consortia, standards are not publicly published – even final ones – and only available to consortia members under the acceptance of a non-disclosure agreement (examples are CD-ROM, DVD and Blu-ray disc). These standards – final versions or preliminary documents – are obviously never part of the public domain.

Inspired by a desire to better deal with preliminary standards documents as prior art, and guided by the above-mentioned cases at the EPO Technical Board of Appeal, the EPO entered into a series of two activities. Firstly, the EPO ensured itself systematic access to preliminary standardisation documents that meet the

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17 In this case, the opponent argued that the patented invention was already made public by a preliminary standard document in ETSI (prEN 726-3). The court, however, decided that this document was not to be considered publicly available and therefore not part of the prior art. This decision of the court built on the findings that (1) the opponents in this case referred to a version of the ETSI directives - specifying confidentiality rules on ETSI proceedings - that was published after the priority date of the patent in question and (2) the preliminary standards document in question had some markings which created confusion on whether it was supposed to have a confidential status or not. It could be argued that absent these specific conditions, a preliminary standards document may indeed be public and therefore indeed be part of the state of art.

18 Here we specifically refer to SSOs where membership is open to any interested party. There are many more dimension and interpretations of what ‘open’ SSOs are; for more information see Andersen, 2008; Krechmer, 1998; and the World Trade Organisation’s (WTO) six principles (see WTO Staff Working Paper ERSD-2013-06).
requirement for prior art. It did so by means of membership of several SSOs as, we well as by signing Memoranda of Understanding with ETSI and IEEE (both in 2009) as well as a High level technical agreement with the International Telecommunication Union (ITU). These agreement also involved further ways of collaborating; for instance, the EPO and ETSI agreed also to collaborate in order to improve the ETSI database of essential patents by linking this database to the EPO’s patent databases (Willingmyre, 2012). Information relevant to prior art is pulled from a broad repository of documents such as i) standards documents as finalized after discussions, agreements and voting; ii) preliminary standards drafts that serve as a basis for discussion and voting; iii) other temporary drafts that have been deleted after a certain period or replaced by a new, published version; iv) contributions to working groups, most predominantly first disclosures of new technical information shortly before or during a working group meeting.

Secondly, utilising a process of preparation, harmonisation, classification, proper date checking, creation of bibliographical information, and technical document format and/or language translation, these preliminary standardisation document are made part of the NPL databases in the EPO, ensuring they can easily be searched by patent examiners. In fact, these steps are the same as those taken for many other types of NLP used by patent examiners.

In 2006, the ETSI NPL database was launched at EPO. Following that, the ITU and IEEE databases were launched in 2006 and 2008 respectively. From that moment on, patent examiners could actually access and consider standardisation-related NPL in their normal workflow.

3 Data and experimental setting

In order to assess the effect of the EPO policy change concerning the use of standardisation-related NPL (SSO-NPL) on patent granting we use standard treatment effect analysis. We exploit the fact that the same invention can be applied for patenting both at the USPTO where SSO-NPL document are not provided to examiners and EPO where the policy change actually took place. That is, we observe the same “unit of analysis” (patent application for a given
invention) both under treatment (the EPO patent application) and without treatment (the application for the same invention at the USPTO). In this section we present the data, the definition of treated and control groups, and provide basic evidence concerning our outcome variable.

3.1 Data sources and sample selection

For the empirical analysis of this study we are rely on the EPO/OECD Patstat Database (April 2014 edition), complemented with both the OECD Citations database (February 2015 edition), and the OECD Patent Quality Indicators database (February 2015 edition). While the latter databases are build upon PATSTAT, they provide more detailed information on non-patent literature (NPL), among other things. More specifically, the OECD database provides a harmonized numbering system for NLP known as ‘XP numbers’, and also provides NPL if an EPO or USPTO application in question comes from a PCT route.

3.1.1 Selection of paired patents

The key feature of our empirical setting is the possibility to observe the same invention both in the “treated” and the control group. This is possible because firms can protect their invention in several legislations and therefore apply for patents at different national patent offices (e.g. the EPO and USPTO).

In order to allow for a good comparison of patent grant rates between the EPO and the USPTO, we took a ‘paired patent’ approach, where we considered those innovations for which patents are applied for both at the EPO and at the USPTO. Such innovations can be identified in patent databases because they are part of the same patent family, meaning that their national applications all refer to the same ‘priority document’ that first discloses the invention for which the patents are applied for.\(^\text{19}\) For both the focal patent group as for the control patent group we identified all existent patent pairs (and thus discarding patents that are only applied for in the USPTO or only in the EPO, which may lead to biases\(^\text{20}\)).

\[^{19}\text{The PATSTAT patent database has two kinds of patent families. This is related to the fact that patents may have more than one new element in them, and thus refer to more than one priority document. The ‘narrow’ DOCDB patent groups all patents that share exactly the same set of priority documents. The broader INPADOC family groups patents that share at least one priority document. (see Sipapin, and Kolesnikov, 1989; Dernis and Khan, 2004). For our study, we look for patent pairs that are as similar as possible, and this we used DOCDB patent families.}\]

\[^{20}\text{For a ‘weak’ patents, companies might consider to apply for a patent only at a patent office that has lower granting standards. Including such patents in our analysis could result in systematic biases.}\]
While the large majority of the patent families in our dataset have one EPO application and one USPTO application, there are some families that have multiple applications in a single patent office (and very few that have a lot). These can be re-issued patents, continuation patents, divisionals, and divisionals-in-part (see Hegde et al, 2007). Although this is a small part of the overall sample, it might include a relatively higher share of high value patents, potentially affecting our results. In such cases, we select for each patent office the ‘oldest’ application.

3.1.2 Selecting the periods for pre and post policy change

A crucial aspect of our analysis is the identification of the timing in which the policy is adopted and therefore to determine the pre-treatment and post-treatment period. The date of policy implementation settled at July 2002. Pre-treatment starts in 1989 when ETSI was established, representing the real start of mobile telecommunication standardisation. The post-treatment period starts in middle 2004, 18 months after the introduction of the policy change. It ends in 2010, in order to mitigate the truncation problem arising from the lag between the time of patent application and the eventual granting.

3.1.3 Selection of technological areas possibly affected by standardisation

A further step concerns the identification of the standard-related technological areas that can be classified as “SSO-related” and thus that includes patents that are possibly mostly affected by the policy change. To this purpose we need to identify a list of IPC classes that include technologies in which standardization is a prominent phenomenon. We did so by the investigating IPC classes of the so-called essential patents. These are patents (already granted or not) declared at the SSO by their owner to be indispensable for any product that implements the standard in question. Standardisation bodies usually have disclosure rules for such patents (Bekkers and Updegrove, 2013). Using a recent, public database that compiles disclosed essential patents from the 14 largest global standard

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21 In our sample, 9.52% of the DOCDB pairs has more than two associated patent applications. 5.38% has three associated applications (one EPO and two USPTO, or otherwise), 1.91% has four associated applications, and this number goes further down, up to one DOCDB patent pair with 88 associated applications.
22 If there are multiple ‘oldest’ patent with the same data at an office, we chose a granted patent (if available in the set), and otherwise a patent that did not get a grant.
23 As we will explain below, however, we limited the data used in our analyses to the years 2000 to 2010 because of specific aspects of our data.
24 See Bekkers and Martinelli, 2012 for a similar type of selection.
setting bodies (see for details Bekkers et al., 2012), we investigated the IPC subclasses for these patents. As shown in Table 1, the distribution is very skewed: out of all 634 existing IPC subclasses, five classes represent already 63% of all disclosed essential patents. We take these five classes as identifier of SSO-related patents. The patent classes in our focal set are quite large patent classes, presumably because they are dominated by telecommunications, which is a technical area that is rather cumulative of nature, and thus with many patents.

We also selected a series of large patent classes that have no essential patents in them at all, which are therefore are classified as not related to standardisation to be used as control in a further exercise. This group includes a total of 13 classes, ensuring that the number of patents in the control set was approximately similar to that in the focal set. Table 1 clearly shows the contrast in the presence of essential patents (SEPs) between the focal set of standard-related IPC classes (STDIPC) and non-standard-related IPC classes (non_STDIPC).

Table 1: Overview of focal set (STDIPC) and control set (non_STDIPC)

<table>
<thead>
<tr>
<th>Set</th>
<th>IPC subclass</th>
<th>Number of EPO applications</th>
<th>No. of SEPs</th>
<th>Short technical topic of subclass</th>
</tr>
</thead>
<tbody>
<tr>
<td>STDIPC set (patent applications in standardization-related areas)</td>
<td>H04L</td>
<td>410,629</td>
<td>3307</td>
<td>Transmission of digital information, e.g. telegraphic communication</td>
</tr>
<tr>
<td></td>
<td>H04W</td>
<td>186,929</td>
<td>2439</td>
<td>Wireless communication networks</td>
</tr>
<tr>
<td></td>
<td>H04B</td>
<td>231,044</td>
<td>2143</td>
<td>Transmission systems used in telecommunications</td>
</tr>
<tr>
<td></td>
<td>G06F</td>
<td>915,087</td>
<td>929</td>
<td>Electric digital data processing</td>
</tr>
<tr>
<td></td>
<td>H04M</td>
<td>143,733</td>
<td>578</td>
<td>Telephonic communication</td>
</tr>
<tr>
<td>Non_STDIPC set (patent applications in non-standardization-related areas)</td>
<td>E21B</td>
<td>115,450</td>
<td>2</td>
<td>Processes or means for the direct conversion of chemical energy into electrical energy</td>
</tr>
<tr>
<td></td>
<td>C23C</td>
<td>105,081</td>
<td>2</td>
<td>Earth or rock drilling</td>
</tr>
<tr>
<td></td>
<td>A61f</td>
<td>199,560</td>
<td>1</td>
<td>Coating metallic material</td>
</tr>
<tr>
<td></td>
<td>A61M</td>
<td>165,574</td>
<td>1</td>
<td>Filters implantable into blood vessels; prostheses; etc.</td>
</tr>
<tr>
<td></td>
<td>C08G</td>
<td>158,998</td>
<td>1</td>
<td>Macromolecular compounds obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds</td>
</tr>
<tr>
<td></td>
<td>C08K</td>
<td>115,081</td>
<td>1</td>
<td>Use of inorganic or non-macromolecular organic substances as compounding ingredients</td>
</tr>
<tr>
<td></td>
<td>A01N</td>
<td>111,744</td>
<td>1</td>
<td>Preservation of bodies of humans or animals or plants or parts thereof biocides</td>
</tr>
<tr>
<td></td>
<td>B65D</td>
<td>229,459</td>
<td>0</td>
<td>Containers for storage or transport of articles or materials,</td>
</tr>
<tr>
<td></td>
<td>B01J</td>
<td>193,763</td>
<td>0</td>
<td>Chemical or physical processes, e.g. catalysis, colloid chemistry; their relevant apparatus</td>
</tr>
<tr>
<td></td>
<td>C08F</td>
<td>144,664</td>
<td>0</td>
<td>Macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds</td>
</tr>
<tr>
<td></td>
<td>C09D</td>
<td>104,293</td>
<td>0</td>
<td>Coating compositions, e.g. paints, varnishes or lacquers; Gearing</td>
</tr>
<tr>
<td></td>
<td>F16H</td>
<td>100,656</td>
<td>0</td>
<td>Gearing</td>
</tr>
</tbody>
</table>

From the above d, we constructed patent application pairs as describer in Section 3.1.1 above. Our resulting working sample includes 540,862 pairs, each having an application at the EPO and an application at the USPTO. Table 2 shows
the tabulation of patent applications by patent office and STDIPC vs. non_STDIPC technological group. The distribution across the four groups looks rather even.

Table 2. Distribution of patent applications for EPO and USPTO by technological group

<table>
<thead>
<tr>
<th></th>
<th>non_STDIPC</th>
<th>STDIPC</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Perc</td>
<td>N</td>
</tr>
<tr>
<td>EPO</td>
<td>124,209</td>
<td>50%</td>
<td>127,261</td>
</tr>
<tr>
<td>USPTO</td>
<td>124,209</td>
<td>50%</td>
<td>127,261</td>
</tr>
<tr>
<td>Total</td>
<td>248,418</td>
<td>50%</td>
<td>254,522</td>
</tr>
</tbody>
</table>

3.2 Outcome variable

Our analyses, the dependent variable is whether for a given application (in a given patent office), a patent grant event took place. There is one aspects here worth of a brief discussion. Statistical patent data, including PATSTAT, usually only allows to observe the granting of a patent, by looking whether a publication is issued by the patent office that represents such a grant (for instance a ‘B1’ or ‘B2’ kind publication, or an ‘A’ kind publication in the US prior to March 2000). In contrast, we do not directly observe whether a patent is rejected, or the application is abandoned by its owner, etc. For old patent applications this is not an issue: if enough time has lapsed, then one can safely assume the application will never see a grant. For recent patents, however, the problem is that we cannot know whether a patent is not yet granted, or never will be granted. This issue is addressed in our analyses by considering only patents filed up to 2009.

Finally, Figure 1 shows the granting rate over time for both the patents in standards related areas (STDIPC) and patents in areas not related to standards (non_STDIPC) at the two patent offices. Note that patent grant here means that by April 2014, the data of our PATSTAT database, the patent in question was granted by the patent office. Given the examining lags at the patent offices, the more recent data in our graphs is somewhat more affected by truncation than the older data.
First notice that, in general, USPTO patent applications are more likely to be granted than EPO applications, both before and after the policy change implementation. This reflects a well known stylised fact about institutional differences between the two patent offices. However, some differences between the two technological groups emerge in the period after the policy implementation. In particular, beside the general decrease rate in patent granting, USPTO patent applications are more likely to be granted in areas related to standards (STDIPC) rather than other areas. On the contrary, since 1993, the situation in the EPO is the opposite.

The almost 100% grant rate of USPTO patents before the year 2000 does pose questions, though. Further investigation of our data revealed that this is the result of a specific phenomenon: until March 2000, the USPTO did not publish patent applications, only granted patents. While applications before this data are actually still included in PATSTAT, they do not have a DOCDB patent family associated with them, effectively preventing us to construct proper patent pairs prior to March 2000 (because for applications before that date, we cannot identify pairs of patents that did get granted at the EPO but not at the USPTO). As a result, we limit our empirical analysis to the years 2000-2010 only.

4 Empirical analysis

In order to assess the effect of the EPO policy change concerning SSO-related patents we use standard treatment effect models. We believe such an analysis is appropriate as:
a) the policy change was not anticipated by applicants;
b) the policy change was not anticipated by examiners, that is even if examiners knew about it, they cannot change their granting “propensity” until the new SSO-related documentation becomes part of the official body of prior art;
c) there is a clear point in time when the policy was introduced: before 2006, patent examiners also simply did not have such SSO-related documentation at their disposal;
d) there had not yet been a previous trend in the refusal of patents on the ground of SSO-confidential non-patent literature.25

4.1 Empirical strategy

Treatment effect estimation usually focuses on measuring the average treatment effect (ATE) defined as the difference in the outcome with and without the treatment:

\[ ATE = E(Y_i, D_i = 1) - E(Y_i, D_i = 0) \]

In our case, \( Y_i \) is a dummy equal to 1 if the patent application \( i \) is granted and \( D \) is a dummy equal to 1 if the patent application \( i \) is exposed to the policy. However, a second quantity of interest, that more precisely capture the effect of a policy change, is the average treatment effect on the treated (ATT) defined as:

\[ ATT = E(Y_{i,1} - Y_{i,0} | D = 1) \]

The ATT, in our context, represents the mean effect of the policy on granting probability for the patents that were actually exposed to the policy. The empirical challenge of estimating ATT is the difficulty (or sometimes the impossibility) to observe units that are both treated and untreated.

The quasi experimental setting of our analysis implies that the very same invention can be applied for patenting both at the USPTO and EPO, therefore we are in the rare position of being able to directly observe the same individual both with and without treatment, and thus we can estimate the ATT.

We perform several exercises. The first step of our empirical analysis concerns differences between the grant rate of the EPO and the USPTO for patents in IPC

\[ ^{25} \] At least, if we ignore the outcome of the individual patents subject to the two court cases discussed in Section 2.
codes related to standardisation, filed after the policy is implemented. We estimate the following regression:

\[ Y_i = \beta_0 + \delta_1 EPO_i + u_i \]  

(1)

where \( EPO_i \) is a dummy equal to 1 if the application is filed at the EPO, i.e. the patent is exposed to the policy change. In this setting the control group is composed of all patent applications for the same invention at the USPTO (i.e. \( EPO=0 \)).

The exercise does not rule out the possibility that differences in granting probability are due to (other) institutional differences between EPO and USPTO. As the descriptive graphs of the previous sections highlight, indeed, USPTO shows a generally more generous granting procedure. Moreover, there might be other unmeasured factors that change granting probability across the two patent offices, beyond the policy change. We therefore propose a second exercise where we apply a difference-in-difference approach. We consider also the STDIPC patent application filed before the policy and estimate the following regression:

\[ Y_i = \beta_0 + \beta_1 EPO_i + \delta_0 POSTPOL_i + \delta_1 EPO_i \times POSTPOL_i + u_i \]  

(2)

where \( Y_i \) is again a dummy equal to 1 if the patent application \( i \) is granted. The dummy \( EPO_i \) is equal to 1 if the patent application \( i \) is filed at the EPO and controls for differences between the treated and the control group before the policy change. The dummy \( POSTPOL_i \) (‘Post Policy Era’) is equal to 1 if the applications year is after the policy is implemented at EPO and it controls for possible time trend occurring in the dependent variable not related to the policy. The coefficient of primary interest is \( \delta_1 \), capturing the effect on the dependent variable of being in the treated group (EPO) after the policy implementation.

Finally, there is also another source of variation that we can exploit. Indeed, equation 2 does not rule out the possibility that granting procedures concerning patents in IPC classes related to standardisation are systematically different across the EPO and the USPTO, beyond the differences arising because of the policy change. This calls for a difference-in-difference-in-difference (DDD) exploiting as controls the patent applications in non_STDIPC IPC classes. In this case, the estimated model is:

\[ Y_i = \beta_0 + \beta_1 EPO_i + \beta_2 POSTPOL + \beta_3 STDIPC_i + \delta_1 EPO_i \times POSTPOL_i + \delta_2 EPO_i \times STDIPC_i + \delta_3 STDIPC_i \times POSTPOL_i + \gamma_0 EPO_i \times STDIPC_i \times POSTPOL_i + u_i \]  

(3)
As before, $Y_i$ is a dummy equal to one if the patent application $i$ is granted, and the dummy $EPO_i$ and $POSTPOL_i$ are the same as in equation (2). We add the dummy $STDIPC_i$ ('Standardisation related IPC class') which is equal to 1 for patent applications in a technological area where standards are relevant and zero otherwise, thus controlling for systematic differences in the granting rates of patents in standardized technological areas that are not related to the policy change. The coefficient of interest is thus $\gamma_0$.

Equations (1), (2), and (3) are estimated via a standard OLS linear probability model with properly clustered standard errors.

### 4.2 RESULTS

Table 3 shows the estimation results for the three models presented in the previous section.

<table>
<thead>
<tr>
<th>Model 1a</th>
<th>Model 1b</th>
<th>Model 2a</th>
<th>Model 2b</th>
<th>Model 3a</th>
<th>Model 3b</th>
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<td>(0.005)</td>
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</tbody>
</table>

YEAR DUMMY YES YES YES

TECH DUMMY YES YES YES

| N       | 232820   | 232820   | 254522   | 254522   | 502940   |
| R-sq.   | 0.129    | 0.181    | 0.132    | 0.182    | 0.093    |

Note: Standard errors in parentheses. * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Model 1a in Table 3 shows the estimation of Eq. (1), where we consider the differences in granting rate between the EPO and the USPTO, considering patent applications in fields related to standardisation, and filed after the introduction

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26 Recall that STDIPC classes and non_STDIPC classes are distinguished upon their occurrences in SEP patents included in the dSEP database provided by Bekkers et al. (2012).
of the policy. The dummy EPO identifies the treated group. Looking at Figure 1, it will come at no surprise that we observe in this regression that the likelihood of a patent being granted is at the EPO is 35% lower than the likelihood for the same patent at the USPTO. When we add dummies to control for specific variation between years and between technology areas (Model 1b), the result is stable.

Model 2a expands our sample of EPO and USPTO patents applications by including those applications filed for before the policy implementation, thus controlling for pre-policy trends. (Like above, this analysis only considers only considering patents in areas related to standardisation). Again, we find that the likelihood of granting at the EPO is lower than that at the USPTO, and we find that the likelihood in the post-policy era is lower than in the pre-policy era. The coefficient on the interaction between these two variables (EPO and POSTPOL) now also show that the EPO likelihood to grant also decreased 2.8% compared to that of the USPTO. Therefore, Model 2 improves upon the previous model in being able to distinguish institutional differences and policy effects. When we add dummies to control for specific variation between years and between technology areas (Model 2b), the results become a bit stronger, raising the effect to 3.7%.

The model that comes closest to estimating the actual impact of the policy change is Model 3, which reports the estimation of Eq.(3), by expanding the sample to technological areas where standardization is not prominent. Hence, the number of observations doubles to approximately half a million. Our variable of interest is the three-way interaction that captures the effect of being in the treated group (EPO), while the policy is implemented (POSTPOL) in a standard-related technology (STDIPC). Results reveal that the policy implementation decreases the probability of a standard-related patent to be granted by approximately 7.6%. If we also correct for variation between years and between technology areas (Model 3b), the effect of the policy increases to 8.3%.
5 Conclusions and policy implications

The aim of this paper is to investigate the causal effect of a recent attempt undertaken by the EPO to improve the quality of the patent granting process. To do so we examine a policy change that aimed at including the information revealed during the standardisation-setting process into the official definition of prior art. To learn about causality, we exploit the rather unique situation in which the same individual (a patent application) can be observed both with and without treatment. Indeed, we have data on patent applications for exactly the same invention filed for at both the EPO (where the policy change took place) and the USPTO (where it did not).

First, we take patents in standard-related IPC classes (STDIPC) and compare granting rates of such EPO patents with USPTO patent siblings in the post-policy period. Second, we apply a difference-in-difference strategy to compare EPO vs. USPTO patents before and after the policy. Finally, we further account for systematic differences between STDIPC and non_STDIPC through a difference-in-difference-in difference estimation of the pre vs. post-policy granting rates across patent offices and technological areas.

All the empirical analyses consistently support that the policy was successful. Indeed, we find a negative and strongly significant reduction in the granting rate, suggesting that the process of patent granting has become more careful and selective after the policy implementation. In fact, after controlling for other relevant determinants, we find that the policy resulted in a decrease of grant levels of approximately 8% for patents in technical areas strongly related to standardisation.

This reduction in grant rates could also have significantly decreased the number of patents granted for ideas that were actually invented – and shared in good faith in standardisation meetings – by other parties than the application (in other words: 'stealing'). Such behaviour is a real life risk (see Granstrand, 1999, p.204, and also in court cases, patent owners have actually been accused of doing so).
However, since we do not have sufficiently detailed data on the real inventor, opposed to the applicant, our study cannot answer this question.

We believe our results represent a lower bound estimate of the actual effect of the new EPO policy. As indicated above, the policy can not only result in lower grant rates, but also in a reduced scope of patents that do get granted, or in a disincentive to apply for patents at the EPO when the applications are aware that standardisation-related prior art may reduce their chances to obtain the desired patents. These two other forms of impact of the new IPO policy offer opportunities for follow-up research.

This paper contributes to the literature on patent quality, where quality relates to the granting process. In technological fields where patents are relevant and fragmented in property (as mostly SSO areas) it is of pivotal importance that granted patents meet patentability requirements (e.g. novelty). Furthermore, as the policy under examination not only aim to improve the quality of the patents but also to limit firm strategic patenting, we also contribute to the growing literature on firm’s strategic behaviour in managing and building extensive SEPs patent portfolios (e.g. Leiponen, 2008; Bekkers, Bongard, and Nuvolari, 2011; Berger et al., 2012; Kang and Bekkers, 2015).

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**References**


