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The worldwide count of priority patents: A new indicator of inventive activity

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ABSTRACT

This paper describes a new patent-based indicator of inventive activity. The indicator is based on counting all the priority patent applications filed by a country's inventors, regardless of the patent office in which the application is filed, and can therefore be considered as a complete 'matrix' of all patent counts. The method has the advantage of covering more inventions than the selective Patent Cooperation Treaty (PCT) or triadic families counts, while at the same time limiting the home-country bias of single-country-based indicators (inventors from a particular country tend to file in their own country). The indicator is particularly useful to identify emerging technologies and to assess the innovation performance of developing economies.

1. Introduction

The past decades have seen a sharp increase in the use of patent-based indicators by scholars and policy analysts. Patent data are used across scientific disciplines and for a range of purposes—such as assessing a country's innovation performance, evaluating researchers' mobility or tracking the emergence of new technologies. Yet the abundance of data sources and counting methodologies lead to heterogeneous metrics. Depending on the reference date (priority date vs. application date), the criterion for geographical allocation (inventor vs. applicant), the level of aggregation and several other dimensions, patent counts can vary to a very large extent.[1]

Certain types of patent indicators are more appropriate for certain uses, and careful consideration of the research objective is needed to select the most appropriate indicator. For instance, national data provided by the US Patent and Trademark Office (USPTO) are appropriate for studies of the market orientation of inventive activity. Due to their limited coverage, however, national databases are subject to a geographic bias. For instance, USPTO patent counts are strongly biased in favour of US and Canadian inventors, owing to the high propensity of North American applicants to file patents at that patent office. The ways to avoid the geographic bias are either to count 'international' patents filed under the Patent Cooperation Treaty (PCT), or to count applications filed simultaneously at several national offices (e.g., the 'triadic families' discussed in Section 2). These indicators are very exclusive. They count only applications having an international market perspective and, hence, are biased towards inventions of higher value, which are often owned by large firms with a substantial patenting budget. It has long been recognised by scholars that many inventions of local relevance are also of interest for various reasons. They can serve the development of small companies, they witness

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[1] See the OECD Patent Statistics Manual 2009 for an in-depth critical review of existing patent indicators, and Dernis et al. (2001) for a first empirical assessment of various counting methodologies.

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Table 1
Comparison of patent indicators.

	Home bias		Time effect	Timeliness (months)	Document	Level of aggregation	Value
	Geographic	Institutional					
USPTO	Strong	None	N	40	PF & SF	Individual	Low to high
EPO	Medium	None	Y	18	PF & SF	Individual	Med. to high
PCT	Low	None	Y	18	PF & SF	Individual	Varying
Triadic	Low	None	Y	40	–	Family	High
Worldwide[a]	None	Medium	N	18	PF	Individual/Family	Low to high

Notes: PF: priority filing. SF: second filings. Worldwide: the indicator proposed in this paper.
[a] The timeliness of 18 months does not apply to patent applications filed at the USPTO, which can remain undisclosed until grant.

the presence of absorptive capabilities, and they may be of particular value within developing countries. Overlooking these local patents therefore precludes a full view of the inventive activity of countries.

This paper presents a methodology to build an indicator of priority patent applications using the Worldwide Patent Statistical Database (Patstat) that is maintained and distributed by the European Patent Office (EPO). A priority filing is the *first* patent application filed to protect an invention. It is generally filed in the patent office of the inventor's country of residence, although it may also be filed elsewhere. In some countries the national patent office attracts only a small share of the priority filings made by domestic inventors. A comprehensive measure of inventiveness therefore requires a count of all priority patent applications filed worldwide and their assignment to the country of the inventor's residence (or that of the applicant, depending on the research objective). The aim of this paper is to present a new patent-based indicator that relies on this approach.

The idea of a count of patent priorities is not new per se, as it has been done before, notably in the Trilateral yearly reports published by EPO, the Japan Patent Office (JPO), and USPTO. To make this approach operational on a large scale, however, several practical issues need to be resolved. The most crucial one derives from the fact that the Patstat database is plagued by missing information on inventors. A distinguishing characteristic of our contribution is that we present a way to address this problem. In particular, whenever a priority filing has missing information on inventors, we look for any subsequent filing of the same invention that may include this information. Validity tests suggest that the proposed retrieval algorithm is highly accurate.

Compared with existing indicators, which mainly focus on higher-value patents, the worldwide count improves the measurement of the inventive activity of small open economies and emerging economies, and reflects the overall innovative dynamism of countries. It is also extremely useful in tracing the geographic location of emerging technologies. With its all-encompassing approach, the indicator measures the 'inventiveness' of countries, as opposed to the inventive 'performance' captured by existing high-value indicators. This being said, the measure of patenting activity developed in this paper is actually the source of all patent series, in the sense that it can be used to generate all existing patent indicators. For instance, to generate the triadic indicator, it would be easy to select only those priority filings that eventually became triadic patents. Thanks to its generality, the worldwide count of priority filings is also particularly appropriate for within-country analysis of inventive activity. It allows scholars and policy analysts to track the population of patents by domestic inventors and informs them of the characteristics of their national system of innovation and exposure to international research.

The paper is organised as follows. The next section reviews the existing patent indicators. Section 3 describes the methodology. A statistical overview of the indicator is provided in Section 4. Section 5 studies patenting activity in an emerging field to illustrate the differences with established patent indicators. Section 6 discusses how the patent indicator can be used and offers conclusions.

2. Patent indicators

This section reviews four popular patent indicators in light of six key characteristics: (i) the home bias; (ii) the existence of a time effect; (iii) the timeliness of the statistics; (iv) the type of document; (v) the level of aggregation; and (vi) the value of patents. In the following discussion, it is assumed that the reader has a general knowledge of the patenting process and of patent indicators.[2]

The term *home bias* means that domestic applicants tend to file more patents in their home country than nonresident applicants, relative to their inventive capacity (OECD, 2009: 60). By extension, we use this term to refer to how the institutional and geographical characteristics of patent systems affect patent counts. For instance, relying on USPTO patents to assess countries' innovation performance would lead to a biased count in favour of US firms, but also Canadian and Mexican firms due to their geographical proximity to the United States.[3]

The *time effect* is defined as the effect of the passing of time on a patent indicator. One illustration of this effect is provided by de Rassenfosse and van Pottelsberghe de la Potterie (2007), who show that the older members of the European Patent Convention (EPC) have a higher propensity to file applications at the EPO.

Timeliness indicates how quickly a particular class of patent data becomes available.

The *type of document* refers either to priority filings or second filings. A priority patent application is generally filed at the inventor's home office, although this need not be so. When a priority patent application is subsequently filed in other jurisdictions, with the aim of extending the patent protection to foreign markets, the applications are called 'second filings'.

The *level of aggregation* can be the individual patent level or the family level. A family of patents is a set of patents (or applications) filed in several countries which are related to each other by one or several common priority filings (OECD, 2009: 71).

Even though it is difficult to estimate *patent value*, it is possible to rank some of the indicators according to the presumed average value of the patents that they count. Table 1 displays a comparative description of the main characteristics of existing patent indicators.

A first indicator is the count of the number of patents granted by the USPTO, which has been accessible to researchers for a long time and is extensively used for international comparisons (Merton, 1935; Schmookler, 1954; Soete and Wyatt, 1983). It is argued that

[2] A good discussion of these topics can be found in Dernis et al. (2001) and OECD (2009). Schmookler (1950), Pavitt (1985), and Griliches (1990) provide an extensive discussion of the possibilities and problems of patent indicators.
[3] See Harhoff et al. (2009) for an illustration of how geographical distance affects the propensity to seek patent protection in a country.