World Patent Information 38 (2014) 12–18

Contents lists available at ScienceDirect

World Patent Information

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

Canadian worldwide patent activity: An industrial level analysis

Rashid Nikzad*,[1]

Industry Canada, 50 Victoria Street, Gatineau, Quebec, Canada K1A 0C9

ARTICLE INFO

Article history:
Available online 30 March 2014

Jel classification:
O3

Keywords:
Patent
Intellectual property
Innovation
Technological change
Canada
Industrial exports
Industry classifications
International patenting
Modified gravity model

ABSTRACT

The objective of this paper is to find the determinants of Canadian international patent activity at the industrial level. The paper achieves this goal in two steps. In the first step, Canadian worldwide patent applications are mapped into industry classifications. The paper draws on three different methods (Johnson, 2002 [13]; Schmoch et al., 2003 [22]; and Lybbert and Zolas, 2013 [16]) and two different data sources (EPO PATSTAT and OECD Triadic patent families) to do this task. In the next step, Canadian patent applications abroad are modeled by using a modified gravity model. The empirical results suggest that the industrial R&D and value added of Canada and destination countries as well as industrial exports are significant factors of Canadian patent activity abroad.

1. Introduction

A patent is a set of exclusive rights granted by a patent office to an inventor or his assignee for a fixed period of time in exchange for a disclosure of an invention. Despite some concerns such as the value of patents, heterogeneity across countries and industries, etc., patent statistics have served as a useful proxy for measuring technological change and transfer of technologies [7,9,10,12,19]. Hence, the study of international patent activity helps us understand where technologies originate and to where they spread.

Modeling patent activity was already the subject of some cross-country studies [1,2,5,8,19–21], but there are very few studies that address outward patenting of a single country at the industry level. Exceptions include Lybbert and Zolas (2013) [16] who model bilateral patent flows of countries based on GDP and country-level trade barriers, and Nikzad (2012) [18] who studies foreign patent activity in Canada at the industry level.

The objective of this paper is to find the determinants of Canadian international patent activity at the industrial level. The paper undertakes this task in two steps. In the first step, Canadian worldwide patent applications are mapped into industries. There have been different patent-industry concordances developed so far. This paper uses the three more recent concordances (Johnson, 2002 [13]; Schmoch et al., 2003 [22]; and Lybbert and Zolas, 2013 [16]) to map Canadian patents to industry classifications. The study uses two sources of data for this purpose, the EPO PATSTAT and the OECD Triadic patent families. In the second step, Canadian patent applications abroad are modeled using a modified gravity model to find the determinants of Canadian international patent activity.

This paper complements previous studies in two directions. First, the study is done at the industry level of a single country by using different patent-industry concordances. Second, the study focuses on the international patent activity of the country instead of the patents received by the country. The empirical results suggest that the industrial R&D and value added of Canada and destination countries as well as industrial exports are significant factors of Canadian patent activity in selected foreign countries.

The structure of the paper is as follows. Section 2 will discuss patent activity of Canada. This section also reviews different approaches to map patents to industries and explains the methodology used in this paper to find Canadian global patenting at the industry level. Section 3 will present a modified gravity model to find the determinants of international patent activity. Section 4 presents the empirical findings. Section 5 concludes.

2. Patent statistics

This section reviews Canadian patent statistics. Section 2.1 presents the distribution of patent applications by destination. Section 2.2 reviews different approaches to map patents to

* Tel.: +1 819 934 5233.
E-mail address: Rashid.Nikzad@uottawa.ca.
[1] The author is now working at Statistics Canada, Canada.

http://dx.doi.org/10.1016/j.wpi.2014.03.001
0172-2190/

industries and their caveats. Section 2.3 introduces the patent sources used in this study. Section 2.4 discusses the steps this study takes to find the number of patent applications by industry.

2.1. Destinations of Canadian patents

Figure 1 presents the trend of Canadian applications from 2000 to 2011. Patent applications can be divided into two broad categories of resident filings and applications abroad. Canadian resident filings were approximately constant around 4700 applications per year in this period, while Canadian international patent activity increased from around 13,900 filings in 2000 to around 24,500 filings in 2011. This means the share of Canadian resident filings in worldwide Canadian filings decreased from 30% in 2000 to 19% in 2011. This increase in international patent activity is consistent with global patent trends [21]. The United States has captured a large portion of this increase in Canadian global filings since 2000.

Figure 2 presents the patent applications abroad by destination in 2010. The United States alone accounted for over 60% of Canadian applications abroad in 2010. Patent statistics show that Canadian applications tend to file 1.6 to 2.5 times more in the United States than in Canada, and this trend has been increasing since 2000 (Fig. 1). In terms of other destinations, the European Patent Office (EPO) accounted for about 13% of Canadian applications abroad. China, Japan, India, Australia, and Republic of Korea were the next destinations for Canadian patent holders.[2]

2.2. A review on patent-industry mapping

An important question in terms of economic analysis and innovation is the number of patents in each industry. Patents are assigned a product code, which helps lawyers and patent examiners in grant and litigation decisions. The most widely used patent classification system is the International Patent Classification system (IPC). Although, IPC provides useful information for legal purposes and helps patent information searchers to reveal the valuable technical and business information in patents, economic researchers cannot use it easily because it corresponds with no other classification systems. Mainly, economists and policy makers are interested to know the number of patents in each industry to be able to combine this piece of information with other economic variables such as R&D expenditures, value added, investment, etc.

Different efforts have been made to find a concordance between patent classifications and industry classifications. One of the first attempts to find an industry classification for patents was done at the Canadian Intellectual Property Office (CIPO): between 1972 and 1995, CIPO simultaneously assigned patent classifications as well as an industry of manufacture (IOM) and sector of use (SOU) code to each of over 300,000 granted patents. This industry code was based on the Standard Industrial Classification (SIC). Later, a group of researchers from Yale University developed the Yale Technology Concordance (YTC) between IPC and SIC based on this data [14]. Their methodology was to use the information of all 300,000 patents to determine the probability that a patent with a specific IPC has a particular IOM-SOU combination. In another attempt, the US Patent and Trademark Office (USPTO) established a detailed concordance between the subclasses of the United States Patent Classification (USPC) and 41 unique classes of the US Standard Industrial Classification in the 1980s. This is done on the basis of examining the definition of each USPC code and assigning them to one or more of the 41 industrial classes.

[2] Readers may refer to Nikzad (2013) [17] for more details about the patent profile of Canada.

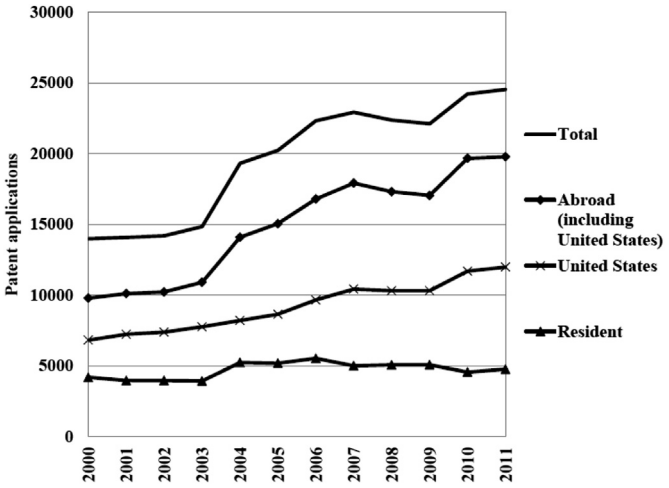
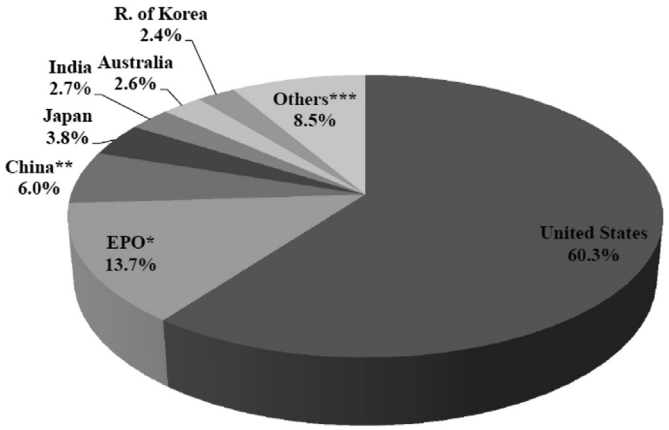


Fig. 1. Patent applications with Canadian origins (2000–2011). Source: WIPO Statistics Database.

Two more recent attempts in this area include Johnson (2002) [13] and Schmoch et al. (2003) [22]. Johnson used the YTC to develop the "OECD Technology Concordance" between IPC and the International Standard Industrial Classification (ISIC) based on the original CIPO data in 1972–1995. In the OECD Technology Concordance, each patent classification (IPC) is mapped to each industry classification (ISIC) with a probability attached to it. There are some caveats with this concordance. First, since the concordance is based on old CIPO data, new technologies are not included in the mapping. Also, the relationship between technologies and industries might have changed since then. Second, the translation of the original mapping from SIC to ISIC adds some uncertainty to the concordance. Despite these caveats, this concordance is one of the best available methods to find the number of patents per industry [22].

Schmoch et al. (2003) [22] are another recent concordance that maps 625 4-digit IPCs directly to 44 two-digit ISIC and Statistical Classification of Economic Activities in the European Community (NACE). This mapping is based on the information of about 3000 firms in the manufacturing sector which includes about 154,000 patents in three years. One problem of this mapping is that it establishes a one-to-one relationship between IPC and industry classes and ignores the possibility of multiple linkages from an IPC to



* European Patent Office
** Including Hong Kong SAR
*** including European countries not through EPO

Fig. 2. Shares of Canadian patent applications abroad (2010). Source: WIPO Statistics Database.