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## How to forecast cross-border patent infringement? – The case of U.S. international trade

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## ABSTRACT

The International Trade Commission is one venue for enforcement of United States Patents, the other venue being the Federal District Courts. The ITC conducts investigation on unfair methods of competition and unfair acts in the importation under United State Section 337. The majority of ITC investigations are based on the importation of goods that are alleged to infringe a United States patent. This paper seeks to investigate fundamental characteristics of patents investigated by ITC, name as “ITC patent” in this study, from 1976 to 2012 in order to obtain early precaution of possible ITC investigation for newly filed patents. Patents which have been investigated by ITC are defined as ITC patents (1305 patents) and those which have never been investigated by ITC defined as non-ITC patents (4,388,043 patents). Both ITC patents and non-ITC patents are analyzed to understand the differences between the two types of patents in terms of 11 variables. Subsequently, the difference between ITC patents and non-ITC patents in a manner that is statistically different from random distribution will be identified. Furthermore, regression model is used to test whether each of the above variables (the 16 indicators) is related to each other and evaluate the probability of being investigated by ITC.

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### 1. Introduction

The most important feature of a patent is to protect intellectual property right in the knowledge economy [1]. The degree to which a patent can protect its intellectual property right is proportional to its patent value which has been rigorously studied [2–4]. The value of a patent relies heavily on the characteristics of the patent, and it is widely accepted that one of the most important characteristics, in terms of value, of a patent is whether or not a patent has been involved in infringement [5,6]. It can be observed that the number of patent infringement disputes has been increasingly remarkably over the past two decades [7][8][5]. In the US, there had been a total of 37,317 disputed patents since 1976 to 2012, these disputed

patents comprise 36,905 patents investigated by the US courts and 1305 patents investigated by the International Trade Commission (ITC) [9].

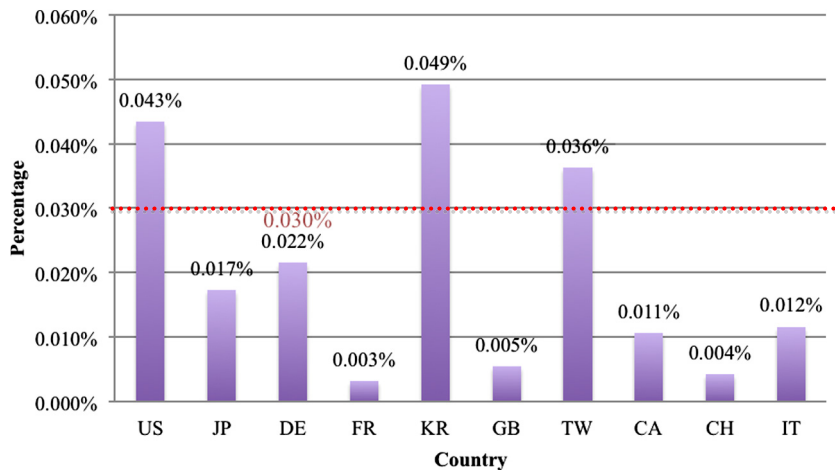
Patent as one of the important documents for protecting intellectual property in a knowledge economy plays a very significant role in an infringement [10]. Unlike most of non-infringed patents, an infringed patent is practically used to protect intellectual property and it is quite straightforward to hypothesize that infringement chance is positively related to patent value. Actually, the hypothesis has been verified by literatures. For example, Allison et al. (2004) argued that litigated patents are patents of higher value and their characteristics are fundamentally different from those without being used in litigated, i.e. non-litigated patent [5].

Cook (2007) argued that it is important to differentiate both infringed-patent and non-infringed patent to understand technological competition [11]. Also, even some methods have been proposed in literatures to assess probability of patent infringement, for example, by ways of real option [12], fuzzy method

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**Fig. 1.** Percentage of ITC patents in top 10 fist assignee countries (top 10 countries with highest numbers of patents, dashed line shows the average is 0.030%).

[13,14], or combination of both [15]. Some researches focused on infringements in some selected industries. For example, textiles, combustion engines, and pharmaceuticals, Software, computers, Semiconductor, Mechanical, Electronics, Optics, Imaging, Biotechnology, Chemistry [5][16–19].

Patent infringements can be classified into two types. One type of patent infringement is investigated by the court, the other type is cross-border patent dispute investigated by the International Trade Commission (ITC). ITC was established in 1916 as U.S. Tariff Commission and changed to International Trade Commission in 1974, it has broad investigation power on infringements of trade, e.g. Patent, Copyright, Trademark and Trade secret. ITC as the government agency dealing with cross-border patent infringements plays a much more important role in international trading and global economy than the court dealing with domestic patent dispute. From 1976 to 2012, ITC had investigated 1305 patents defined as “ITC patents” in this study that have never been characterized in the literatures. Especially when it comes to the difference between ITC patents and non-ITC patents, such investigation is not yet available in the literatures.

Therefore, this study seeks to fill the gap in the literature by conducting holistic scale analysis on ITC patents, i.e. all utility patents in USPTO database from 1976 to 2012 are classified into two both ITC patents and non-ITC patents. Subsequently, multivariate analysis and regression analysis are adopted in this study in order to characterize patents and reach the purpose of this paper as disclosed in this paper title “How to Forecast Cross-Border Patent Infringement?”, seeking to provide a method to forecast Cross-Border Patent Infringement?

More specifically, the purpose of this paper is to use some important patent characteristics to forecast probability of Cross-Border Patent Infringement, which can be correlated to patent value, by answering the following two questions: 1) What are the characteristic differences between ITC patent and non-ITC patent, 2) how a patent's characteristic influences the probability of cross-border patent infringement?

## 2. Patent value and patent infringement

The use of patent in protecting intellectual property has been getting more and more important in the development of a knowledge economy. Besides the protection of intellectual property, patent can also be used to measure innovation capacity of a country or an enterprise [20], market value of intellectual and intangible asset portfolio [21]. Patent valuation has been a key research topic for academic researchers as well as a mean for patent assignee to formulation business strategies [22]. In a growing knowledge economy, how to objectively evaluate patent value has become a key factor for sustaining innovative competitiveness.

To evaluate value of patents, Reitzig (2004) validated indicators of patent value by analyzing application rationales and found some useful indicators, i.e. patent age, forward citation, backward citation, patent family size, technological range, number of claims, etc [23,24]. However, “Value” is a not a fixed price but an abstract concept as a function of very many factors and different dimensions. Patent is an official document to legally protect invention so legal value is essential for a patent. Also, patent defines and protects the scope of a technological invention so technological value is of no doubt inherent in a patent document. Further, the technology protected by patent can be commercialized to create economic value and allow patent owner to monopolize the market. Therefore, patent value can be investigated from three different dimensions, i.e. 1) legal value [25,26][17][27–30][15], 2) technology value [31–34] and 3) economic value [35–40]. Also, the evaluation of the three values by different indicators has been discussed by Gibbs [41] and Zhang et al. [24].

As the growing globalization of business activities, enterprises seek to use infringement-based business strategies to prevent competitors from entering into the market by patent. The value of patent with exclusive right fundamentally relies on the extent to which the invention can be protected from infringement. Evidence must be used to evaluate patent value

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