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The validity of industrial design registrations and design patents as a measurement of "good" product design: A comparative empirical analysis

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1. Introduction

Product design drives innovations and often improves a competitiveness of firms [1,2]. Additionally, once an innovation successfully leads to a change of a product's meaning [3,4], a new market will be cultivated. Sometimes, an integration of product design and technological features may create new meanings of products, which has a probability of disrupting current product markets [5].

Although there is an increasing recognition of the importance of design-based innovations, we have limited appropriate measurable indicators of product design development activities and their performance. Typically, consumer surveys give us a great amount of information about what is a good design from a consumer's point of view. But the data only indicates consumer responses and say nothing about the product's development process. Indeed, Galindo-Rueda and Millot [6] reviewed current challenges to measuring design innovation activities. Their arguments emphasize the scarcity of appropriate measures of design development activities. The versatile elements of design make it difficult to measure design inputs and outputs precisely.

One of the prominent data sources is design awards. Among various design awards, some distinguished awards recognize good design in a reliable process and display winning products indicating its designers, manufacturers, and jury's comments. These data provide us an objective indicator of good design [7] and are part of the information on a product's development process, like the names of the designers involved. Indeed, several studies investigated the relations between design capability and firm performance by using the nomination of design awards [8,9]. The recent paper more directly examines the effect of receiving design awards. Guo [10] discovered that the more firms receive awards, the higher financial performance firms achieved. Suzuki, Ehara, and Tsuno [11] revealed that winning an international design award raises a winner's stock price 1.25% on average.

But still, we cannot trace innovative design development activities through design awards. Design awards are excellent champion data. But they are insufficient data source in their development teams. Many design awards simply indicate firm names in their designer information. Thus, we have very limited insights about which kind of design development activities affects a creation of outstanding good designs and what factors improve firms' design performance.

In this paper, we explore a measurement of product design activities that complement the weakness of design awards. Mainly, we focus on industrial design registrations since multiple firm-level analyses indicate that innovative firms use industrial design registrations more than less innovative firms [12,13]. Section 2 describes whether industrial design registrations are protecting good product design and what challenges firms face in protecting their good designs using these intellectual property rights. Section 3 states the methodology to check the validity of industrial design registrations in leading intellectual property intensive countries; China, France, Germany, Japan, Korea, the United Kingdom, and the United States. The subsequent section displays the result. The discussion in Section 5 answers the research questions and suggests several future research topics in Section 6.

2. Theoretical background

2.1. Elements of good product design

We first clarify elements of a good product design. The noun term “product design” is often used as a polysemous word. Many studies have focused on specific dimensions of product design, but a recent study by Homburg, Schwemmle, and Kuehnl [14], reviewing prior literature on design, offers a unified view of the dimensions of “product design”. They argue that the value of product design is divided into three elements: aesthetics, functionality, and symbolism. Leder, Belke, Oeberst, and Augustin [15] defined aesthetics as features that cause a perception of beauty for the beholder. Functionality, in contrast, is described as a reflection of expectations from consumers for a product to fulfill a purpose [16,17]. Symbolism corresponds to the perceived message a product communicates regarding a consumer's self-image to both the consumer and others on the basis of visual elements [17,18].

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Table 1
Comparison of industrial design registration systems.
*WIPO Statics Database, ** Author.

	China (SIPO)	Europe (EUIPO, Germany (DPMA), France (INPI), and UK (UKIPO))	Japan (JPO)	Korea (KIPO)	United States (USPTO)
Name of the system	Design patent	Community design/registered design	Design right	Design right	Design patent
Protection term	10 years	25 years	20 years	20 years	15 years
Annual applications (design count in 2016)*	650,344	104,522 (EUIPO) 56,499 (DPMA) 14,752 (INPI) 10,030 (UKIPO)	31,013	69,120	44,967
% of applications from non-resident (in 2016)*	2.8%	28.8% (EUIPO) 18.8% (DPMA) 7.3% (INPI) 12.9% (UKIPO)	20.8%	9.4%	45.7%
Novelty examination	No	No	Yes	Yes (in the majority of product categories)	Yes
Multiple designs application	Yes (up to 10 designs)	Yes (up to 100 designs)	No	Yes (up to 100 designs)	Yes
Average days between file to registration (in 2014)**	174	82 (EUIPO)	273	303	505
Approx. fees for registration (including 3 years maintenance fee)	100 USD	350 USD (EUIPO) 75 USD (DPMA) 95 USD (INPI) 70 USD (UKIPO)	330 USD	165 USD	1000 USD
Requirement for drawings	6-sided view + 1 diagonal drawings	Essential drawings	6-sided view drawings	6-sided view drawings + 1 diagonal drawing (can be omitted)	6-sided view drawings (can be omitted)
Indication of creators	Yes	Partially yes (not mandatory)	Yes	Yes	Yes
Classifications	Locarno	Locarno	Locarno and original	Locarno and original	Locarno and original
Citations	No	No	Yes	Yes	Yes
International registration	No	Yes	Yes	Yes	Yes

Several design or marketing studies have revealed conditions of each element to create high value. First, aesthetics do not directly increase consumers' willingness-to-buy [14]. Rather, functionality, symbolism, and brand attitude together develop a consumer appetite. Aesthetics only contributes to improving brand attitude, and indirectly increases purchase intention. Moreover, products with similar shapes to past products tend to show better performance than those with novel shapes [19–21]. This implies that unique aesthetics do not always attract consumers. Second, the functionality has a greater impact than aesthetics on willingness-to-buy [22]. Meanwhile, when it comes to novel functionality, the aesthetics are an important moderator to explain a product's value to consumers [23]. In other words, even a functionally novel product potentially attracts consumers, but without an appropriate shape (or aesthetics), its value will not be understood properly. Third, effects of symbolism differ depending on consumers. In the automobile market, symbolism strongly affects customers who are not satisfied with their cars but is less influential toward those who felt satisfied [24].

2.2. Intellectual property rights and good product design

Our next question is how to measure good product design. If designs are disclosed with a lot of background information, these data became a vital option for reliable measurements. Patents, trademarks, utility models, and industrial design registrations publish intellectual assets in exchange for exclusive rights. Among them, industrial design registrations, as indicated by their name, seem to be the primary measure to protect industrial design, a prominent part of aesthetics. Crucially, this system can cover all three dimensions of design as long as functionality and symbolism are realized in the shapes and dimensions of the design. Following the argument of Filitz, Henkel and Tether [25], our debate leads to the first hypothesis.

H1. The majority of good product designs are protected by industrial design registrations.

However, considered the following differences in systems among countries and regions, we should suspend our judgment of the fitness of this system in every nation for the protection of good product design. First, the design of the system, which may have a long history, possibly does not cover the modern aspects of good product design. Indeed, these registration systems are designed to protect novel product shapes but do not include any special consideration of intangible features, such as semantics or meanings of products. As mentioned above, the requirement for novelty contradicts the insight of marketing studies. As Galindo-Rueda and Millot [6] and Bruce and Bessant [26] mentioned, good product design is sometimes protected by utility patents and other kinds of intellectual property rights.

Second, industrial design registration systems vary among regions. To illustrate, India, Indonesia, Japan, Korea (in almost all product categories), Russia, and the United States register industrial designs and patents after professional examiners examine their novelty and other requirements, while in Brazil, China, and the European Union Intellectual Property Office (EUIPO) and the European Union (EU) member states patent experts only check their formality. A European Community design registration system, which started in 2003, is based on a “design approach” concept that focuses on the market value of industrial designs [27]. This system allows for a considerably rapid approval and price protection compared to the design patents in the United States [28]. Thus, although the European design registration system (Community design) is appropriate to measure aesthetics innovations [25], we should not generalize the idea to all design registrations outside of Europe.

Comparing industrial design protection systems among five major design registration intensive patent offices (State Intellectual Property Office of the People's Republic of China (SIPO), EUIPO, Japan Patent Office (JPO), Korea Intellectual Property Office (KIPO), and United States Patent and Trademark Office (USPTO); so-called ID5) and three domestic intellectual property offices in Europe (German Patent and Trade Mark Office (DPMA), National Institute of Industrial Property of