The Four Major Forms of IPRs, Innovation and Economic Development by Latecomers

Patents, Utility Models, Trademarks, and Industrial Designs

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THE FOUR MAJOR FORMS OF IPRS, INNOVATION AND ECONOMIC DEVELOPMENT BY LATECOMERS: PATENTS, UTILITY MODELS, TRADEMARKS, AND INDUSTRIAL DESIGNS

Keun Lee

1. INTRODUCTION

The role of intellectual property rights (IPRs) in the economic growth of countries has long been the topic of academic research and policy debates. The classical issue on the relationship between IPR and innovation has been whether the strong or weak protection of IPR stimulates innovation (Maskus & Penubarti 1995; Smith 1999; Awokuse & Yin 2009). While some evidence of the effects of strong IPRs, particularly patent rights, on economic growth exists, the debate is far from settled and the evidence is mixed.[1] Further, even if the incentive effects of IPR protection is true, the linkage is valid only when there does exist innovation capability. Otherwise, or in the context in typical developing countries where innovation capabilities are absent, innovation would not occur even with a strong IPR (Lee 2019).

Thus, the literature has explored the possibility that IPRs could have differential effects on countries at different stages of economic development, and its importance has first been acknowledged in a World Bank publication (Fink and Maskus 2005), and partly addressed in global intellectual property reforms (Commission on IPR,2002). Actually, there have existed a large volume of the literature, albeit with mixed results, that tended to focus on this dynamic relationship between the protection of intellectual property rights and economic growth at different stages, such as Kanwar and Evenson (2003), Falvey, Foster and Greenaway (2004).

Now, the recent literature tends to shift the focus from the strength of protection on economic growth at different stages to the roles of diverse forms of IPR in facilitating innovation capabilities of the lagging or latecomer economies. It is first by Kim et al (2012) that turned to the new issue of the impacts of the different types of IPRs, rather than the strength of IPRs, that would be appropriate for countries at different stages of economic development. Given that through adaptation, imitation, and incremental innovation, firms in developing economies can acquire knowledge and enjoy some learning-by-doing (Suthersanen 2006), and the innovations they produce may not have the inventive step to merit a traditional patent, Kim et al (2012) suggested and verified the idea that the second-tier industrial property right, namely, a utility model (petit patents) may be relevant and useful at lower level of development, serving as stepping stone for further technological progress. Given this possible linkage between diverse form of IPR and innovation and growth, it is very important to explore the role of the IPR regimes in innovation and economic growth by latecomers.

[1] See Aghion et al. (2001), Boldrin and Levine (2006), and Eicher and Penalosa (2008) for a review of the theoretical debates.

Without enhancing innovation and growth of the latecomer countries, global inequality will not be reduced. Thus, this review paper discusses the roles of diverse IPR forms in promoting innovation by the latecomers, focusing the four major IPR forms, such as regular patents, utility models (petite patents), trademarks, and design patents. It is important to identify effective strategies and policies to promote innovation at different stages of development, within the context of different forms of IPR. While Kim et al. (2012) focuses on the different usefulness of utility models vs patents at the early stages of development, the next question is about the roles of other IPRs, such as trademarks and designs.

While trademarks have traditionally been viewed as expressions of quality and variety of products (Block, et al., 2015), more recent literature sees them as measures of product innovation (Mendonça, Pereira, & Godinho, 2004; Flikkema, Man, & Castaldi, 2014). A literature has also emerged on the relationship between patents and trademarks. While Thoma (2020) finds a mutually reinforcing effect, Llerena & Millot (2020) find that such effects vary across sectors. In the context of emerging economies, Lee (2019) and Kang et al. (2020a; 2020b) observe two different paths of technological development in developing economies, namely patent-driven versus trademark-driven. In addition, some sectors rely more on trademarks than patents as their IPR instruments. For instance, trademarks are more prevalent when innovation involves tacit knowledge that cannot be filed as patents.

In the meantime, only a handful of studies look at the roles of industrial designs. For instance, Chiva and Alegre (2009) and Bidirici and Bohur (2015) find that designs contribute to better firm performances, whereas Thoma (2020) finds no mutually reinforcing effect between patents and designs. Whereas some studies look at the role of designs at firm level performance, few studies put that question in the context of national economic development, in particular at different stages of a country's development, with a few exceptions like Lee et al (2022).

In sum, this paper will provide a synthesized view on the dynamic and changing role of the four forms of IPRs in innovation and economic development in emerging economies, and it mainly draws upon the following studies involving this author, such as Kim et al (2012), Kang et al (2020ab), Lee and Kang (2023), and Lee et al (2022).

In what follows, the next section explains the meanings and definitions of the four IPR forms. Then, subsection three sections discuss the roles of patents and utility models (section 3), trademarks (section 4), and industrial designs (section 5), respectively. The final section provides a summary and concluding remarks.

2. THE FOUR FORMS OF IPRS: PATENTS, UTILITY MODELS, TRADEMARKS AND DESIGNS

2.1 Patents and Utility Models

Both patents and utility models are exclusive rights granted for an invention, which allow the rights holder to prevent others from commercially using the protected invention without his authorization for a limited period of time. However, beyond this basic definition, differences exist between invention patents and utility models, based on standards of inventiveness and legal requirements.

Patents are granted for inventions that are novel, non-obvious, and have industrial applicability. They are typically granted for 20 years duration from the date of application, cover products and processes, undergo substantive examination, and are costly to obtain (filing fees, attorney costs, and translation fees, where applicable). Utility models are second-tier protection for minor inventions, such as devices, tools and implements, particularly in the mechanical, optical, and electronic fields.[2] Processes or methods of production are typically excluded. The duration of protection is typically 6 - 10 years. Utility models are generally less expensive to apply for and do not require substantive examination (for novelty, non-obviousness, and industrial applicability). The inventive step required is small; the invention typically must exhibit a practical or functional advantage over existing prior art. Since the perceived threshold inventive step of utility models is much lower than that of patents, in practice utility models are sought for small, marginal innovations which may not meet the patentability criteria (Beneito, 2006).[3] Thus, utility models and patents differ in that they protect different types of innovations. Patents protect innovations of relatively high inventiveness and utility models protect those of relatively low inventiveness.

Not all countries that provide patent rights protect utility models, such as the U.S. and U.K. The few developed countries that protect utility models include Germany, Japan, and some European countries. Countries that protect them are largely developing economies (former or current), such as Korea, Taiwan, China, and Malaysia. In some cases, utility models are the dominant form of IPRs. For example, in China, utility models accounted for nearly two-thirds of the total intellectual property rights granted, while patents accounted for 10%, during 1985 - 1998. Even though the share of utility models in total IPRs has declined in China, they still account for about half at present.

Korea is also among those developing countries where utility models have been intensively exploited. In 1961 the Korean government revised its entire system of intellectual property laws and established its first autonomous IPR system, protecting both conventional and minor innovations. Since the technological capabilities of Korean firms had been lagging during the 1960s and 1970s, firms relied heavily upon on imported technologies and on reverse engineering and adapting them for local needs (L. Kim, 1997, Lee et al. 2003). This very exercise enabled them to learn from foreign technologies. Accordingly, Korean inventors actively filed for utility model protection for their incremental innovations (Lee and Kim, 2010); the number of utility model applications exceeded that of invention patents until the early 1990s in Korea. In the 1970s and the early 1980s, the ratio of utility models to patents was nearly two to three. This ratio began to decline after 1984 when the ratio peaked at over 6 that year. Although patent and utility model applications were both still rising, the composition began to shift.

Since the mid-1980s, Korea began to have valuable patentable assets of its own to protect, as much as foreign companies had such assets that they wanted protected within Korea. Major IPR reforms were legislated in the mid-1980s, and since 1987 there was an abrupt rise in the strength of patent protection and an enlarged scope of protection.

[2] See Bently and Sherman (2001) for a legal discussion of utility models.

[3] For example, utility models are granted to devices embodying a creative idea applicable to the shape, structure or other technological aspects of a product, such as an improved device capable of reducing the amount of water used to flush a toilet, or a bottle cork remover capable of operating faster than known devices. Those devices are not patentable but inventive enough for utility model protection.

Substance patents for pharmaceutical and chemical materials and products were newly introduced, as well as protection for computer software and materials. The term of patent protection was also extended from 12 years to 15. Finally, by 1995, patent applications exceeded the number of utility model applications. These trends correspond with the transformation of Korea from a nation with limited technological resources and capabilities to one of the leading patenting nations.

2.2 Trademarks

While both patents and utility models deal with technological or scientific invention or improvement, trademarks are more a market-based IPR than a technology-based IPR. Recently, trademarks have been recognized as another proxy measure of innovation, complementing or substituting patents (Allegrezza and Guard Rauchs 1999; Schmoch 2003; Mendonça et al. 2004; Bosworth and Rogers 2001; Malmberg 2005; Greenhalgh and Rogers 2007; Sandner and Block 2011; Mehrazeen et al. 2012; Flikkema et al., 2014; Block et al., 2015). Moreover, some researchers consider trademarks as a market strategy of innovative firms or ventures (Desyllas and Sako, 2013; Block et al., 2014).

Trademarks encourages firms not only to make good products and to adhere to a consistent level of quality, but to link new products and services in the market (Helmers and Rogers, 2010; Block et al., 2014). Moreover, trademarks are used also to protect and appropriate the value of innovations in sectors where patents are not a viable option (De Vries et al., 2017). Firms that regard know-how or secrecy to be an important protection method for innovative products are less likely to apply patents and these are types of tacit knowledge(Arundel and Kabla 1998). Thus, a product made with the use of tacit knowledge can be protected and distinguished from competitors in the market and can establish market power through the registrations of a trademark.

2.3 Designs

Design or industrial design is defined by the World Intellectual Property Organization (WIPO) as the ornamental or aesthetic aspect of an article, or more specifically as "the shape, pattern, colour, or any combination thereof in an article, which produces an aesthetic impression on the sense of sight."[4] Design has been identified as an important means of adding value to products and services and improve competitiveness (Rothwell and Gardiner, 1983). Designs increase a product's attractiveness and appeal to customers. Design has also been used as a means of communicating with customers through products (Verganti, 2009), and design management is a vital aspect of corporate strategy (Walsh, 1996). In addition, design is an important driver of innovation, acting as a bridge between technical and customer-oriented

functions (Kline and Rosenberg, 1986; Rothwell, 1992; Walsh, 1996). The appropriate design of a user-friendly feature may greatly increase the value of a product or service to customers. Like innovation, design activity can even influence future economic growth (Livesey & Moultrie, 2008). Design and quality do not necessarily match but unique appearance still increases

[4] This definition is from www.wipo.int/designs/en/. Thoma (2020) observes that the fact that a design patent is granted only after a substantive examination suggests that the design is novel and not obvious, as well as original and ornamental. In the US, design patent holders benefit from protection of 14 to 15 years.

customer value and profit. In other words, product differentiation is achieved through designs, which can even mitigate technological inferiority to a certain extent.

3. REGULAR PATENTS VS PETIT PATENTS FOR INNOVATION AND GROWTH IN LATECOMERS

While patents are the most common way of protection of IPR related to innovation, it is somewhat doubtful whether in developing countries patents are an effective instrument for appropriating the returns to innovation. In a well-known survey of U.S. firms, Cohen et al. (2000) find that firms patent for various purposes other than merely as a mechanism for appropriating returns. For example, possession of patent rights plays an important role in litigation (to deter threats of infringement suits or countersuits) and in cross-licensing negotiations, where firms can better gain access to rivals' technologies if they are able to reciprocate with their own patent rights. However, the survey finds that smaller firms or inventors are less able to utilize patents for those purposes and hence are dissuaded from availing themselves of patent protection. Litigation costs are especially onerous for small firms since they have lower levels of output over which to spread the overhead costs of legal protection (e.g. legal staff). Furthermore, smaller firms or inventors have fewer and perhaps less valuable technologies to offer in cross-licensing negotiations. The implication for developing economies is that to the extent that a large share of inventors there is small, patents would not be very effective instruments for appropriating returns or accessing technologies.[5] This may explain why developing economies do not engage as intensively in producing patentable innovations and why something like utility models may serve as a useful alternative outlet for emerging innovation.

Thus, from the strength of protection on economic growth at different stages, recent literature tends to shift the focus to the roles of diverse forms of IPR. This shift makes senses because innovation in many developing countries is of the adaptive, imitative type. The innovations they produce may not have the inventive step to merit a regular patent, but they may qualify for this second-tier industrial property right; namely, a utility model (or petty patent). Through adaptation, imitation, and incremental innovation, firms in developing economies can acquire knowledge and enjoy some learning-by-doing (Suthersanen, 2006).

In academic and policy debates, whether in the context of developed or developing countries, the focus has been on the appropriate strength of IPRs.[6] While the original TRIPS agreement does not deal with utility models, the World Intellectual Property Organization (WIPO) has recently considered the usefulness of utility model systems for lower income countries.[7] However, empirical evidence on the effects of utility models on innovation and growth, however, is scant and based largely on anecdotal evidence. Kumar (2002), for example, argues that in East Asia, utility models helped initiate a culture of patenting and innovation.

[5] Mazzoleni and Nelson (1998) also discuss how strong, broad patents in less developed countries, by creating entry barriers, could impede the development of indigenous manufacturing capabilities. This idea that latecomers do not always have always to develop high-level innovations is some contrast the argument of the vintage capital model technologies (Gilchrist and Williams 2001) that everybody target frontier technologies.
[6] See Commission on IPR (2002) and Correa (2000) for a review of policy discussions.
[7] See http://www.wipo.int/sme/en/ip_business/utility_models/utility_models.htm and http://www.wipo.int/sme/en/ip_business/acquire_protection.htm.

The World Bank (2002) documents case studies in Brazil where utility models allowed domestic producer to adapt foreign innovations to local needs and conditions. More formal econometric evidence is provided in Maskus and McDaniel (1999) which studies the use of utility models in Japan and finds that such protection on balance had positive impacts on the growth of Japanese total factor productivity.

It was first in Kim et al (2012) that investigates the different roles of patents and utility models in the innovation and economic growth of countries at different levels of economic development. The main findings of Kim et al (2012) is that the relative importance of patent rights and utility model protection to innovation and growth varies by level of technological development. They find that patent protection contributes to innovation and economic growth in developed countries but not in developing. This is consistent with the view that patent protection matters to industrial activities only after countries have achieved a threshold level of indigenous innovative capacity along with an extensive science and technology infrastructure (Kim, 1997; Lall and Albaladejo, 2001). In contrast, utility model protection weakly affects innovation and growth in developed countries but allows developing economies to build up their indigenous innovative capacities.

Also, in the part on the firm-level analysis using the data of Korean firms, Kim et al (2012) find that when firms are technologically lagging as before the 1990s in Korea, utility models (or minor inventions) contribute to firm growth and to their capacity to produce (future) patentable inventions. Once firms become more technologically advanced or since the 190s in Korea, their performance is driven less by utility model innovations and more by patentable innovations. Most importantly, the empirical analysis also shows that those firms which used to file utility model grow up to file regular patents with several year lags, which is in quite contrast to the conventional economic model assuming a fixed dichotomy of innovators vs imitators (Barro and Sala-i-Martin 1997; Eeckhout and Jovanovic 2002). This evidences also serve as a counter argument against a possible concern that a country's firms be locked into minor adaptations which are protected by utility models.

In developing markets, patents raise the cost of doing business and innovation. This cost tends to be more onerous for lower income economies. In contrast, a utility model system provides an alternative way for such economies to create incentives for innovation, albeit incremental, without affecting the cost of doing business adversely, and while providing the technological inputs appropriate for local needs.

4. THE ROLES OF TRADEMARKS IN LATECOMER'S DEVELOPMENT

4.1 Trademark-based Path for Latecomer Innovation and Development

This section asks whether there is an alternative or non-patent driven, path of technological development by latecomers. In seeking an answer to this question, this section pay attention to the role of trademarks. Actually, using the Korean data and experience, Kang et al. (2020) discusses two different paths of technological development, namely, patent-driven path vs. trademark-driven path. Kang et al. (2020) find that in some sectors like food, apparel, and pharmaceuticals, trademarks have been the dominant form of the IPRs with a much large number of their registrations than patents from the initial stage of development until recently in contrast to other sectors, like electronics and automobiles, where the main IPR form has

been patents during the 1990s and the 2000s. This division of sectors into one of the paths is largely determined by the nature of sectors or sectoral systems of innovation (Malerba 2002, 2004; Malerba and Mani (2009).

For instance, trademarks are more important when the innovation involves tacit knowledge that cannot be filed as patents, or when firms are more oriented toward domestic markets than world markets. Whereas trademarks may also represent innovations, they can be filed even without formal R&D activities targeting technological advances. Thus, one may reason that those sectors relying on trademarks than patents may be those lagging in terms of technological advances and thus more oriented toward domestic markets than international markets. We also note that patents tend to reflect more codifiable or explicit knowledge than tacit knowledge. Then, one may reason that those trademark sectors correspond to the sectors with their knowledge more tacit than codifiable, which was actually verified by empirical analysis in Kang et al. (2020).

To analyze sectoral differences in the dominant forms of IPR across sectors, Kang et al (2020) have constructed the firm -level data covering 1971-2010 in Korea. They find that trademarks are dominant throughout the whole period in some sectors, whereas in other sectors the dominant form of the IPR changes to the patent from the 1990s. These two groups, namely the trademark group and patent group are presented, respectively, in terms of the ratio of the number of patents to the number of trademarks.

The case of the patent-dominant group is consistent with the finding of Kim et al. (2012) which analyzed and compared the firm-level patent and utility model data divided into the different periods. However, they did not consider the impact of the sectoral heterogeneity in this relationship among IPR forms, sectors' knowledge base, and performance, and failed to consider the possibility of non-patent-driven path of latecomer firm development and catch-up. Kang et al (2020) considers both patents and trademarks, and classify the sectors by the registration patterns of patents and trademarks and investigate the differences between the groups.

They examine the dynamic patterns of the two groups, patent- and trademark-dominant groups, over the periods, to find the two stylized facts. First, at the beginning of Korea's industrial development, trademarks were the main IPR in almost all sectors as typical manufacturing firms registered trademarks more than other IPRs until 1980s. This is consistent with the fact that until the late 1980s in-house R&D of firms were very low or be just starting and thus had no technological innovations to file patents (Chung and Lee 2015). Second, the division of the two groups appeared only after the mid-1990 (i.e., after a certain level of technological development was achieved). Even after the mid 1990s, the firms in the trademark group continue to register trademarks more than patents. However, this does not necessarily mean that the firms in this group did not do any R&D but may reflect the fact that the R&D outcomes might not be patentable as they involve more tacit knowledge, reflecting the knowledge base of the sectors. These facts are consistent with the interpretation that the registrations of trademarks and patents are related to the both different sectoral knowledge bases and the different levels of technological capabilities of the firms in the different sectors. Regressions in their study confirm that the trademark groups are those sectors involving more tacit knowledge and domestic market orientation associated with slow progress in technological capabilities. These results imply that firms facing slow technological progress in

mostly tacit knowledge-based sectors have tended to rely on trademarks in their growth based on domestic market than export markets. The results are important because it implies the existence of alternative path of economic development by the latecomer firms in different sectors, beside the patent-driven path which is already verified in Kim et al. (2012).

4.2 Roles of Trademarks in the Firms' Upgrading to OBM

In the context of upgrading and catching up by latecomer firms from emerging countries, registration of trademarks may represent firms' effort to establish firms' own brands by switching to the OBM (own brand manufacturing), compared to the earlier or low-value-added mode of the so-called OEM (own equipment manufacturing). OEM is a specific form of subcontracting using a vender's exact description of the product and the products are sold using the buyer's own distribution channels and brand name (Hobday 2003). Given that marketing and branding bring in more value-added and profit margins, upgrading from OEM to OBM is considered a desired but challenging path of upgrading for firms in emerging countries (Lee et al 2015).

Korea represents a successful catching development relying on knowledge and innovation, given its poor endowment of natural resources. Lee (2013: 25) suggested a capability-based view of the Korean and Asian economic development, which is an extension of the technology-based view (OECD 1992; Hobday 1995; Kim 1997). From this point of view, one core element of the Korean model is its emphasis on firms' building capabilities and technological development, which enabled the economy to achieve continuous upgrading within the same industries as well as to advance successive entries into new promising industries (Lee 2013).
In Korea, firms have strengthened their capabilities through diverse channels, including licensing, OEM, foreign direct investment (FDI), strategic alliance, and co-development. Among these, the primary channel of learning is technical guidance from foreign OEM buyers or learning by working in FDI firms (Lee 2013). OEM systems are the most cost-effective methods for obtaining capabilities in manufacturing production at the lowest stage of technological development (Ernst and O'Connor 1989; Ernst 1998). OEM facilitates technological learning and knowledge transfer because in that process OEM firms product according to precise specifications, and vendors provide specific guidance and teaching (Romijn 1999; Amsden 1989). This learning process leads to standard levels of skill and productivity (Hobday 1994; Kim and Lee 2002). In the 1960s, the 1970s, and even the 1980s, most of the firms in Korea were under the technical guidance and learning from foreign OEM buyers, which enabled firms to generate income and also to learn and build know-how and some technological capability. While the OME mode worked fine at some stage, it also comes with certain long-term limitations.

As noted in Lee and Mathews (2012), because any success with OEM at the lower tier of GVC tends to cause wage rates to rise accordingly, profit margin of OEM business tends to decline. At the same time, new cheaper labor sites in "next-tier down" countries can emerge to replace a concerned country's position in the GVCs. For instance, while there used to be more than 500 OEM firms in plush toy making in Korea, most of them have had to move their factories abroad due to the rising domestic rates or to close down factories in Korea (Lee et al 2015). In the case of footwear sector in southern Brazil, it had to face a sudden setback due to the rise of China as a alternative site offering cheaper wage rates since the mid 2010s (Lee et al 2018).

The above situation forces firms to move up to higher value-added activities (Lee et al. 2018). Thus, in the debate on upgrading within GVC, particularly functional upgrading, the three stages of OEM-ODM-OBM have often been the key framework of understanding (Hobday, 2003). Own Design Manufacturing (ODM) is the second step of catch-up where manufacturers can depart from simple jobs, such as assembling, and begin involvement in production design. Own Brand Manufacturing (OBM) is the last step, and refers to when these manufacturers perform independently all functions of production, design, marketing, channel management, and R&D. Despite its intrinsic merit, this kind of upgrading transition, especially to the one OBM, involves several risks and costs. Most of all, there are often interference or even counterattacks from flagship firms in existing GVC or incumbents against the SMEs trying OBM. For instance, in the case of consumer goods, former vendor companies (brand owners) often stop giving OEM orders to destroy the company that has begun to sell their competing brands (Lee et al., 2015). In the case of capital goods, incumbent companies suddenly charge predatory prices in the market once they realize that latecomer firms have become successful in developing their products, which poses the threat of competition against products of the incumbent. In certain cases, the incumbent reacts by filing lawsuits against the latecomers, and claiming that the latter copied their products (Shin et al. 2016).

This complex and uncertain nature of costs, risks and benefits of OEM versus OBM could be considered as a dilemma. According to Hobday et al. (2004), some Korean firms indeed found themselves in the 'innovation dilemma', debating whether to continue relying on the global leaders for their brands and marketing channels, or to try to compete with them in international stage by deploying in-house R&D to develop their own leading-edge products and brands. Some of the largest and more advanced producers, such as Samsung and Hyundai Motors, have gradually made a transition to OBM. In contrast, some companies emphasize OEM even though they have the ability to make their own products; for instance, Youngwon Corporation is a famous maker in leisure products, like outdoor wear and backpacks, which have kept the OEM mode until now. They produce and supply high quality garments like North Face, NIKE, and POLO, etc. In other words, if the profits from OEM are acceptable to firms, the decision of converting to OBM would be delayed for them.

Overall, transition toward OBM is not a binary event, as many firms mix both modes of OEM and OBM in diverse degrees and over time. So, transition itself is a gradual process, if not stopped or failed in the middle. In general, the profits from a pure OEM have gradually decreased since the late1980s or the 1990s because the entrance of other OEM firms in other countries. Since then, some firms have tried to convert to OBM and tried to use trademark to protect their own products in the market.
Although there does exist some empirical research on the role of trademarks in firm performance in diverse countries, such as Sandner and Block (2011) and Mehrazeen et al. (2012), none of them address this question of trademark registration interpreted as representing upgrading effort by latecomer firms toward OBM from OEM. Transition to OBM can be identified if firms start filing more trademarks and then one can find out the linkage from trademark registration to firm growth. Kang and Lee (2023) is one of the first studies that tried to find out performance (sales growth) impact of e a transition toward OBM.

Kang and Lee (2023) verifies the linkages from trademark registration to firm growth along the different stags of development and over the two groups of sectors, using the Korean firm data. Extending the identification of two groups, such as patent vs. trademark domiant group, by

Kang et al (2022), Kang and Lee (2023) confirms the fact that growth paths of firms can also be different in the two groups. In the trademark group, trademarks had served as an useful device for firms growth at earlier stage of development with low level of technologies, and then these firms have become able to execute more technological innovations and to file more patents, which have finally become associated with firm growth at later period. In the patent dominant group, utility models have served as an useful device for firms growth at earlier stage of development, and with technological advance of these firms their sales growth have become positively associated with both patents and trademarks, the latter of which represent the effects of their brand power or completing of transition to OBM.

5. THE ROLES OF INDUSTRIAL DESIGNS IN EXPORTS AND FIRM GROWTH

Whereas some studies look at the role of designs at firm level performance, few studies put that question in the context of national economic development, in particular at different stages of a country's development. Design might not be that important when a national economy is underdeveloped because growth relies on the mass production of low-cost goods by low-wage workers. However, the relative importance of design rises with economic development at later stage when not only prices but also quality matter. Although design and quality do not necessarily match, a certain degree of product differentiation can be achieved through industrial design, and unique appearance still increases customer values and thus could help firms' sales performance (Chiva and Alegre 2009; Bidirici and Bohur 2015).

Especially in emerging country context, the role of designs can be important in helping firms go for export markets. Moreover, technological inferiority can be mitigated by design, which is important for latecomer firms which are often weak in technological capability but have to export in world market. International competitiveness can be upgraded further through product differentiation and high quality, which, in turn, can be upgraded through technological innovation and design enhancement, implying a possibility of mutually reinforcing effect between patents and designs. Therefore, we may also explore whether designs matter more in export-oriented sectors than in other sectors, and whether they complement patents or not. Lee et al (2022) investigate these hypotheses using long-term Korean firm-level IPR data.

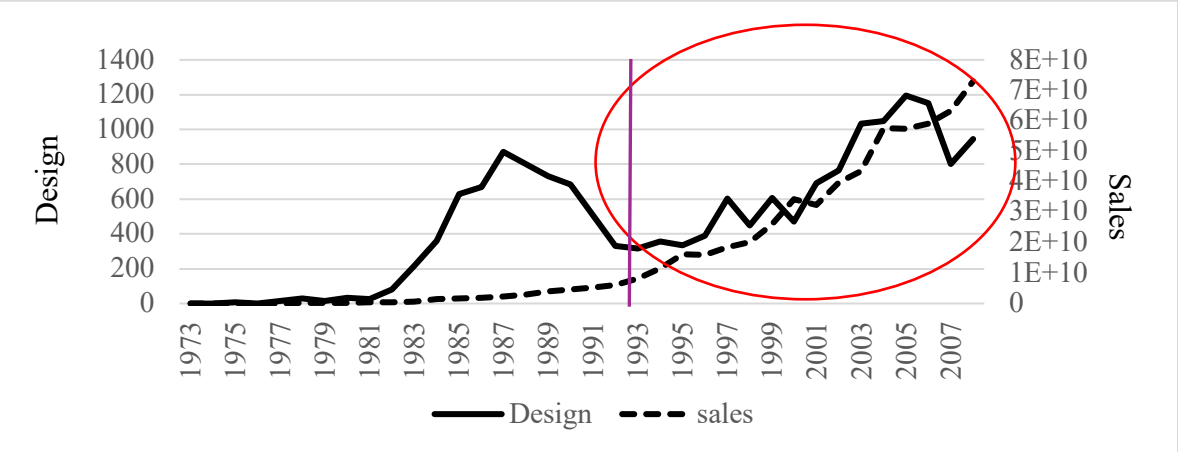
The close correlation between increasing per capita GDP and attention to design is evident in, for example, the rapid growth of the design industry in Japan since the early 1980s when per capita income reached US$10,000 (Chung, 2003). More generally, design assumes growing importance for firm performance in the advanced stages of economic development. In Korea, as in Japan, design has played a larger role since the mid-1990s when GDP reached $10,000 (Chung, 2003). The Korean experience is informative and interesting because the country transformed itself from a typical developing country that relied on imported foreign technology to a global exporter and innovation leader within one generation.

Since 1993 Korea has continuously pursued five-year plans to foster industrial design. In fact, the Korean government has sought to substantially expand the level of investments in design toward the level of investments in technology. Industrial design receives a lot of central government support because it is directly related to export competitiveness. In this connection, the Ministry of Trade, Industry, and Energy; the Ministry of Economy and Finance; and the

Ministry of Small-Medium Enterprises and Startups all emphasize the importance of design and cultural storytelling in promoting exports.[8]

In Korea, concrete examples of the close relationship between product competitiveness and industrial design can be found in the electronics, rubber, and plastic industries. Samsung Electronics, Korea's largest chaebol and one of the world's most well-known brands, promoted Samsung Design, its design center, from a small unit to a company-wide R&D organization in 1981.[9] The company launched a new management initiative highlighting the central importance of design in 1993. Kun-Hee Lee, Samsung's then-CEO, announced a complete corporate restructuring of Samsung via his Frankfurt Declaration which spelled out a new management initiative. He pointed out that good design is critically lacking in Samsung's products and prevented them from becoming world-class. Samsung declared 1996 to be the year of the design revolution and undertook a concerted campaign to build a unique design identity. Since then, Samsung has grown to become a global brand and a global company. Figure 1 shows the parallel rise of Samsung's design registrations and total sales since 1993, and Samsung's exports far exceed its domestic sales after 1996 (Lee et al 2022). Samsung Electronics received a staggering 61 prizes at the International Forum Design Award in 2020. Recently, in their battle for global supremacy in the mobile phone market, Apple sued Samsung for alleged copying of designs rather than regular patents, highlighting the importance of design in corporate competitiveness.

[Figure 1] Design registration and sales growth of Samsung



Source: Lee et al. (2022)

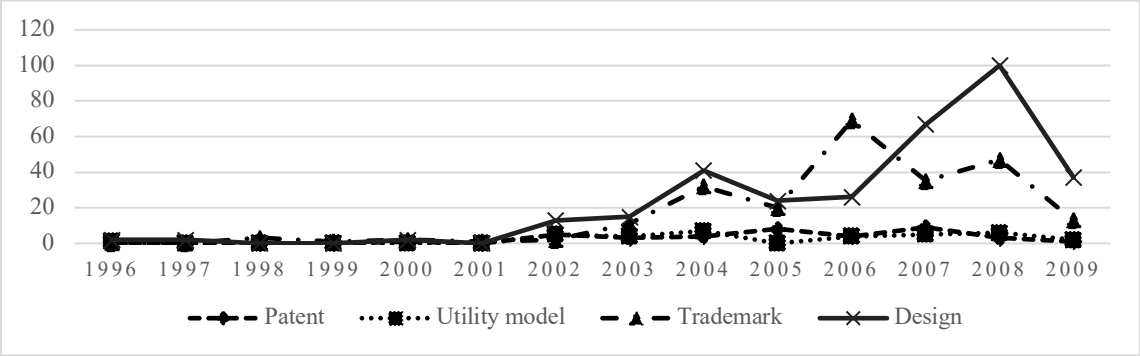
Designs are important not only for big businesses but also for SMEs (small and medium sized enterprises). LocknLock, a rubber and plastic-making SME founded in 1978, aimed to become a global leader in household products. After failing in original equipment manufacturing (OEM), LocknLock abandoned its old items. Instead the SME produced new items and pursued its own branding strategy, and eventually entered the US home shopping market where it achieved great success in exports (Lee et al., 2015). A unique design with a four-sided sealed container was a key ingredient of its export success.

Design has been the leading IPR of the company, which is armed with unique designs and high

[8] http://english.moef.go.kr/pc/selectTbPressCenterDtl.do?boardCd=N0001&seq=4697
[9] http://www.design.samsung.com/global/contents/design-history/index.html

quality, since 2000 (Figure 2). Superior design enabled LocknLock to overtake leading global brands operating in the Korean market - e.g., Tupperware - and to gain a sizable foothold in the global market. LocknLock's exports surpassed its domestic sales since 2005 (Lee et al 2022). This firm also won prizes at the Red Dot Design Awards in 2008 and 2011, and the International Forum Design Awards in 2018.

[Figure 2] Registration of 4IPRs LocknLock, a Korean SME



Source: Lee et al. (2022)

In general, design is analyzed quantitatively with survey data from the perspectives of art, management, and thought (Ahire and Dreyfus, 2000; Colombo et al., 2012). Chiva and Alegre (2009) analyze design investment and firm performance based on a survey of 182 Italian and Spanish ceramic tile company managers and find that design management enhances firm performance. Analysis of the performance of design-intensive firms supported by the Korean government show that business experience, firm size, and performance are positively related to government design support (Lee and Lee, 2008).

Bidirici and Bohur (2015) analyze the relationship between design and firm performance using a dataset of large Turkish firms. The study concludes that Turkish firms should prioritize design to create more value and grow. A UK study performed regression analysis on the relationship between productivity and holding designs in OHIM (Office for Harmonization in the Internal Market) and/or UKIPO (UK Intellectual Property Office). It finds that that design registrations cause systematic differences in firm performance from 2004 to 2010 (UKIPO, 2011).

However, no existing study performs regression analysis on design registrations and firm performance using long-term panel data. An exception is Lee et al (2022) which explores the changing roles of designs at different stages of development. They explores the hypothesis that a higher design intensity can affect firm performance in later stages of development.

Testing this hypothesis requires identifying different stages of development. Lee et al (2022) divided the sample period of the data, from 1970 to 2010 into three sub-periods, 1971–1986, 1987–1998, and 1999–2010. These sub-periods are chosen on the basis of major structural shifts in modern Korean economic history. Since the mid-1980s, in-house corporate R&D became more prevalent the private sector and joint public-private joint R&D projects grew rapidly (Lee et al, 2015). Since1987, the patent law, including that of substance patent, was revised substantially. Following the classification of Kim et al. (2012), we choose 1986 as the end year of the first sub-period. The second sub-period ends in 1998, immediately after the Asian financial crisis. Since the extensive structural and policy reforms implemented in the wake of the crisis turned Korea into a more innovative economy, 1998 is an obvious breaking point.

Firm performance is proxied by sales growth, which makes the results comparable to those in Kim et al (2012) about the changing roles of patents and utility models. Using this proxy allows us to frame the results in the context of the resource-based theory of the firms (Penrose 1952/1995) and related empirical papers on developing countries, such as Lee and Temesgen (2009).

The analysis by Lee et al (2022) of Korean data confirms that different IPR forms matter differently for firm performance at different stages of a country's economic development. First, they find that industrial designs tend to be filed by more export-oriented sectors at a later stage of development when they contribute to sales increases. Then, they also find that design matters significantly for firms' sales growth during later stage of development but not at early stages. Specifically, such association is found only since the 1990s, but not during the earlier stage of Korea's development when utility models were more prominent. In the meantime, the complementary effects between patents and designs are not robust, with results varying from sample to sample. This is consistent with Thoma (2020) although in a slightly different context.

6. SUMMARY AND CONCLUDING REMARKS

This paper argues that different types of IPRs are differentially important for innovation and firm growth at different stages of economic development, and that innovation policy should be tailored to take into account not only different stages of development and capabilities, but also sectoral heterogeneity. Different types of IPR are more appropriate for countries at different stages of economic development. Strong or weak IPR protection is not the key issue for developing countries, and what matters for them to realize innovation and growth is not only the strength of IPRs but also the type of protection. The cross-country analyses and the experience of Korean firms suggest that the design and strength of intellectual property systems should be tailored to the indigenous technological capabilities of firms in order to best provide the appropriate incentives for innovation. The main findings of the recent literature on IPR and development can be summarized as follows.

First, the relative importance of patent and utility model protection for innovation and growth varies with the level of technological development. While patent protection contributes to innovation and economic growth in developed countries but not in developing countries, utility model protection is more appropriate for developing countries because it recognizes minor or adaptive innovations and helps build indigenous innovation capacity. In developing countries, patents increase the cost of doing business and innovating. These costs tend to be more burdensome for low-income economies. In contrast, a utility model system provides an alternative way for such economies to incentivize innovation, albeit incrementally, without adversely affecting the cost of doing business and while providing the technological inputs appropriate to local needs.

Second, trademarks are a more appropriate form of IPR when the innovation involves tacit rather than codifiable knowledge that cannot be patented. Trademarks also represent innovation and can be registered even in the absence of formal R&D activities aimed at technological progress. If we consider the sectoral heterogeneity in this relationship between IPR forms, sectoral knowledge base and performance, we can see that there may be a not patent- but trademark-driven path of latecomer firm development and catch-up. The Korean experience shows that those sectors that rely on trademarks rather than patents may be those

that lag behind in technological progress and thus are more oriented to domestic markets than to international markets, or those sectors that involve more tacit knowledge.

Third, design may not be important when an economy is at a low level of development because growth relies on mass production of low-cost goods by low-wage workers. However, the relative importance of design increases with economic development at later stages, when not only price but also quality matters, as in export markets. Design and quality do not necessarily coincide, and design can mitigate technological inferiority. Thus, industrial design is important for latecomer firms, which are often technologically weak but need to export to the world market.

The empirical analysis surved in this paper shows that at the early stage of development, firms' sales growth is associated with utility models in the patent-driven path and with trademarks in the trademark-driven group. It is also confirmed that trademark-oriented industries tend to focus on the domestic market, while design-oriented industries tend to focus on global markets. In the later stage, not only patents but also designs and trademarks become important, especially for firms that go beyond the domestic market and target the global market.

In sum, the key lessons for emerging or catching economies are that conventional patents are not the only form of IPR that can effectively promote innovation, and that in the early stages of development and in certain sectors, other IPRs such as trademarks and utility models can be an effective form of IPR to detect and promote imitation and/or innovation. Successfully competing in global markets ultimately requires all of the patents, trademarks and designs. The overall conclusion is that in developing countries, a nuanced approach to innovation policy, taking into account the country's stage of development and sectoral diversity, works better.

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