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GREAT EXPECTATIONS:

LEARNING THE BOUNDARIES OF DESIGN RIGHTS

Jussi Heikkilä[1] & Mirva Peltoniemi[2]

Abstract

We present a case study of an increase in design right filings and concurrent design right litigations in an industry that previously had little experience of design right protection. The motives for and outcomes of filing, and how these changed over time are discussed. We go on to explore the events, which offered the decision makers opportunities to update their beliefs about the scope of design right protection. We find that filing motives changed from specific protection goals to freedom to operate over time. We also find that the actors faced several, but sometimes contradictory, learning opportunities. There are two types of learning relating to the usage of design rights: 1) learning the initial scope of protection and 2) learning the dynamism of scope that results from the growing number of designs in the product category. The evidence suggests that the scope of existing design rights is negatively affected by new design right grants. Our findings highlight the essential role of belief formation and updating in innovation activity and intellectual property rights-based competition. We conclude that uncertain design rights and information asymmetries may have fostered entrepreneurial optimism.

Keywords: intellectual property right, design right, uncertainty, beliefs, learning

JEL classification: O31, O32, O33, O34, L24

Highlights

- We investigate design right filings and litigations in an industry.
- Increased filings explained by new product category, blocking and FTO.
- Learning events comprise patent office's decisions and court rulings.
- Motives to file change as actors update their beliefs about scope of design rights.
- Uncertain IPRs and information asymmetries may foster entrepreneurial optimism.

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1 Introduction

Intellectual property right (IPR) offices around the world provide a menu of alternative IPR protection methods for inventors. Patents, trademarks and design rights are the three most important IPR categories (WIPO, 2004). The aim of each of these IPRs is, first and foremost, to promote innovation and IPR-based competition. Patents promote technological progress, which is the driver of increasing productivity and economic growth. Trademarks enable consumers to distinguish between different brands. Design rights, in contrast, promote aesthetic innovations and product differentiation. IPR-based competition fosters creative destruction that eventually increases productivity in industries. Patents and design rights also foster efficient division of innovative labor by creating markets for inventions, designs and technology, in which inventors and designers may sell or license their IPRs to firms that are most capable in commercializing them.

The majority of empirical IPR literature has focused on patents and trademarks while design rights have remained a less investigated form of IPR. Recently, design rights have attracted increasing practitioner interest, but academic research on their usage and strategic role has remained scarce (Filippetti and D'Ippolito, 2017; Filitz et al., 2015). Accumulated empirical evidence regarding the functioning of design right systems is scant (Du Mont and Janis, 2013). On the one hand, anecdotal evidence and surveys suggest that many entrepreneurs and firms consider design rights too weak to play a role in appropriating returns from innovation (Filippetti and D'Ippolito, 2017; Filitz et al., 2015). On the other hand, in some industries firms have adopted an 'all you can file' strategy (Filitz et al., 2015), and also increases in filings and litigations among leading firms have been documented (WIPO, 2017). Such descriptive accounts identify the phenomenon of entrepreneurs and firms

making decisions on when to file for design rights and whether to sue competitors for infringement, but so far, these decision-making processes and related dynamic interaction have not been studied in detail. How do motives to file change over time as an industry begins to actively use design rights? Through what kinds of events can firms gain new information concerning the scope of design right protection? By exploring these questions, we aim to shed light on the characteristics of the design right institution that affect firm behavior and learning, and hence the dynamics of innovation and competition.

In order to answer our research questions, we perform a case study of the Finnish sauna[3] heater industry where we observe a sudden increase in design right[4] filings between 2008 and 2013. Figure 1 displays the aggregate filings of design rights at the Finnish patent office and the increase in filings in product category "sauna heaters". Moreover, the jump was accompanied by litigations where the scope of protection was tested. Litigations signal that there was uncertainty and/or conflicting beliefs concerning the scope of protection offered by design rights (cf. Bebchuk, 1984; Priest and Klein, 1984; Somaya, 2003; Waldfogel, 1998). This revelatory case study aims to increase our understanding on how agents can learn the boundaries of design rights.

[FIGURE 1 HERE]

The Finnish sauna heater market is particularly suitable for our research mission since we are able to identify all the firms active in the industry during the industry-wide change in filing activity. They are also subject to the same institutional environment because the

[3] Oxford dictionary defines sauna as "A small room used as a hot-air or steam bath for cleaning and refreshing the body". Source: http://www.oxforddictionaries.com/definition/english/sauna

[4] Design rights are also referred to as "industrial design rights". The design patent system in the U.S. is an equivalent institution. For clarity, we use the term "design right" throughout the paper.

Finnish market is their main operating area. Finland has advanced IPR institutions (patent, trademark and design right systems combined with a trusted legal system), which are actively used by sauna-heater producers. Hence, this research site enables us to explore IPR-related strategic interaction between competing firms and to shed light on their evolving beliefs about the effectiveness of design rights.

Our contribution to existing literature is threefold. To our knowledge, this is the first study 1) to document how motives to use design rights evolve dynamically over time, 2) to systematically identify the events (incl. litigations and interaction with patent office) through which decision makers in the industry may update their beliefs regarding the scope of design right protection and 3) to provide suggestive evidence that the scope of design right protection decreases as more design rights are filed in a product category. By focusing on a specific market, in which firms truly compete with each other for the same customers and share a knowledge base, it is possible to shed light on the underlying strategic interaction, innovation dynamics, and learning processes (cf. Klepper et al., 2015; Malerba, 2002; Malerba, 2006).

The paper is structured as follows. In section 2 we review the literature on design rights, motives to use design rights and probabilistic nature of IPRs. Section 3 presents the empirical context and section 4 our research methods. Section 5 details the sequence of events relating to the case and in section 6 we discuss our observations. Section 7 concludes.

2 Literature review

2.1 Design rights

A design right protects the appearance of a product, and the scope of protection is defined by the drawings or photographs in registered documents (WIPO, 2004, p. 375). The owner of a design right has the right to exclude others from the commercial use of the protected design. In most jurisdictions, a design right is considered to be infringed if a hypothetical informed user ("ordinary observer" in the U.S.) cannot distinguish between the protected design and an allegedly infringing party's product. A challenge related to design rights has been the fragmentation and poor quality of design databases although the availability of electronic databases has improved over time (Blackman, 1996; van Dulken, 2002).

National systems for design protection differ significantly (Blackman, 1996; Janis and Du Mont, 2012; Rahman, 2014; Schickl, 2013; Yoshioka-Kobayashi et al., 2018). The majority of the literature on design rights focuses on U.S. design patent system (e.g. Chan et al., 2017; Crouch, 2010) while other national design right systems have received limited attention. There remain also significant national differences across EU member states despite largely harmonized design laws (Schickl, 2013). To complicate matters more, design right systems are still evolving. For instance, Egyptian Goddess v. Swisa decision by the U.S. Court of Appeals for the Federal Circuit in 2008 eliminated "point of novelty" test and adopted the "ordinary observer" test as the sole test for assessing design patent infringements thus approximating U.S. and EU design protection regimes (Schickl, 2013).

Design rights are used, in particular, in consumer goods industries (Gallié and Legros, 2012). Several surveys have found design rights to play only a minor or moderate role in

appropriating returns from innovations (Arundel, 2001; Blind et al., 2006; Filippetti and D'Ippolito, 2017; Galindo-Rueda and Millot, 2015; Lim et al., 2014; Moultrie and Livesey, 2011). In Arundel's (2001) sample of innovative firms only 3% reported registered designs to be the most important method to appropriate returns from innovation. Galindo-Rueda and Millot (2015) found that design rights were the least used type of IP among the 20 largest IP applicants in Europe and, similarly, Blind et al. (2006) reported design rights to be the least important protection method among patenting German firms. Galindo-Rueda and Millot (2015) also point out that the reason for the relatively rare use of design rights may be high cost in relation to benefits achieved or the narrowness of the scope of protection. Moultrie and Livesey (2011) report that in the UK the majority of firms perceived registered designs to be difficult to defend and believed design rights to have low value as tradable assets. Lim et al. (2014) conducted in-depth interviews with design companies and concluded that design rights are of little relevance in the market for designs: the interviewees were aware of the design right system but had made informed decisions not to actively use design rights.

The study by Filitz et al. (2015) offers some indication that, despite their weaknesses, design rights are becoming more important for firms in forming competitive positions. They point out that the active filing of European registered community designs and recent court cases (e.g., Apple vs. Samsung) suggest that firms regard design rights important in being competitive. Also Orozco (2009) presents Apple as an exemplar that has successfully utilized design rights in combination with other IPRs. Filitz et al. (2015), moreover, document different design right strategies within and between industries: some firms register design rights selectively while others apply an "all-you-can-file" strategy. In

addition to industry-specificity, experience in design right filings has been found to be associated with future filing activity (Fjaellegaard et al., 2015). Their analysis of Danish linked employer-employee data also indicates that hiring a designer is associated with the firm's higher likelihood of future design right filings. Filippetti & D'Ippolito (2017) interviewed 20 design consultants and firms in Italy and found that design rights are employed to establish ownership in the market. However, design rights are not considered to be very effective because "barriers to imitation are very low and 'inventing around' is easier when form plays a more prominent role compared to technology" (Filippetti and D'Ippolito, 2017, p. 614). Yoshioka-Kobayashi et al. (2018) document that firms use design rights to protect their award-winning products.

Even though the evidence on the effectiveness of design rights is mixed and inconclusive, recent filing activity by highly successful firms and the emergence of specific filing strategies suggest that design rights can be important vehicles of appropriability and strategy. Yet, the courses of events leading to changes in filing-related actions and motives at firm- and industry-levels remain unclear.

2.2 Motives, probabilistic IPRs and subjective beliefs

Motives to use patents have received plenty of research attention and many strategic filing motives have been documented (e.g. Blind et al., 2006; Torrisi et al., 2016). To what extent do motives to use design rights correspond to motives to patent? Table 1 lists the most common motives and comments on their transferability to the context of design rights.

[TABLE 1 ABOUT HERE]

Filitz et al. (2015) confirm that strategic use of design rights is also prevalent in certain industries: their interviews revealed that in footwear industry "some firms wittingly file invalid design rights to prevent infringement suits from third parties and/or to improve bargaining power over retailers" (p. 1200). Therefore, FTO and reputation are identified as motives to file also with design rights. Orozco (2009) argues that the relatively low cost and ease of prosecution induces experienced firms to seek multiple design patents to block rivals from entering their design space. He cites Apple's strategy to protect iPod with various design patents as an example of this behaviour. This can be seen as a form of pre-emption (cf. Gilbert and Newbery, 1982; Grimpe and Hussinger, 2014; Guellec et al., 2012). However, the relative weakness of design rights may make them less powerful in blocking rivals from a design space diminishing their value as bargaining chips.

IPR protection is inherently imperfect and probabilistic (Ayres and Klemperer, 1999; Farrell and Shapiro, 2008; Lemley and Shapiro, 2005). This means that inventors are vulnerable to expropriation (Gans and Stern, 2003; Teece, 1986). Weak IPRs may, therefore, reduce the incentives to innovate and hinder the formation of markets for inventions through licensing (Arora and Ceccagnoli, 2006; Gans et al., 2008; Spulber, 2013; Teece, 2018). Generally, our understanding of the behavioural effects of probabilistic IPRs is limited. For instance, how do those decision-makers, who contemplate using IPR systems for the first time, form beliefs and learn (i.e., update their beliefs) about the scope of protection provided by a particular IPR? Is it realistic to assume that agents have the same unbiased expectations and common knowledge of the scope and strength of IPRs? Our case provides a particularly fruitful context to investigate this phenomenon.

Differing beliefs regarding the scope of IPR protection may arise due to different prior experiences, asymmetric information, or cognitive biases (Bebchuk, 1984; Crouch, 2008; Gans et al., 2008; Meurer, 1989; Priest and Klein, 1984; Somaya, 2003; Waldfogel, 1998). Laboratory experiments suggest that decision-makers often are subject to self-serving biases meaning that they interpret new information favourably for themselves (Babcock and Loewenstein, 1997; Miettinen et al., 2012; Van den Steen, 2004). Moreover, confirmation bias may make it difficult to change current views despite receiving conflicting information (Rabin and Schrag, 1999). As a result, a decision-maker with a firm belief in the scope of protection offered by her IPR portfolio has the tendency to read court rulings in a manner that strengthens rather than weakens her beliefs.[5]

In the markets, firms learn collectively from each other's innovations and R&D activities, and form beliefs about the most promising technological trajectories in order to allocate R&D investments. What is missing from previous studies is the analysis of IPR-related belief formation and learning. In our empirical case, we track design right-related actions, motives and learning events as an industry begins to actively use design rights. This allows us to see whether and how different filing motives play a role over time. By uncovering the learning events we can analyse how and why the beliefs changed potentially resulting in changes in behaviour.

[5] Table A.1 in the Online Appendix summarizes the factors that are associated with increased probability of litigation and distinguishes between rational and behavioural views.

3 Empirical context

3.1 Finnish IPR environment and design right system

Finland introduced its national design right system in 1971 to fill the gap between copyright and patent protection. According to the committee that drafted the design right law in 1967, design right provides designers exclusive rights, which guarantee a reasonable return for her labour and provides producers an opportunity to obtain returns from their investments on design.

Finland became a member of the European Union in 1995 and has since implemented IPR law directives including the design right directive (since 1st Aug 2002). The directive also changed slightly the protection requirements by introducing the concept of "informed user" to the assessment of individual character. According to the directive "The scope of the protection conferred by a design right shall include any design which does not produce on the informed user a different overall impression." The directive extended the maximum term of protection from 15 to 25 years and extended the scope of protection by eliminating the product class-specificity of protection. Moreover, the amended design right law introduced a grace period — that is, the option to file for design right protection within 12 months after the design has been publicly disclosed. On April 1st 2003, EU's Office for harmonization in the internal market (OHIM) began to register EU-wide community designs (Filitz et al., 2015), which has led to a shift from national design right applications to registered community design right applications.

According to the Finnish Design Protection Act, a design right provides an exclusive right to a design that is new and has individual character. Finnish patent office examines the

applications before registering designs. The boundaries — that is, novelty and individual character of design rights are defined as follows (2 §):

"A design shall be considered new if no identical design has been made available to the public before the date of filing of the application for registration or, if priority is claimed, the date of priority.

A design shall be deemed to be identical if their features differ only in immaterial details.

A design shall be considered to have individual character if the overall impression it produces on the informed user differs from the overall impression produced on such a user by any design which has been made available before the date of filing of the application for registration or, if priority is claimed, the date of priority. In assessing individual character, the degree of freedom of the designer in developing the design shall be taken into consideration."

Haarmann (2012) points out that when an applicant is granted a design right, she can be relatively certain that the granted design right does not infringe other designs. However, the Finnish design right system has been criticized for assigning only narrow protection: The users of the system consider the enforcement of design rights to be challenging and, thus, design right holders sometimes forego suing infringers (Oesch et al., 2005; Puustinen, 2001). Generally, design right is considered to provide protection only against exact copying of designs (IPR strategy of Finland, 2008; Puustinen, 2001). The government bill on implementing the design directive acknowledged that compared to patents and trademarks, design rights are a relatively little used protection method in Finland.

3.2 Finnish sauna, sauna heaters and their design

Sauna is an integral part of both the traditional and contemporary Finnish culture (Särkikoski, 2012; Tommila, 1996). According to Statistics Finland, there are more than 2 million saunas in Finland. The heart of sauna is the heater ("kiuas" in Finnish, see Helamaa, 1999; Tommila, 1996). The interviewed sauna-heater producers (see Table A.2 in the Online Appendix) estimated that around 200 000 new heaters are sold annually in the Finnish market.

Sauna heaters are durable goods with lifetimes of 5-20 years. There are several different types of heaters and their technical features and energy efficiency have been subject to continuous development for over 100 years (Helamaa, 1999; Särkikoski, 2012; Tommila, 1996). Generally, wood-burning sauna heaters (stoves) are popular in summer cottages whereas urban apartments and houses often have convenient electric sauna heaters. For the sake of simplicity and consistency, we refer to both electric and wood-burning sauna heaters as "sauna heaters".

According to patent databases, the first Finnish sauna-heater-related patent dates back to 1906 (Patent no. 2556). When the design right system was introduced in Finland in 1971, the first design registration was a sauna heater. Figure 2 demonstrates how the IPR activity among sauna-heater producers has evolved since 1970s. There is a clear shift from patent and utility model (UM) applications (technical inventions) towards design right applications after 2008.[6]

[FIGURE 2 HERE]

4 Methods

4.1 Case selection and generalizability

We chose the case of the Finnish sauna heater industry because it is a revelatory case of an industry that previously had limited experience of design rights and that collectively learned the scope of design protection via increased design right filings and design right

[6] A utility model is a protection method for small technical inventions (see e.g., Beneito, 2006; Heikkilä and Lorenz, 2017). Trademark filings are not reported here. However, the Finnish trademark database shows that the industry started to actively protect brands already in 1950s and 1960s: Muko (1955), Misa (1964), Kastor (1965), Narvi (1967) and Tylö (1968). Source: PRH, Trademark database.

litigations. This means that the case was not chosen for representativeness, but on the basis of theoretical sampling where "cases are selected because they are particularly suitable for illuminating and extending relationships and logic among constructs" (Eisenhardt and Graebner, 2007). In that sense, revelatory cases are special or extreme which enables gaining insights that representative cases would not allow (Siggelkow, 2007). This means that those insights need to be based on the conceptual and logical ingredients of the case that are common and frequent. In the current study, we build on the learning opportunities faced and actions taken by the firms, and the industry-level outcomes of filing activity and litigation. Hence the key constructs are motives, learning, scope and industry-level outcomes.

In addition to their revelatory potential, Yin (1994) advices to choose cases that are opportunities of unusual research access. In the present case, we were able to identify all the firms that were active in the industry during the studied period and collect data on their products, filings, litigation actions and finances. Moreover, we got interviews with the majority of the decision-makers including all of those who played a role in the litigations. This is a unique opportunity for research and understanding IPR-related behaviour.

We use several information sources, both secondary and primary, in order to triangulate our findings (Helper, 2000; Jick, 1979; Starr, 2014) and to create a detailed and cross-validated picture of the sequence of events. Our main information sources are IPR databases, especially PRH's design right database, EUIPO's DesignView and public legal documents of the Helsinki district court from six sauna-heater-related design right litigations. We complement these with interviews of key informants, financial statement data and other archival data. Table 2 lists the information sources.

[TABLE 2 HERE]

4.2 Data collection

Our data collection proceeded as follows. During autumn 2015 we collected IPR information (design right, patent, UM and trademark data) from PRH and EUIPO, analysed the filing patterns and identified the key players in the sauna heater market. In order to ensure that we do not exclude firms that do not appear in the databases, we also used other sources as detailed below. The filing information was updated during the research process as we learned more about the relations between sauna heater firms (mergers and acquisitions, supplier networks and employee statuses). One of the authors visited PRH and reviewed the physical design right documents which also contain information on litigations. We contacted Helsinki District Court and bought digital versions of relevant verdicts. It was possible to order all the court case material, including court evidence documents from physical court archives and review it by visiting the Helsinki district court and court of appeals.

Since the beliefs, motives and decision-making processes of actors are not directly observable to the researcher, the only way to learn more about these is to ask decision-makers directly by conducting interviews (Bewley, 2002; Huber and Power, 1985). In essence, we are aiming to understand a process which means collecting "stories about what happened and who did what when" (Langley, 1999). Hence, concurrently with the analysis of IPR documents we planned the semi-structured interview questions and gathered information about the Finnish sauna-heater producer population. We identified producers from IPR databases, books focusing on sauna and sauna heaters (Helamaa, 1999; Särkikoski, 2012; Tommila, 1996), webpages of Finnish hardware and home improvement stores, and

advertisements in the Sauna magazine over the years. As the firm population is relatively small, we decided to interview all identified sauna-heater producers in order to take into account all perspectives and avoid bias from retrospective sensemaking (Eisenhardt and Graebner, 2007).

We identified and contacted 18 firms and key informants of 14 firms were interviewed between November 2015 and May 2016. Most of the interviewed persons were founders, CEOs or ex-CEOs. Two firms refused to participate and the CEOs of three firms could not be reached. The firms, which our interviewees represented, accounted for more than 80% of Finnish sauna-heater-related design right applications filed between 1990–2013 and also for a large share of sauna-heater-related patent and UM applications filed between 1990-2013 in IPC class A61H 33/06. Table A.2 in the Online Appendix lists the interviewees.

Key informants were interviewed either face-to-face (13 persons) or by phone (5 persons) using the semi-structured interview method. The interviews were recorded and transcribed. The interviews provided information about the underlying motives of decision-makers, which the archives could not provide, and helped us to understand the timing of events more accurately. We also conducted four unstructured interviews with IPR experts specialized in designs rights. They shared with us their experience about how the Finnish design right system functions in practice. Figure 3 illustrates the whole data collection and analysis process.

[FIGURE 3 HERE]

4.3 Data analysis

Step 1. Construction of event history database: Narrative strategy

In the first step of analysis, we adopted the narrative strategy described by Langley (1999). This entails constructing a detailed story from the raw data. Narrative strategy has the benefit of high accuracy of resulting theoretizations (Langley, 1999). We began our case analysis by identifying focal events and constructing an event history database (See Online Appendix). The database was updated and refined as we gained more information on the Finnish sauna heater market. We limit our analysis to the post-1990 period since design rights were only sporadically used among sauna-heater producers before 1990s. Also, most of the identified key informants have worked at sauna heater producing firms only after 1990.

Step 2. Identification of phases and description of events: Temporal bracketing strategy

In the second step, we adopted the temporal bracketing strategy which entails decomposing the data into successive periods and examining "how actions of one period lead to changes in the context that will affect action in subsequent periods" (Langley, 1999). This means that process data is divided into discrete but connected blocks. Within these blocks the data is used to describe the pattern in each, how the context affects the pattern, and how the consequences of each phase affect the context of the subsequent phase. The temporal bracketing strategy complements the narrative strategy as it offers a higher level of generalizability (Langley, 1999).

Based on the event history database, we divided the events into three phases. Phase I describes the emerging design trend among sauna-heater producers and the market entry of IKI-Kiuas, the pioneer firm, which introduced a novel sauna heater design and whose IPR strategy relied solely on design rights. Phase II details the competitive entry of other

sauna-heater producers and court cases, in which IKI-Kiuas sued competitors for design right infringements. Phase III focuses on the period after the court cases were adjudicated and uncertainty considering the scopes of design rights was resolved. All three phases are divided into 1) a brief description of the IPR filing activity and the focal events, 2) motives to use design rights and 3) related learning events.

Step 3. Systematic analysis of data

The challenge with case study research has traditionally been the lack of methodological rigour (Gibbert et al., 2008; Ketokivi and Choi, 2014). A key issue in explanatory case study research is to distinguish between the evidence and the investigators' interpretation of the evidence (Harder, 2010). To make this distinction clear, section 5 presents the evidence as objectively as possible and in section 6 we provide our interpretation. Moreover, we consider several alternative explanations for filing and suing in order to strengthen our argumentation (Siggelkow, 2007). Finally, in order to increase reliability, we followed the suggestion of Yin (1994) and sent the draft of the case study report to the interviewees so that they had the opportunity to correct and add details.

5 The use of design rights among sauna-heater producers 1990-2016

5.1 Phase I: A novel design and market entry (1990-2007)

During the first phase, design gradually became more important in sauna heater products. According to our interviews, the emerging sauna heater design trend was initiated by the more general interior design trend. Central to our case, the first phase saw the entry of a

new sauna-heater producer with a novel product design, the mesh-frame sauna heater, which became the focal design in design right filings and the court cases.

5.1.1 IPR activity

Figure 2 shows that patents and UMs were more actively used than design rights for sauna heaters during 1990–2007. Tables A.3–A.5 in the Online Appendix present the IPR filing activity by sauna-heater producers. They show that sauna-heater-related design right filing activity was at a very low level during 1990–2007 and that UMs were applied mostly by firms that also applied for patents.

Already in 1993, a firm called Designpolis filed a design right application for a pillar shaped wood-burning sauna heater, the exterior of which had an open structure. This can be interpreted as a precursor to the mesh-frame sauna heaters. PRH granted the design right (no. 17063). Since Designpolis did not have production facilities, it tried to license the design to a large sauna-heater producer in 1995 but was not able make a deal. Designpolis decided not to continue commercialization and let the design right lapse. The interviewees systematically stated that licensing is not common in the sauna heater industry and IPRs are more often transferred via mergers and acquisitions than licensing.

In the late 1990s, Jouni Kerrman designed a wood-burning sauna heater with a novel mesh-frame design (Tommila, 2009). Initially this was a hobby for him, but commercialization of the product design was his goal from the beginning. He founded the firm IKI-Kiuas in 1997, and in 1999 the firm applied for the first design right (Finnish design 20399) for a distinctive mesh-frame sauna heater. PRH registered the design after examination of novelty indicating that the design satisfied requirements of registration. That was a wood-burning model. In

2004, IKI-Kiuas filed the first design right application (Finnish design right 23810) for an electric version of the mesh-frame sauna heater and it was granted in 2005. The difference of these sauna heaters in comparison to traditional models (see Figure A.1) is that (1) they have a pillar shape, (2) their exterior is made of mesh, and (3) they include a larger quantity of heater stones resulting in sauna baths with lower temperatures and more humidity. For the sake of consistency, we refer to this type of sauna heaters, which have either mesh exterior or pillar structure, as "mesh-frame sauna heaters".

All the interviewed sauna-heater producers confirmed that IKI-Kiuas was the first to commercialize mesh-frame sauna heaters although several interviewees stated that it just re-applied the old design of smoke sauna stove in a new way, and that the design was hence not novel. However, we did not find documents of earlier versions of mesh-frame sauna heaters sold commercially.

5.1.2 Motives to use design rights

In addition to the fundamental motive to protect the design from imitation, we identified two additional motives to use design rights during the first phase: (1) licensing for external manufacturing and (2) protection for contract-designed sauna heaters.

The interviewees reported the main motive to be the ability to licence the design for manufacturing by another firm. These design right owners did not have the manufacturing capacity, retail networks, or marketing resources necessary for commercialization and therefore attempted to make deals with established firms within the industry. At this point the designers of new sauna heater designs had the genuine belief that the design right offers sufficiently strong protection to enable such licencing transactions. During the period, some

sauna heater producers hired external professional designers to design novel sauna heaters models. Some of these designs were design-right protected, which presumably eased the contracting between external designers and sauna heater producers.

5.1.3 Learning events

During the first phase three distinct courses of events took place that created opportunities for learning about the scope of design right protection. These relate to learning the initial scope of design right protection in a sparsely populated design space. First, the pioneer filed and was granted several design rights: Between 1990 and 2007 IKI-Kiuas was granted nine sauna-heater-related design rights. As the granting of design rights is dependent on PRH determining the requirements of novelty and individual character to have been met, these decisions communicated to the designer that the IPRs are valid and that there is sufficient distance between them in the design space. Therefore, granting the design rights may have had a positive effect on the beliefs of decision-makers about the strength of design right protection.

The second important turn of events was the tendency of the incumbents to decline licencing and sale offers by pioneer entrepreneurs who had design-right-protected sauna heaters. Both IKI-Kiuas and Designpolis attempted licencing. We found evidence that in 2000 IKI-Kiuas tried to sell its sauna heater business to existing sauna-heater producers: A document, which was used as a piece of evidence in forthcoming court cases (see section 5.2), suggests that IKI-Kiuas tried to sell its business to Helo, Harvia, Misa, Narvi, Suomen Puulämpö, Kastor, Mondex and Tylö in the early 2000s.[7] However, at that time the producers were not

[7] Defendant's (Harvia) written evidence H2, "History of IKI-Kiuas". Written by Jouni Kerrman on 4th June 2008.

interested as they were not convinced of the market potential of design heaters. Some interviewees from the above-mentioned firms denied that there were such negotiations. In any case, the unsuccessful licencing and sale attempts signalled to the design right owner that the design right in itself without manufacturing capacity has little value. This course of events may also have signalled that the scope of protection is too narrow to make licensing a profitable proposition for the potential buyer.

This led the pioneer firm to put effort into marketing and selling mesh-frame sauna heaters on their own but with little success. According to our interviews only a couple of dozens of sauna heaters were sold until 2005. Over time IKI-Kiuas, however, gathered important references and publicity by selling sauna heaters to the president of Philippines, the prime minister of Russia, the CEO of Nokia and several famous Finnish sportsmen. According to our interviews Habitare 2005 design fair, the largest annual event for furniture and interior design in Finland, was the crucial event after which the demand for mesh-frame sauna heaters increased remarkably. Figure 4 presents the financial performance of IKI-Kiuas, and shows how their business grew around this time. Ultimately IKI-Kiuas was successful in commercializing its novel design and this profitable product segment was also noticed by incumbent sauna-heater producers. Several interviewees said that the market signalled increasing demand for mesh-frame sauna heaters and that they had to respond to this trend.

[FIGURE 4 HERE]

The third learning opportunity during this time resulted from one of IKI-Kiuas' filings being rejected due to one of its own design rights being an obstacle to it. The design right application M20010056 was rejected by PRH in 2001. According to PRH the design in

application M20010056 was not sufficiently different from IKI-Kiuas' own design, Finnish design right 20399 (see Figure 5). The stated grounds for rejection were:

> *"The applied design differs from the obstacle design so that the mesh in applied design has a lighter structure than the mesh in obstacle design and also the applied design is taller than the obstacle design. The bureau considers that the mentioned differences are not sufficient to bring about essential difference between the applied design and the obstacle design."* (PRH's decision on the 20th June 2001)

[FIGURE 5 HERE]

This event signalled that a design right protects also against designs that have minor differences and not just against exact copies offering new information concerning the scope of protection. Therefore, this may have strengthened the beliefs regarding the scope of protection achieved with a design right.

5.2 Phase II: Competitive entry and alleged infringements (2008–2010)

In years 2008–2010 several sauna-heater producers began producing mesh-frame sauna heaters, which led to litigations initiated by IKI-Kiuas. The disagreement concerning the scopes of design rights lasted until November 2010 when PRH's board of appeals made its rulings considering validity of several design rights.

5.2.1 IPR activity

Sauna-heater-related design right filings hit the record level in 2008 and also in 2009–2010 the filing frequencies were at high levels (see Figure 2). In contrast, for sauna-heater-related patent and UM filings no similar pattern can be observed: Sauna-heater-related patent filings temporarily decreased and UM filings almost totally ceased during 2008–2010. The

design sauna heater market segment witnessed both *de novo* and *de alio* entries during the period. Several firms diversified into the mesh-frame sauna heater product segment and filed design right applications.

5.2.2 Motives to use design rights

During the second phase, we can discern three distinct motives to use design rights in addition to the fundamental protection from imitation motive: (1) blocking rivals from the design space, (2) FTO, and (3) defence in court (which is related to both FTO and blocking rivals). As described in the section above, other sauna-heater producers introduced new design sauna heaters, which had the same basic idea as the pioneer's models. They filed design right applications around the time that they launched the products.

As the other companies started to enter the mesh-frame sauna heater category, the pioneer attempted to block them form the design space by active filing and eventually suing the competitors for design right infringement. At the same time the competitors were filing to ensure FTO. The freedom-to-operate motive means, in this context, that by being granted a design right a firm can be relatively sure that they are not infringing on other firms' design rights and potentially subject to compensation for damages or litigation. Even though granted design rights may be overturned in court, they are a signal that discourages competitors from suing. Therefore, filing for design rights became concurrently a risk management strategy in addition to a basis for competitive advantage. During the litigations, some defendants used design right filings to strengthen their case. The litigation also increased awareness of design right system among sauna-heater producers since the litigations got attention in popular press. As the firms became aware of the design right institution they also learned, based on the court ruling, that a design right only protects

from exact copying. Therefore, the firms began to see value in design rights as a vehicle of deterring other firms from making exact copies.

5.2.3 Learning events

During the second phase, there were three events that gave the participants opportunities to shape their beliefs concerning design right protection: (1) a competitor was not granted a design right due to pioneer's design being an obstacle to it, (2) several other competitors were granted design rights despite pioneer's appeals, and (3) the pioneer sued these competitors for infringement and lost. These events relate to learning the initial scope of design right protection and learning how the scope changes dynamically as more design rights are registered.

The first event concerned a firm called Kauhavan Rauta. According to PRH's design database, it was the second Finnish firm that applied for a design right for a mesh-frame sauna heater, when it filed its application in January 2008 (Finnish design right application M20080008). However, PRH rejected the design right application in June 2008 as it did not differ substantially from IKI-Kiuas's design 23810 (see Figure 5). Kauhavan Rauta appealed for this decision to PRH's board of appeals, which ultimately, in 2010, upheld the decision to not grant the design right. As a result, Kauhavan Rauta ceased its mesh-frame sauna heater production. This event likely reinforced sauna-heater producers' beliefs concerning the strength of design right protection, and offered information concerning scope.

However, the events relating to other competitors were completely different. In 2008 Harvia, Mondex and Narvi introduced novel sauna-heater designs to the Finnish market. According to PRH's archives Harvia and Mondex had applied for design rights in spring

2008. Their applications were made public in May and June 2008. IKI-Kiuas responded by making claims at PRH that those designs did not satisfy novelty requirements. In September 2008, IKI-Kiuas sued Harvia by claiming that its heater designs were infringing on IKI-Kiuas' (see Figure 6). In November 2008, IKI-Kiuas also sued Mondex and Narvi for design right infringements.

[FIGURE 6 HERE]

At this point, Narvi did not have design rights but it filed for the design of its allegedly infringing sauna heater (see Figure 6), in December 2008. Due to grace period, a design right was granted despite the product having been in the market for some time. The fact that PRH granted the design right to Narvi was an indication that the scope of IKI-Kiuas' design rights did not cover Narvi's design. This was an indication that as the number of design rights grows their scope of protection becomes narrower.

The litigations concerned the boundaries of IPRs — that is, the scopes of the pioneer's design rights relative to defendants' sauna-heater designs. PRH granted design rights to competitors' designs despite the claims made by IKI-Kiuas. This was an indication that according to the design right examiners at PRH these new designs were not infringing existing design rights and, hence, were novel and had individual character. Kerrman, the designer of IKI-Kiuas' sauna heater designs, appealed but PRH's board of appeals sustained the design rights in force in its decision dated November 2nd, 2010. The correspondence between the board of appeals and IKI-Kiuas illustrate how Kerrman reacted, when PRH granted design rights to competitors' mesh-frame sauna heaters. Here is a quote from the letter (15th Jan 2009) to the board of appeals:

"During the past years I have applied for and been granted several design rights in belief that they will protect me as the first producer from copying and unhealthy competition. Now it seems that it is the opposite case. PRH seeks to protect the imitators from me."

Legal documents of the court cases reveal that sauna-heater experts evaluated the sauna-heater designs at Helsinki district court (see Event history database in the Online Appendix) and concluded that an informed user could not confuse the pioneer's designs with other products although an ordinary consumer might. The court ruled that the imitators' design heaters were based on the same idea but were not exact copies. According to the court rulings, they differed in several relevant details and the overall impressions produced on an informed user were substantially different in comparison to IKI-Kiuas's designs. Thus, competitors' designs were not infringing on those of IKI-Kiuas. Our interviewees consistently pointed out that IKI-Kiuas had a false belief about the scope of design right protection: that a design right protects the whole idea of mesh-frame sauna heaters.

"At that point it little by little became clear to IKI, as litigation proceeded, what the design right protects and what it does not."(Interviewee F)

"It was totally clear, they did not understand what they were doing. They did not understand, that they are not going to win. - - just sued due to stubbornness. - - but after all the end result was that they burned a huge amount of money." (Interviewee L)

"It wasn't a patent for a mesh-frame sauna heater, which would prevent everybody from producing. There was no technical invention. The design was protected and nobody infringed that design right, and it was a fact." (Interviewee J)

"It [the court case] was a walkover." (Interviewee C)

Even though these comments assign blame to the pioneer's naivety, one should keep in mind that they are made ex-post. At that point, the pioneer had experienced its own filings and one competitor's filing being rejected due to similarity while not being exact copies (see Figure 5). However, later in court the competitors' design rights were upheld despite a degree of similarity (see Figure 6). It appears that there was a change in the scope of design right protection and the hypothetical informed user had learned to differentiate between smaller differences. Such dynamism in scope was new information for the pioneer.

5.3 Phase III: Post litigations (2011–2016)

After the district court's decision to dismiss the infringement cases in 2009 and the decisions of PRH's board of appeals to grant design rights to other sauna-heater producers in 2010 despite IKI-Kiuas's appeals, several divergent beliefs regarding the scope of design rights were resolved.

5.3.1 IPR activity

In 2011–2013 design right filing activity slightly decreased relative to 2008–2010 (see Figure 2) and decreased to pre-2008 low levels in 2014–2016. A general trend has been that sauna-heater producers have shifted to file at the EUIPO instead of PRH.

5.3.2 Motives to use design rights

After the litigations, protection from imitation and FTO remained important motives to use design rights. The third identified motive relates to building the reputation and credibility of the firm. Some interviewees mentioned that retailers required design rights in order to show that the firm's sauna heaters did not infringe others' products. In other words, this was a risk management strategy for the retailers.

"And then what is the image that you give to collaborators, retailers. If a retailer begins to advertise sauna heater X, then it doesn't have to worry, whether there will be a similar sauna heater X, which a competing retailer is selling with half the price after a few weeks. Hence, it [design right] provides protection so that the retailer has an incentive to advertise. Therefore, it provides a good basis for collaboration and brand building." (Interviewee J)

Design rights were filed in order to make the firm look like a proper business in the eyes of collaborators and retailers. Some interviewees also stated that being granted design rights increases the firm's status within the industry, because it sends the message of having your own vision and making an effort in further developing the product category. Finally, design rights were seen as assets that increase a firm's value in the case of an acquisition.

5.3.3 Stated beliefs about the strength and importance of design rights

The design space of sauna heaters became increasingly crowded during 1990–2013. Between 1971–1989 there were a few dozen sauna-heater-related design right filings at PRH whereas between 1990–2013 there were close to 200 filings. The motives to use design rights have also evolved during the latter period. In the interviews (see Table A.2 in the Online Appendix), we asked the sauna-heater producers about their beliefs concerning the scope and strength of design rights after the litigations and appeal processes were completed. The post-litigation common belief is that design rights provide only narrow protection — that is, protection against exact copying. The quotations in Table 3 illustrate these updated beliefs of the interviewees.

[TABLE 3 HERE]

6 Discussion

Based on our observations, the sudden increase in design right filings was triggered by the emergence of a new product segment, mesh-frame sauna heaters, the attempt of the pioneer to block rivals through filing, and the rivals' response to file in order to ensure FTO. After the court cases and appeals at PRH were resolved, the design right filings decreased to pre-2008 levels. The observed pattern, an increase during a litigation, in design right filings is qualitatively similar as in the recent and highly cited design patent litigation by Apple and Samsung (see Figure 4.12 in WIPO, 2017, p. 117). Litigations are a consequence of heterogeneous beliefs created by uncertain IPRs and they act as a mechanism to clarify boundaries of IPRs and to homogenize beliefs.

Competition and the intensive filing of design rights seems to have promoted product differentiation, widened the range of products available to consumers and decreased prices leading to an increased consumer surplus (cf. Teece, 1986). Concurrently, the industry transformed from technology-based to design-based competition. The followers could not copy the pioneer's products but they were able to successfully design around the narrow design right protection.

Eventually the design right filings decreased to pre-2008 levels in 2014–2016. The litigations confirmed that the scope of design rights in protecting sauna heaters is narrow and provides limited exclusive right relative to substitute designs. Low levels of design right filings reflect the sauna heater producers' beliefs that design right protection is of little importance.

6.1 How do motives to use design rights change over time?

Over time we see an evolution of filing motives from specific protection goals to FTO. In the first phase, design right filings were motivated by the plan to licence the new designs for external production. As sauna heater business requires complementary assets (Teece, 1986) such as production capabilities, the pioneer tried to license the design to established sauna-heater producers. This is in line with the policy objectives of IPR legislation creating incentives for innovators by protecting their rights and thus enabling markets for technology (Arora et al., 2004; Gans et al., 2008; Guellec and van Pottelsberghe de La Potterie, 2007). However, licensing did not materialize and the motives shifted considerably in the second phase.

Experienced incumbent sauna-heater producers were reluctant to license the invention and some claimed that it would be too easy to design-around due to narrow design right protection. The reluctance to license might have also derived from other things: the new design could have cannibalized the markets for existing products or the potential licensees were not yet convinced of the market potential and wanted to see the concept to be proven first. Moreover, we cannot rule out the possibility that licensing parties could not reach an agreement on licensing terms.

After unsuccessful licensing attempts, the pioneer's goal was to commercialize the product and block rivals from the design space. However, competitors introduced their sauna-heater designs which competed more directly than their old products with the pioneer's products, and the pioneer sued them for design right infringement. Concurrently, the competitors filed numerous design rights to ensure FTO, to deter litigations and also to use them as a part of their defence in court. Moreover, the publicity relating to court proceedings

increased the awareness of the design right institution within the industry and may have triggered additional filings. The awareness argument has been documented in recent studies on increased patent filings (Intarakumnerd and Charoenporn, 2015). It also seems that the uncertainty about design right scope during pending court cases (2008–2009) and pending appeals at the PRH's board of appeals (2008–2010) played a role in inducing sauna-heater producers to engage in a design right arms race. The pioneer did its best to pre-empt competitors from protecting their designs with design rights and entering its niche market (cf. Blind et al., 2009; Gilbert and Newbery, 1982; Grimpe and Hussinger, 2014; Guellec et al., 2012; Orozco, 2009). However, as a result of the court cases the pioneer was also forced to continue filing to ensure FTO.

As the industry participants collectively learned about the narrow scope of protection, they began to use design rights in the narrow sense of deterring exact imitation. Interviewed IPR experts pointed out that the scope of design right protection is product-specific and contingent on the product life cycle: When a product design is truly novel, the scope of protection can be broader but as the product segment matures and more variations of differentiated products are introduced the scope becomes narrower and design rights are granted to increasingly smaller product attributes. Hence, the scope of design right protection in a specific product category is dynamic and depends essentially on the evolving interpretations of "individual character" and "informed user" (see section 3.1). Individual character is evaluated from the viewpoint of an informed user and as more product variations enter the market and time goes by, the hypothetical informed user learns to distinguish between increasingly small product differences. Thus, when a design right is granted, it creates a negative externality by narrowing down the scope of protection enjoyed

by neighbouring design rights. The finding is consistent with studies that report firms to apply for patents to pre-empt competitors from patenting and to deter litigation (Blind et al., 2009; Grimpe and Hussinger, 2014; Guellec et al., 2012; Jell et al., 2017).

In the final phase, the motives were reduced to FTO and reputation. The FTO motive entails testing the boundaries of existing design rights and decreasing the likelihood of infringing on them in the increasingly crowded design space (Filitz et al., 2015). The reputation motive is most important for new firms entering the market and establishing retail channels. This also relates to the FTO motive as by requiring design rights from their suppliers the retailers are minimizing infringement risks and avoiding being sued.

6.2 How do actors learn about the scope of protection?

We identified events that offered opportunities for learning and belief-updating. Some events, including being granted design rights and competitors being denied them due to obstacle designs, signalled strong protection (Figure 5). However, later on competitors were granted design rights despite appeals and the court ruled no infringement having taken place (Figure 6). These events sent very different signals for industry-level belief formation concerning the scope of design right protection.

Figure 7 summarizes our findings regarding the learning events, evolution of motives, industry level outcomes and their mutual connections. We identify two types of learning relating to the usage of design rights: 1) learning the initial scope of protection in an industry that had limited experience of design rights and 2) learning the dynamism of scope that results from the growing number of designs in the product category. Figure 7 illustrates the accumulating design prior art in the sauna heater product segment. Prior art and design

rights in force increased steeply during phase 2 but began to decrease in 2014 reflecting the saturation of the sauna heater design space. Such saturation decreases filing activity because the hypothetical user is able to differentiate between minuscule differences, and therefore it is unlikely that a granted design right would block competitors from commercializing similar designs or that an insurance against suing competitor would be needed.

[FIGURE 7 HERE]

Our case study demonstrates that heterogeneous subjective beliefs about the scope of IPR protection (cf. Miettinen et al., 2012; Priest and Klein, 1984; Somaya, 2003) may have a significant impact on innovation activity, competition and industry dynamics. It is plausible to assume that information asymmetries and subjective probabilities arise at least partly from differences in accumulated experience and know-how: More experienced market participants are likely to have learned more about the practical interpretation of IPR legislation. When IKI-Kiuas sued Harvia, Narvi and Mondex in 2008, the firm's management did not have previous experience of IPR litigation whereas Harvia and Narvi had been litigating a few years earlier on an alleged UM infringement, 2001–2005. When the interviewees were asked which sauna-heater-related court cases they remember, some remembered the aforementioned Harvia vs. Narvi court case in addition to court cases between IKI-Kiuas and other producers. However, several interviewees did not remember what was the ruling in Harvia vs. Narvi court case and what the case exactly concerned.

" - - it was a long dispute and it ended in a court ruling. I can't remember, which won the case, Narvi or Harvia, but the other had to pay compensation to the other." (Interviewee D)

"Probably Narvi and Harvia had a dispute at some point but - - I can't remember who won - - I don't know if there have been any other [disputes]." (Interviewee L)

Some interviewees even reported that they do not pay much attention to others disputes.

"I haven't followed what others have done." (Interviewee P)

"I've heard of some [court cases], but I don't have enough time, I haven't followed them at all. I know that there have been court cases but I haven't concentrated on them." (Interviewee E)

Information about previous Finnish IPR court cases is, in principle, accessible to everyone but with a cost of time and effort.[8] Already Bebchuk (1984) stated that "legal rules and institutions that magnify the extent to which an informational asymmetry is present might well increase the likelihood of litigation" and the mentioned access costs are this kind of a magnifying factor. Hence, it is possible that sauna-heater producers made decisions under bounded rationality — that is, without the relevant historical information and legal knowledge. Some interviewees had sceptical views about the legal system:

"They [litigations] are annoying, you never know what will happen." (Interviewee F)

"- - litigations are so extremely expensive in Finland and rulings are more or less erratic." (Interviewee H)

A rational reason for litigations may have been IKI-Kiuas seeking for "reputation for toughness" (Kreps and Wilson, 1982). The incumbent sues early entrants to signal to other potential entrants that they would also be sued if they entered (Choi, 1998). Not suing is

[8] Even for researchers it is not easy to access the legal documents physically stored at court's archives in Helsinki.

therefore an inferior option since it would signal to competitors that imitation and entry would be accepted. Our interviews supported this "reputation for toughness" view. Most of the informants thought that IKI-Kiuas had very low chances of success in the litigations but others pointed out that suing was the only rational option since not suing would have signalled surrender.[9]

Research on behavioral economics indicates that in addition to rational reasons there may also be behavioral explanations for the occurrence of litigations (see Table A.1 in Online Appendix). The uncertain design right protection may have biased the expectations of the pioneer, IKI-Kiuas. IKI-Kiuas made profits by commercializing mesh-frame sauna heaters and stoves as illustrated in Figure 4 but it was probably more due to first-mover and lead-time advantages than due to strong IPRs. However, since it took so long for competitors to enter the market, it could have strengthened IKI-Kiuas's beliefs on the exclusive power of its design rights. This observation is consistent with divergent expectation theory of litigation (Priest and Klein, 1984; Waldfogel, 1998) and also with Babcock et al. (1995) who conjecture that predictions of judicial decisions will be systematically biased in a self-serving manner. Finally, empirical evidence exists that entrepreneurs are prone to unrealistic optimism and overconfidence (Åstebro, 2003; Åstebro et al., 2007; Camerer and Lovallo, 1999; Hyytinen et al., 2014) and that uncertainty increases self-serving bias (Babcock and Loewenstein, 1997; Miettinen et al., 2012). Thus, uncertain (probabilistic) IPRs may further heterogenize the beliefs between competing entrepreneurs and increase the

[9] Some interviewees pointed out that IKI-Kiuas got a lot of free media coverage during these court cases and speculated that this was one of the motives to litigate: "It might have been marketing, but expensive marketing." (Interviewee G); "I think it was to a large extent a publicity stunt. They got a lot of publicity - -" (Interviewee F); "Maybe it was also about marketing in a sense as they got a lot of attention - -" (Interviewee L).

probability of litigation. In other words, probabilistic IPRs may foster unrealistic entrepreneurial optimism.

Our evidence indicates that the pioneer had the belief that its design right portfolio would protect its design sauna heater business from imitators. Eventually it turned out that design rights did not protect IKI-Kiuas's business from competitive market entry although design rights may have delayed the entry of competitors (cf. Ayres and Klemperer, 1999). The design rights may have postponed the entry but on the other hand imitators may also have strategically waited for the pioneer to make the marketing investments to build the new market segment (Ethiraj and Zhu, 2008). One reason for the postponed entry into the mesh-frame sauna heater segment could, of course, be that it took time to design around IKI-Kiuas's design. When PRH granted the design rights to competing firms despite appeals from IKI-Kiuas, it was a clear signal that competing designs were sufficiently different and outside the scope of IKI-Kiuas's design right protection. In other words, competitors were successful in designing around.

At this point, all the marketing investments made by IKI-Kiuas were already sunk costs. Hence, the lack of interest of competing firms for licensing could also be explained by anticipated second-mover advantages (Lieberman and Montgomery, 1988). Other sauna-heater producers were able to closely monitor the success of IKI-Kiuas in the small Finnish market. As Lieberman and Montgomery (1988) point out, important sources of second-mover advantages are the resolution of market and technological uncertainty and the ability to free-ride on first-mover's investments. Moreover, it is likely that consumers' perception of IKI-Kiuas brand spilled over to competitors' brands and competitors benefitted from consumer learning which had already taken place (Janakiraman et al., 2009). The fact that

witnesses in court pointed out that consumers might confuse IKI-Kiuas' models and competitors' models suggests that there indeed were design spillovers.

7 Conclusions

We studied the changing motives to use design rights, the learning opportunities the actors faced, and the change in the beliefs over the scope of design protection. Our case study documents that the increase in design right filings among Finnish sauna-heater producers in 2008 was the result of the birth of a new product segment, the pioneer's attempt to block rivals from the design space, and the rivals' response to file design rights when entering the product segment to ensure FTO. Over time, the filing motives evolve from enabling licensing via blocking to FTO and reputation-building. In exploring how agents learn the boundaries of design rights we identified several events that offered opportunities for belief updating, including rulings by the patent office and court. Future studies could detect discontinuities in design right filings in other industries and jurisdictions, and investigate whether the evolution of motives demonstrates similar patterns.

Our findings suggest that the scope of design right protection in a specific product category decreases as the number of design right applications for product variations increases. Each additional registered variation in design right database creates a negative externality to the scope of neighbouring design rights in the design space. This is due to the fact that the scope of design right protection is based on an "informed user" test: As more designs are introduced within a specific product segment over time, increasingly small differences in design produce a different overall impression to the hypothetical informed user. As each additional design right registration may change the scope of prior design rights, the

decision-makers face the challenge of continuous learning. This means that firms and entrepreneurs must monitor granted design rights in their product categories in order to maintain realistic beliefs regarding the scope of protection of their own design rights. Our case study demonstrates how the private beliefs regarding the scope of design protection may crucially affect design-based competition, innovation activity and industry dynamics. Future studies could theorize on strategies firms could use to address the narrowing scope of their design rights.

This case study provides suggestive evidence that uncertain design rights may induce self-serving biases and foster unrealistic optimism. An important message for future studies is that subjective beliefs matter in IPR-based competition, and that the characteristics of the IPR institution can encourage divergence in beliefs. Learning the boundaries of IPRs is a dynamic process and decision makers often form their beliefs under bounded rationality. Improved quality of IPR information and IPR databases decreases search costs and makes the learning process and belief updating increasingly efficient. At present, inventors and designers may easily and freely access online IPR databases and conduct novelty searchers, FTO searches and competitor landscaping.

Machine readable high quality IPR information enables applications of artificial intelligence (AI), such as natural language processing and image recognition. There already exist a growing number of companies that develop AI applications for IPR analysis, and WIPO keeps track of AI initiatives at national patent offices.[10] These AI applications may help decision makers learn evolving scopes of design rights and other IPRs more efficiently

[10] https://www.wipo.int/about-ip/en/artificial_intelligence/search.jsp Accessed on 3rd February 2019.

thereby mitigating the potential of cognitive biases caused by uncertain IPRs. They may further decrease information asymmetries and heterogeneous beliefs between experienced and inexperienced decision-makers thereby decreasing the amount of duplicative innovation, fostering efficient division of innovative labour and directing innovation investments more productively. Probably future human inventors, designers and innovators remain as optimistic and as prone to self-serving biases as their past counterparts. However, increasingly intelligent AI applications may improve their human judgements. The effect of such developments on innovation and IPR-based competition is an important topic for future research.

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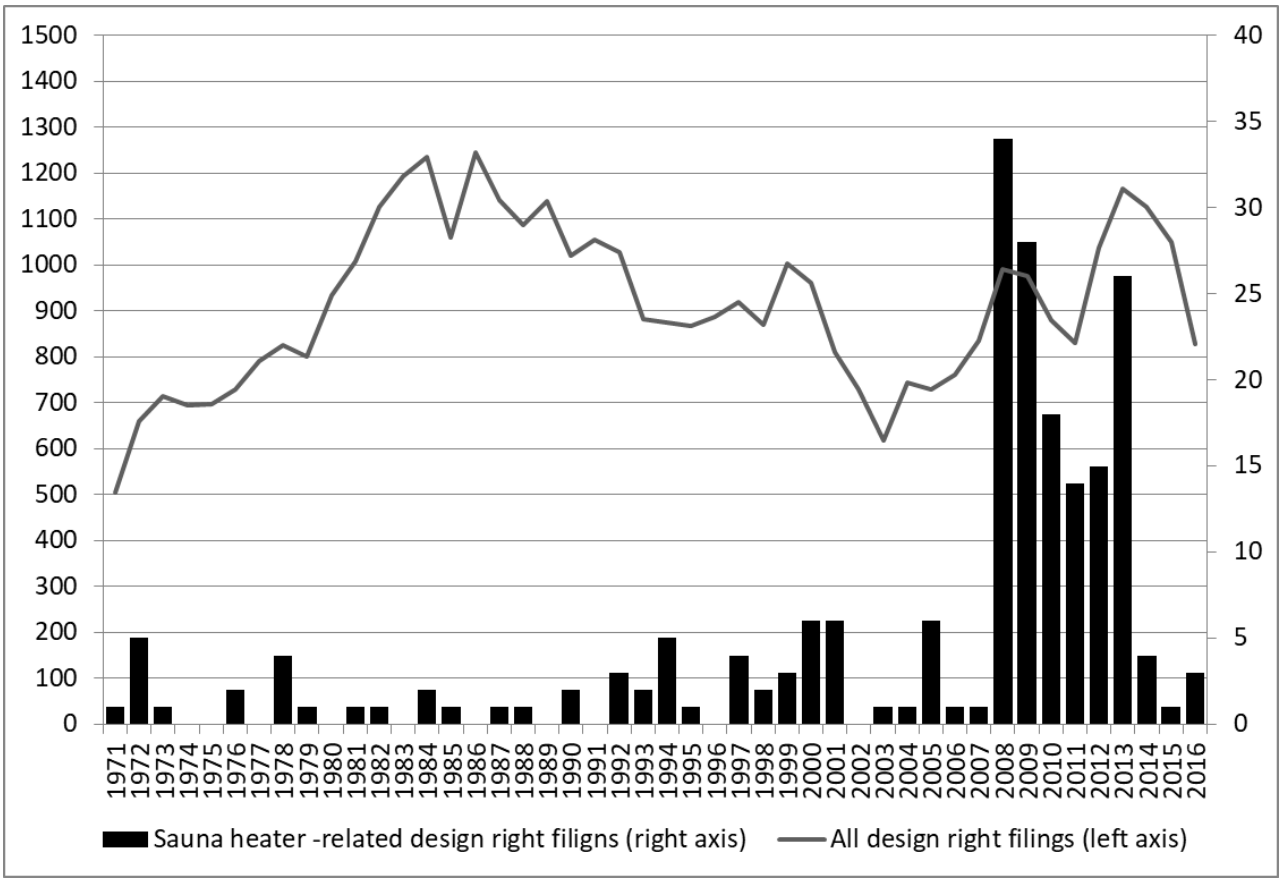
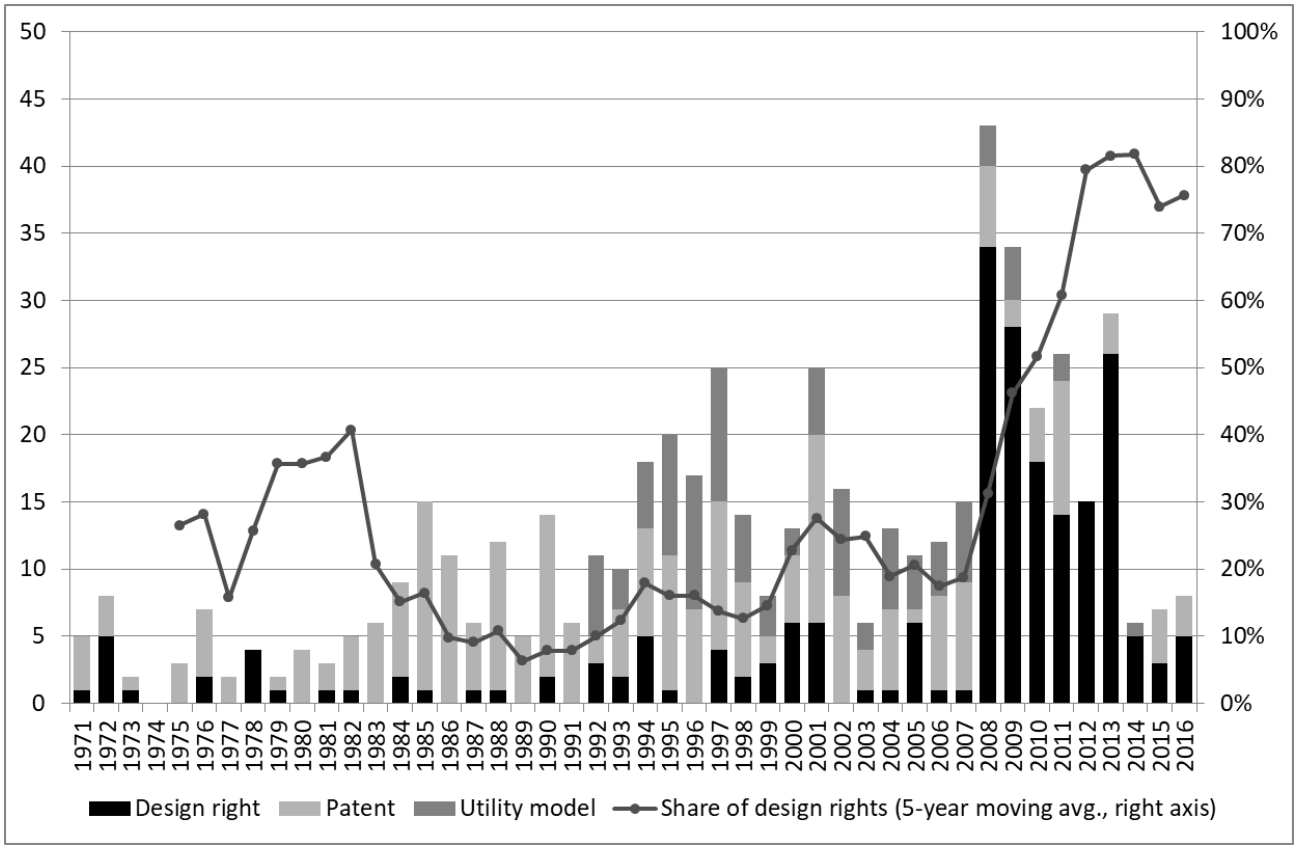
TABLES AND FIGURES

Figure 1. Design right filings in Finland 1971–2016



Note: Since 2003 design right filings include also filings at the OHIM/EUIPO.

Figure 2. Finnish sauna-heater-related IPR filings at PRH 1971–2016



Notes: Since 2003 design right filings include also filings at the OHIM/EUIPO. Patent filings include patent filings at the EPO filed by Finnish sauna heater producers.

Figure 3. Data collection process

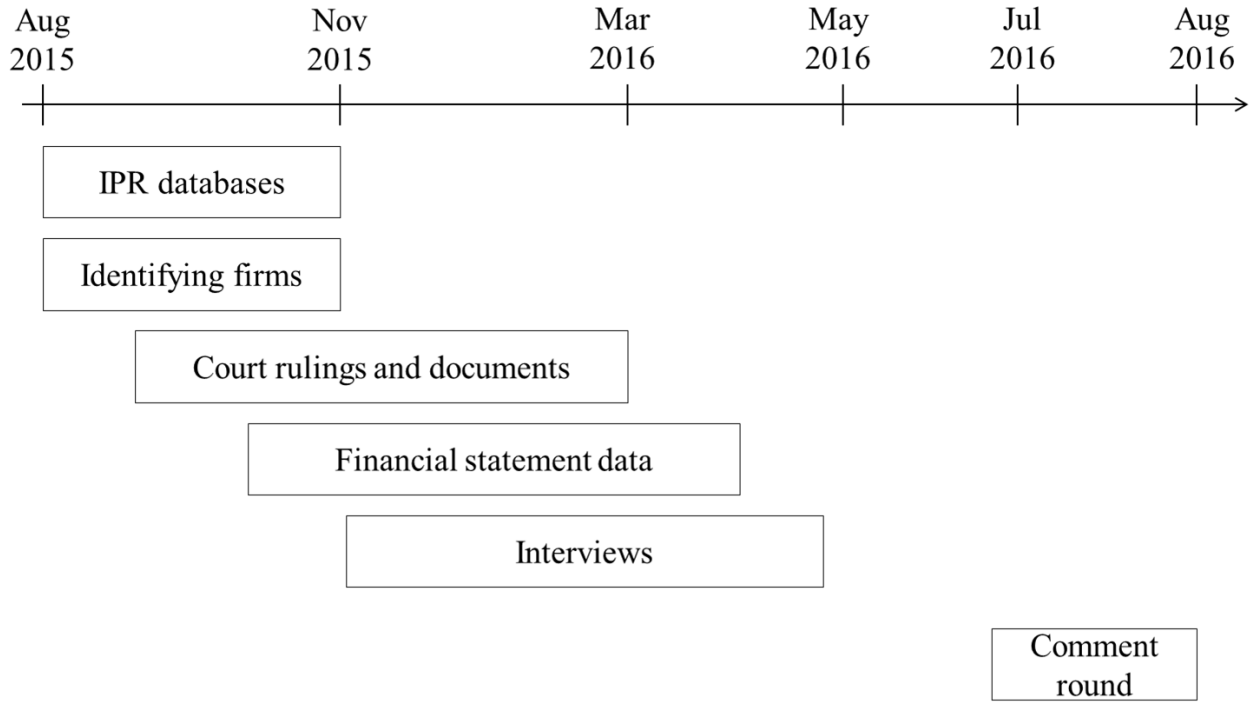
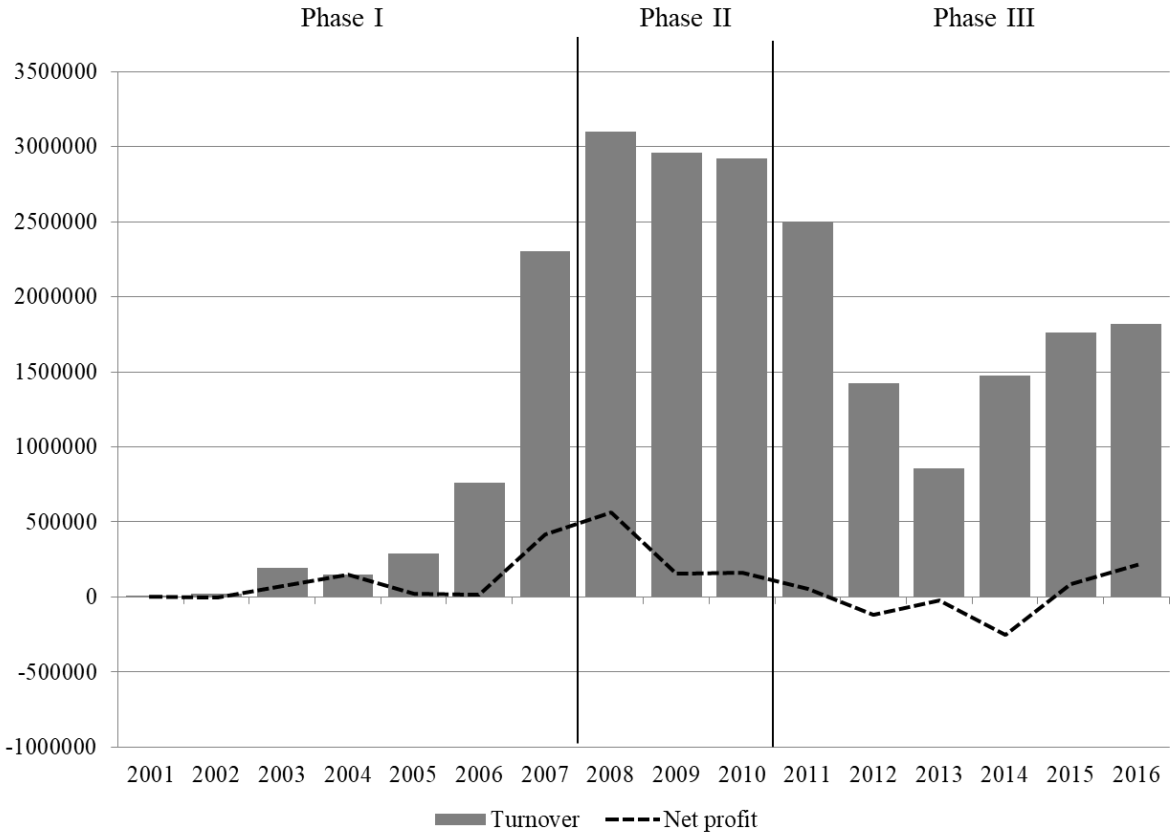
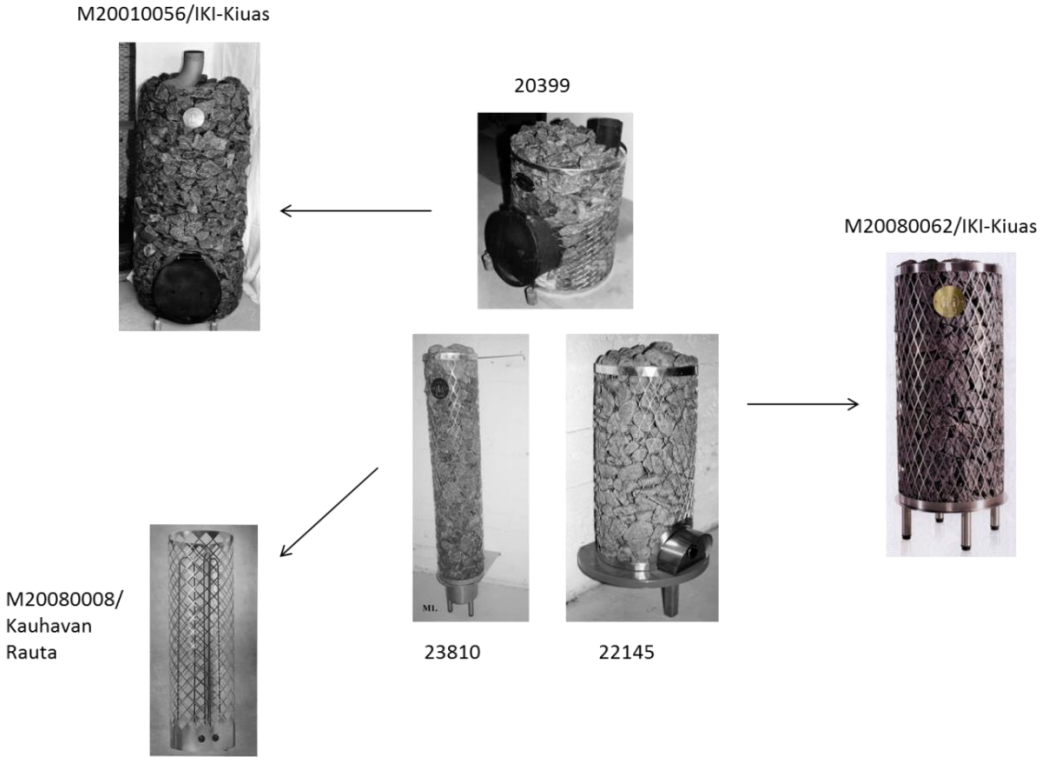


Figure 4. Financial performance of IKI-Kiuas 2007–2013



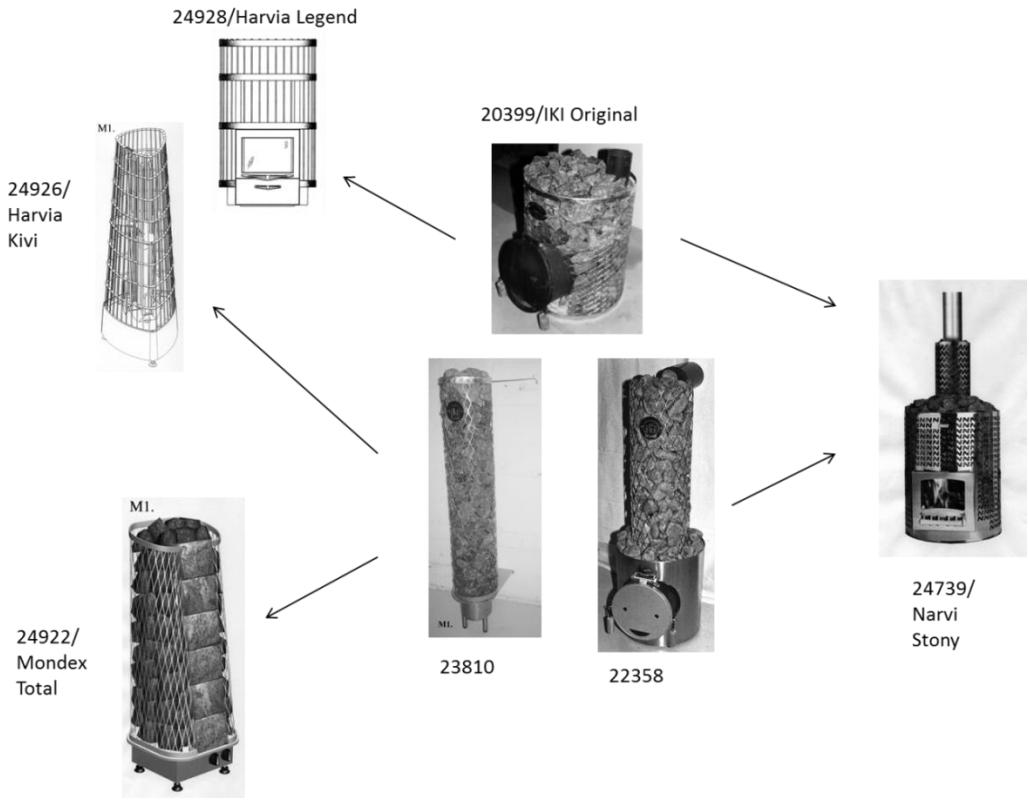
Source: PRH's financial statement database Virre.

Figure 5. Obstacle designs for granting design rights



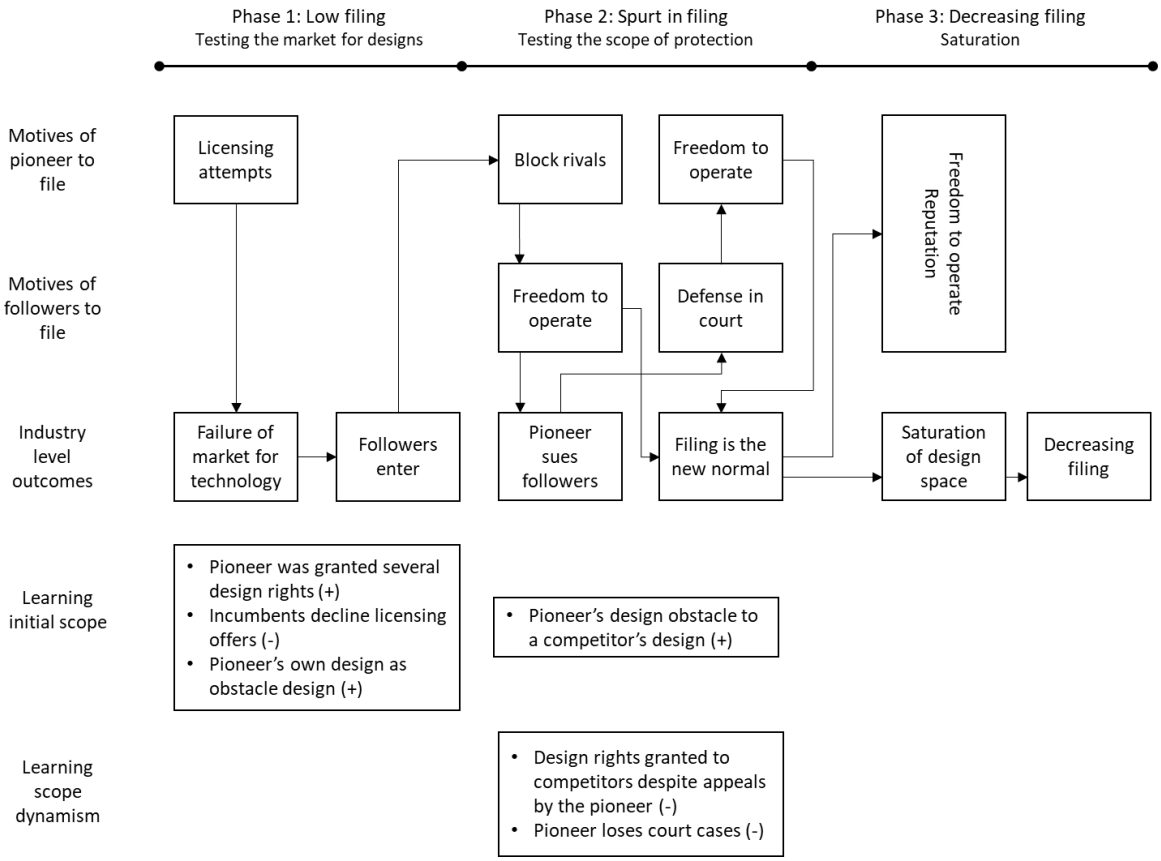
Source: PRH's design database

Figure 6. Alleged design right infringements



Source: PRH's design database

Figure 7. Evolution of filings, motives, industry outcomes and learning events



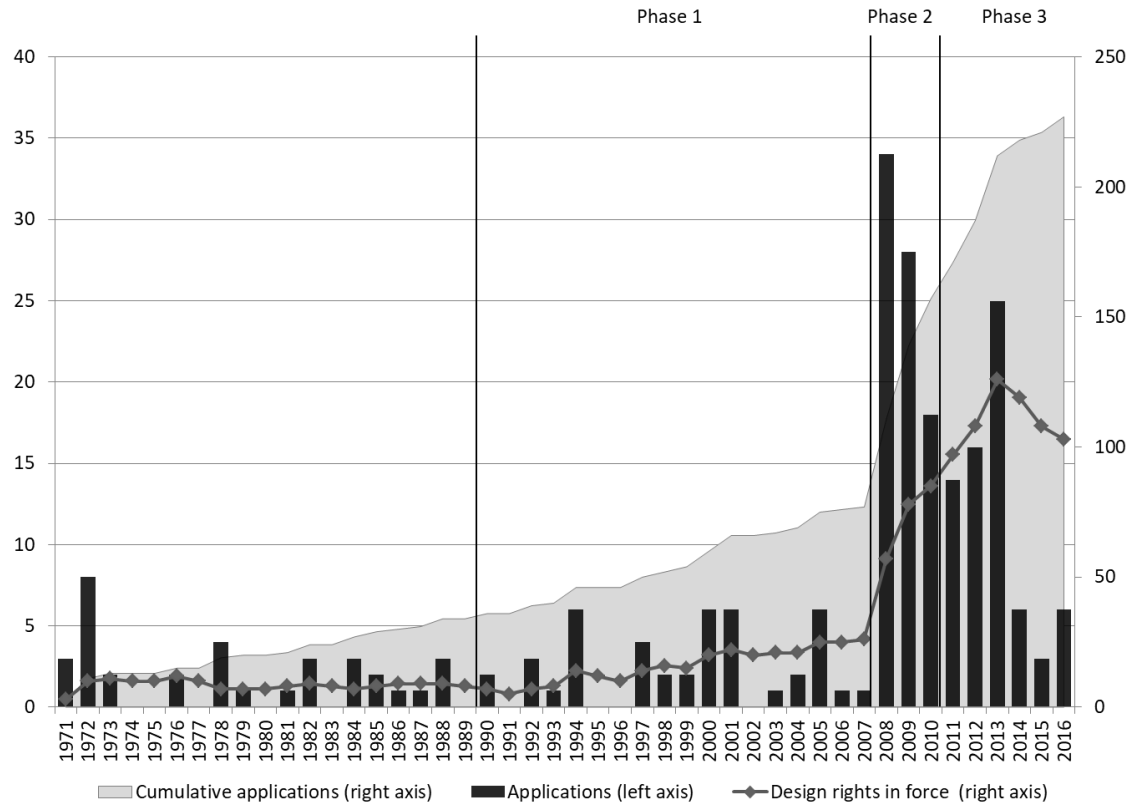


Table 1. Motives to patent

Motive to file a patent/patents	Description	Examples of studies	Applicability to design rights
Prevent imitation ("Basic motive") / Prevent copying / Prevent duplication / Internal use	Right to exlude others from the commercial use of the invention enables profitable commercialization.	Harabi (1995); Duguet & Kabla (1998); Cohen et al. (2000); Blind et al. (2006); Giuri et al. (2007)	Yes
Licensing revenue	Aim to license the patent to other firms who could manufacture/commercialize the invention or aim to license the patent to firm's that are allegedly infringing it.	Harabi (1995); Cohen et al. (2000); Cohen et al. (2002); Blind et al. (2006); Giuri et al. (2007); de Rassenfosse (2012)	Yes
Freedom to operate / Design freedom / Pre-emption / Defensive blocking / Avoid litigation / Prevent suits	File patent applications in order to secure freedom to operate/design/manufacture. Ensure that own inventions and businesses are not infringing others' patents. Prevent others from blocking the technology space.	Grindley & Teece (1997), Cohen et al. (2000); Cohen et al. (2002); Blind et al. (2006); Guellec et al. (2012); Grimpe & Hussinger (2014)	Yes
Offensive blocking / Fencing / Strategic non-use	File patent applications for subtitute inventions in order to block others from patenting or commercializing specific inventions. Deter entry of competitors and dominate technology space.	Gilbert and Newbery (1982), Cohen et al. (2000), Cohen et al. (2002), Ziedonis (2004), Blind et al., (2006), Giuri et al. (2007); Guellec et al. (2012), Grimpe & Hussinger (2014); Torrisi et al. (2016); Jell et al. 2017)	Yes
Negotiation power (use patents as "bargaining chips")	File patent applications in order to increase bargaining power relative to other firms. Closely related to cross-licensing, licensing and	Harabi (1995); Duguet & Kabla (1998); Cohen et al. (2000); Hall & Ziedonis (2001); Ziedonis (2004); Blind et al. (2006)	Yes
Cross-licensing	In a complex technology field, in which the ownership of patents and technologies is fragmented, firms cross-license patents to each other to avoid mutual hold-up.	Grindley & Teece (1997); Cohen et al. (2000); Hall & Ziedonis (2001); Ziedonis (2004); Blind et al. (2006); Giuri et al. (2007)	Cross-licensing is common in industries with comlex technologies where IPRs are overlapping and fragmented but design rights are typically discrete instead of complex.
Influence on standardisation / Make own invention the standard	Aim to establish a technical standard which is patent protected.	Blind et al. (2006); Berger et al. (2012)	Standard setting is more typical in complex technologies whereas designs are discrete.
Attract funding	Signaling firm/invention quality to potential investors. Convince investors about the profitability of products. IPRs can be used as collateral.	Blind et al (2006); de Rassenfosse (2012); Holgersson (2013); Hoenen et al. (2014)	Yes
Measure internal performance	Evaluation of R&D employees' performance by the number of patent applications (invention disclosures). / Incentives for R&D staff	Harabi (1995); Cohen et al. (2000); Cohen et al. (2002); Blind et al. (2006); Harhoff & Hoisl (2007); Giummo (2010)	Incentives depend on national Employee Invention legislation, in which patents are typically included but design rights not necessarily
Government subsidies	Government subsidy programmes incentivice filing activity.	Li 2012; Dang & Motohashi (2015)	Yes
Reputation / Company image / Marketing purposes	A company signals its innovativeness to stakeholders. This motive is closely related to "Attract funding" motive.	Cohen et al. (2000); Cohen et al. (2002); Blind et al. (2006)	Yes

Table 2. Data sources and use

Type of Data	Data Sources	Use in the Analysis
Archival data		
	Finnish design rights (PRH's Design database)	Track filing activity
	Related physical documents of design rights at PRH	Identify obstacle designs ("estemallit")
	Registered Community Designs (EUIPO's DesignView)	Track filing activity
	Appeal documents at the board of appeals of PRH	Identify who appealed and why. Identify beliefs.
	Rulings and documents at the Helsinki District Court and Court of Appeals	Identify allegedly infringed and infringing designs. Identify motives and beliefs and crosscheck events.
	Finnish patents, utility models and trademarks relating to sauna heaters (PRH's PatInfo and Trademark databases)	Track filing activity
	Financial statement data of sauna heater producers (Virre digital database of PRH)	Track performance and identify M&As
	Sauna magazine of Finnish Sauna Association	Crosscheck events
Interviews		
	Confidential semi-structured interviews of key informants	Identify motives and beliefs and crosscheck events
Other		
	Websites of sauna heater producers	Crosscheck events

Table 3. Posterior beliefs about design right protection

Cheap but low importance	Easy to design around	Weak compared to patents
"I can draw a figure in five minutes and send it to [PRH] as a design right application. But it won't be valid, it's pointless work."(Interviewee Q)	*"[design rights] are not of high importance after all. They can always be invented around if you want to make something similar." (Interviewee F)*	*"A patent provides effective protection but I don't believe in design right at all because you need to change so little in order to design around it. - - And it is not examined. It is granted to everyone. But a patent application is examined always and it must differ enough." (Interviewee E)*
"The design right has been tested, it kind of doesn't help much. On the other hand the threshold to file [a design right application] is low, thus it doesn't cost much to apply." (Interviewee P)	*"You can make almost one-to-one the same [design] so that from a consumer's view it is the same product."(Interviewee H)*	*"some patents have been quite important as they have disturbed competitors a lot. But these design rights and others, they don't have high significance at all." (Interviewee F)*
"- - their [design rights] usefulness is very limited." (Interviewee H)	*"We have the feeling from the past that they [design rights] are totally useless, they don't have any significance. One can design them around by any means. They can't prevent anything." (Interviewee Q)*	*Design rights are of low importance because the scope of protection is "a line drawn in water" and in the sauna heater industry "everything has been invented already". (Interviewee K)*
"They are total nonsense. If somebody today asked, whether I would apply for design rights, I wouldn't. They're not useful."(Interviewee M)	*" - - this design right is so stupid that in principle it cannot prevent anything. If [competitor] wants to copy it, they just put a little different things on it." (Interviewee L)*	
	"And of course they [design rights] provide some protection but if the producer analyses them beforehand - before producing, which of course is essential – it will not stumble on them. Hence, if one headlong begins to produce one could infringe but if an IPR service firm studies the case a little, then… One can always make them that much different." (Interviewee C)	

ONLINE APPENDIX/SUPPLEMENTARY MATERIAL

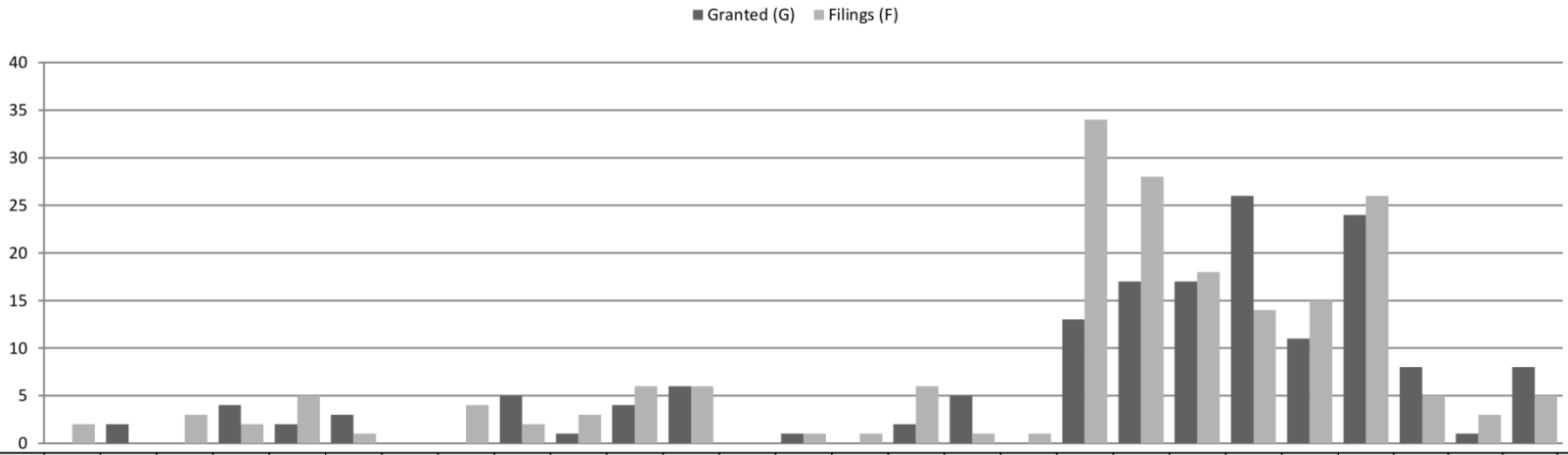
Table A.1. Motives to sue and not-to-settle

Factors potentially associated with the likelihood to litigate and not-to-settle	Description	Examples of studies
Rational choice model of litigation (rational decision makers)		
Heterogeneous beliefs / Divergent expectations	Plaintiff and defendant have divergent subjective expectations (prior beliefs) about the outcome of the litigation due to uncertainty.	Priest & Klein (1984); Siegelman & Waldfogel (1996); Waldfogel (1998)
Asymmetric information	Plaintiff or/and defendant have private information. The information sets of plaintiff and the defendant differ and they may reveal it strategically to get information rents.	P'ng (1983), Bebchuk (1984), Schweizer (1989), Waldfogel (1998)
Asymmetric stakes	Asymmetric stakes (including effects on reputation and reputation for toughness) between the defendant and a plaintiff affect the litigation probability. The plaintiff may want to signal to other firms that in case of infringement, the patent owner is determined to take actions.	Priest & Klein (1984); Siegelman & Waldfogel (1996); Choi (1998); Somaya (2003; 2016)
Behavioral approach to litigation (boundedly rational decision makers)		
Self-serving biases (incl. confirmation bias, fairness and overoptimism)	Negotiations between the defendant and the plaintiff lead to a bargaining impasse since both interpret the evidence favorably to themselves.	Loewenstein et al. (1992); Babcock et al. (1995); Babcock & Loewenstein (1997); Rabin & Schrag (1999); Jolls (2007); Miettinen et al. (2012)
Loss aversion (prospect theory, endowment effect, status quo bias)	People tend to weigh losses more than gains relative to their reference point. The litigating parties take more risks to avoid losses.	Jolls et al. (1998); Miettinen et al. (2012)
Legal advice	Attorneys are more informed about the functioning of legal institutions than their uninformed clients. Depending on an advisor's self-interests and personal biases, she may use legal advice either to bias or de-bias her client's expectations.	Kaplow & Shavell (1992); Langevoort & Rasmussen (1997); Klausner et al. (1998); Jolls et al. (1998); Spier (2007); Belton et al. (2014)

Table A.2. List of interviewees

Firm	Position	Inventor/Designer	Date	Reason for non-response
IKI-Kiuas	Founder, ex-CEO	X	9 Nov 2015	
IKI-Kiuas	Ex-CEO	X	16 Nov 2015	
IKI-Kiuas	CEO		16 Nov 2015	
Tähtisaunat	Founder, CEO	X	4 Dec 2015	
Sydänkiuas	Founder	X	4 Dec 2015	
Harvia	CEO	X	25 Jan 2016	
Helo (former Saunatec)	Ex-CEO		1 Feb 2016	
Mondex	Founder, ex-CEO	X	15 Feb 2016	
Narvi	Ex-CEO		25 Feb 2016	
Kauhavan Rauta	Founder, ex-CEO	X	1 Mar 2016	
Designpolis	CEO	X	8 Mar 2016	
Vuolux	CEO	X	10 Mar 2016	
Muko	CEO		15 Apr 2016	
Muko	Ex-CEO		15 Apr 2016	
Misa	CEO		26 Apr 2016	
Misa	Production manager		26 Apr 2016	
Tulikivi	CEO		6 May 2016	
Teuvan keitintehdas	CEO		13 May 2016	
Jadeca	CEO			No contact
Sawo	CEO			No contact
Sauna-Eurox	CEO			Refusal
Farmtools				Refusal
Aurinkokiuas	Founder, CEO	X		Deceased
University of Helsinki	IP scholar	X	11 Jan 2016	
IP service firm	IP lawyer		11 Mar 2016	
International Sauna Association	President		14 Mar 2016	
Jussi Ahola Design	CEO	X	2 May 2016	
VTT	Standardization expert (retired)		4 May 2016	
PRH	Director		13 May 2016	
University of Helsinki	IP scholar		23 May 2016	

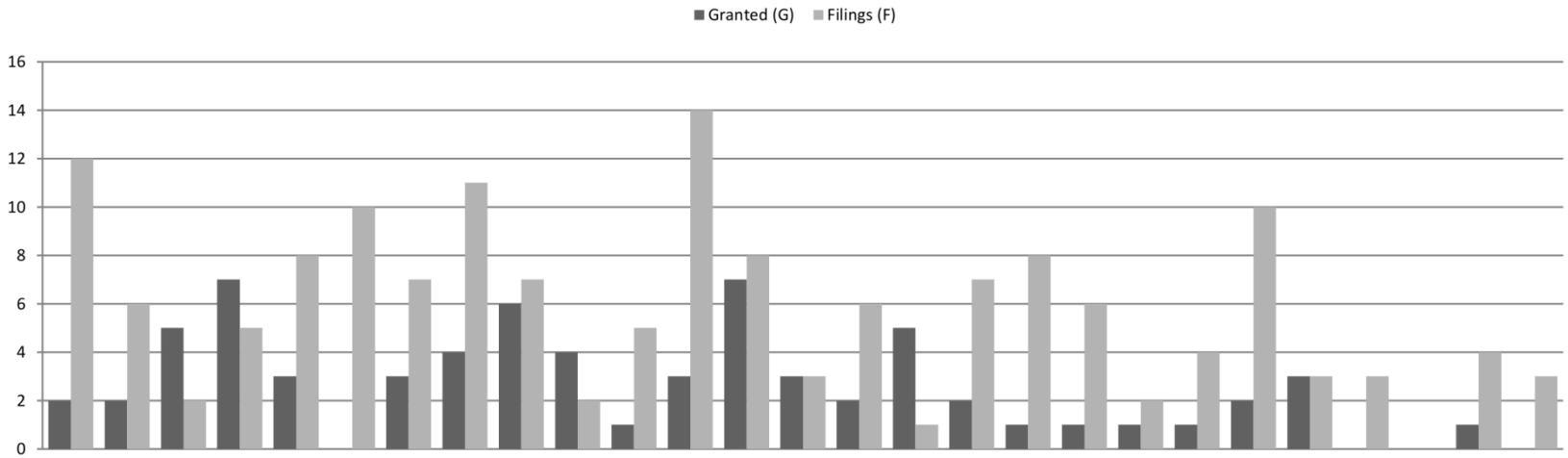
Table A.3. Composition of sauna-heater-related design right filings and registrations 1990–2016



Applicant	1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		Total	
	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F
Aurinkokiuas																																							1	1	1	1	2	3	1	2							5	7
Pekka Pirinen																																													2	2	1	1					3	3
Designpolis							0	1	1	0																																											1	1
Harvia																																	1	1			1	5	2	1			4	1			1	1	1	2	1	0	1	1	12	12
Helo					0	1	1	0	1	2	1	0							0	1	2	4									1	1					0	1	2	2	3	3	4	3	2	2	1	1					18	21
Kastor															0	3	3	0			0	1	1	0											0	1	2	1																	6	6
Tylö																	1	1																							1	1			1	1									3	3
IKI-Kiuas															0	1	1	1	1	0	0	1	1	2			1	0	0	1	1	0					7	11	5	2	1	2	1	3	4	4	1	0	1	1			1	1	26	30
Jouni Kerrman																																							0	1					0	1							0	2
J K Roster																							4	4													1	3	7	9	6	2	3	3									21	21
Kajosauna																																													2	2							2	2
Kauhavan Rauta																																					0	1															0	1
Misa																																																					0	0
Mondex																															0	4	4	0			0	8	0	13	4	6	8	0	2	0	10	13	1	0					29	44
Narvi																																					0	1			1	0					1	1					1	1	3	3
Puulämpö					0	2	2	0																																													2	2
Starsauna Oy																																									0	2	3	1									3	3
Tulikivi																																											1	1									1	1
Others	0	2	2	0	0	0	1	1	0	3	2	1			0	0	0	0	0	2	2	0	0	0			0	1	0	0	0	1	0	0	0	0	2	3	1	0	0	1	1	1	0	4	5	4	4	1	0	3	5	2	25	30
Total	0	2	2	0	0	3	4	2	2	5	3	1			0	4	5	2	1	3	4	6	6	6			1	1	0	1	2	6	5	1	0	1	13	34	17	28	17	18	26	14	11	15	24	26	8	5	1	3	8	5	160	192

Notes: Since 2003 design right filings include filings at the OHIM/EUIPO

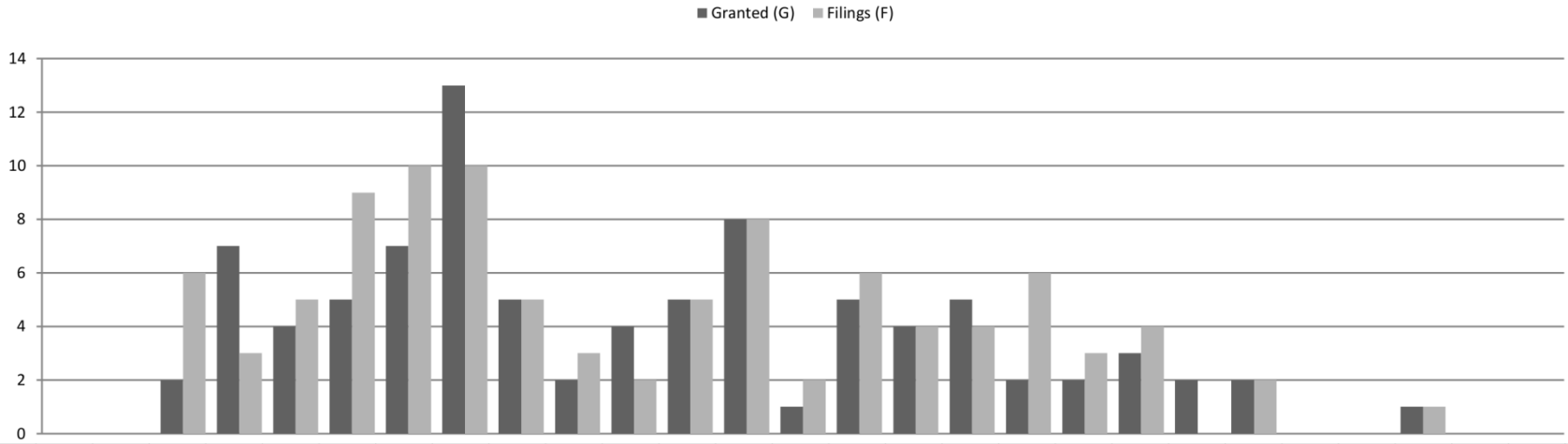
Table A.4. Composition of sauna-heater-related patent filings and grants 1990–2016



Applicant	1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		Total	
	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F
Aurinkokiuas																																																					0	0
Pekka Pirinen																																													0	1							0	1
Designpolis																																																					0	0
Harvia																	0	2	1	0													0	1			1	0			0	1	1	0									3	4
Pertti Harvia	0	1			0	2	1	0	1	0			0	2			2	0			0	1	0	1			0	1	0	1	1	0		1	1	0																	6	10
Helo	0	3	1	0	2	0	1	0	1	0			0	1	1	1	1	0											0	1			1	0																			1	8	7
Kastor																																					0	2	1	0													1	2
Tylö																																																					0	0
IKI-Kiuas																																																					0	0
Jouni Kerrman																																																					0	0
J K Roster																																																					0	0
Kajosauna																																																					0	0
Kauhavan Rauta																																																					0	0
Misa																																																					0	0
Laavukiuas																																																					0	0
Mondex																							0	1			0	2			1	1	0	2			0	1	0	1					1	0							2	8
Narvi									0	1			1	0																																							1	1
Puulämpö																																																					0	0
Sauna-Eurox											0	1			1	0	0	1							1	0																											2	2
Tähtisaunat																																									0	1			1	0							1	1
Tulikivi																																																					0	0
Vuolux																							0	3			1	0																									1	3
Warmheart																									0	1					1	0																					1	1
Reijo Vierimaa																							0	1	1	0																											1	1
Others	2	8	1	6	3	0	5	5	1	7	0	9	2	4	2	10	3	4	3	2	1	4	3	8	5	7	2	0	2	4	2	0	1	3	0	8	0	3	0	1	1	2	1	10	1	3	0	2	0	0	1	4	0	2	42	116
Total	2	12	2	6	5	2	7	5	3	8	0	10	3	7	4	11	6	7	4	2	1	5	3	14	7	8	3	3	2	6	5	1	2	7	1	8	1	6	1	2	1	4	2	10	3	3	0	3	0	0	1	4	0	3	69	157

Notes: Patent filings include patent filings at the EPO filed by Finnish sauna heater producers.

Table A.5. Composition of sauna-heater-related utility model filings and grants 1990–2016



Applicant	1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		Total	
	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F	G	F
Aurinkokiuas																																																							0	0
Pekka Pirinen																																																							0	0
Designpolis																																																							0	0
Harvia																	0	1	1	0																													1	1					2	2
Pertti Harvia							1	1							2	2			0	2	2	0	1	1																															6	6
Helo					2	6	4	0	1	2	2	1	0	5	5	0															1	1																							15	15
Kastor																																			0	1																			0	1
Tylö																																																							0	0
IKI-Kiuas																																																							0	0
Jouni Kerrman																																																							0	0
J K Roster																																																							0	0
Kajosauna																																																							0	0
Kauhavan Rauta																																																							0	0
Misa																																																							0	0
Laavukiuas																																																							0	0
Mondex																							1	1	4	4	0	2	4	2	0	1	1	1				1	1	1	1	0												12	13
Seppo Nikkanen																																	0	1																					0	1
Narvi									1	1																			0	2	2	0																							3	3
Puulämpö																																																							0	0
Sauna-Eurox							2	2	1	1	1	1	1	2	2	2	1	0	0	1	1	0																																	9	9
Tähtisaunat																																																							0	0
Tulikivi																																																							0	0
Vuolux																																											1	1											1	1
Warmheart																																																							0	0
Reijo Vierimaa																					0	1	1	0																															1	1
Others					0	0	0	0	1	1	2	7	6	3	4	6	4	4	1	0	1	1	2	3	4	4	1	0	1	2	1	2	4	2	2	5	2	2	2	3	1	0	1	1									40	46
Total					2	6	7	3	4	5	5	9	7	10	13	10	5	5	2	3	4	2	5	5	8	8	1	2	5	6	4	4	5	4	2	6	2	3	3	4	2	0	2	2	0	0	0	0	1	1	0	0	0	0	89	98

Table A.6. Design rights involved in court cases

Firm	Design registration	Filing date	Publishing date	In force	Opposition	Role
Designpolis	17063	22.12.1993	22.6.1994	31.10.1994-22.12.1998		Evidence of prior art in court.
IKI-Kiuas	20399	13.10.1998	30.10.1998	31.5.1999-		Allegedly infringed by 24926, 24928 and 24739
IKI-Kiuas	22145	29.12.2000	29.12.2000	31.8.2001-29.12.2005		Evidence in court. Obstacle for grant of M20080062
IKI-Kiuas	M20010056	25.1.2001	25.1.2001	not granted		Evidence in court. 20399 obstacle for granting
IKI-Kiuas	22358	27.4.2001	27.4.2001	30.11.2001-27.4.2011		Allegedly infringed by 24739
IKI-Kiuas	23810	8.3.2004	30.3.2004	31.5.2005-		Allegedly infringed by applications of M20080008, 24922, 24926, 24637 and Misa.
Kauhavan Rauta	M20080008	18.1.2008	18.3.2008	not granted		Allegedly infringing 23810, 22511 and 24538
Mondex	24922	6.2.2008	5.6.2008	28.2.2011-	Yes	Allegedly infringing 23810
IKI-Kiuas	M20080062	4.4.2008	30.4.2008	not granted		Evidence in court. 22145 obstacle for granting
Harvia	24926	25.4.2008	16.5.2008	28.2.2011-	Yes	Allegedly infringing 23810
IKI-Kiuas	24511	8.5.2008	15.5.2008	28.11.2008-		Allegedly infringed by M20080008
Harvia	24928	21.5.2008	21.5.2008	28.2.2011-	Yes	Allegedly infringed by 20399
IKI-Kiuas	24538	27.8.2008	31.8.2008	31.12.2008-		Allegedly infringed by M20080008, 24637.
Helo	24637	27.11.2008	27.5.2009	31.8.2009-		Allegedly infringing 23810, 22511 and 24538
Narvi	24739	2.12.2008	31.3.2009	29.1.2010-2.12.2013	Yes	Allegedly infringing 20399 and 22358
IKI-Kiuas	M20090024	12.2.2009	12.2.2009	not granted		Evidence in court. Not granted due to copyright infringement.
Misa						Allegedly infringing 23810, 22511 and 24538

Finnish Sauna and design

Although sauna is such a central part of Finnish culture, the history of Finnish industrial design does not pay much attention to sauna heater designs or designers. A recent history of Finnish design by Korvenmaa (2009, p. 238) explicitly mentions only one sauna heater designer: Jussi Ahola who designed an electric sauna heater for Upo Osakeyhtiö in 1967.[11] In the late 1960s Finnish industrial designers Eero Aarnio[12], Pekka Wikström[13] and Pentti Leskinen[14] also designed sauna heaters. However, at that time Finland did not yet have a design right system in place and these sauna heaters were not design right protected. Recently the use of famous Finnish designers has become more common. Figure A.1 displays examples of traditional Finnish sauna heater designs.

[11] Upo Osakeyhtiö protected a slightly modified version of Jussi Ahola's sauna heater design in 1971 (Finnish design right 268) but Jussi Ahola was not marked as the designer in that application.
[12] No documents of this sauna heater are available but an interviewed industrial designer confirmed this fact, which is also mentioned at the Eero Aarnio exhibition of the Finnish design museum 8.4.2016-25.9.2016.
[13]Source: Finnish Industrial Design Archives http://www.elka.fi/fida/index.php?id=187&page=Pekka%20Wikstr%F6m
[14] Source: Finnish Industrial Design Archives http://www.elka.fi/fida/index.php?id=74

Figure A.1. Finnish sauna heater designs

Note: On the left an electric sauna heater designed by Pekka Wikström for Metos. (Source: Design archive of Finland, year unknown), in the middle an electronic sauna heater designed by Jussi Ahola for UPO in 1967 (Source: Ahola's collection), on the right a wood-burning sauna heater by Mikael Samppa (Misa) (Source: PRH's design right database, Finnish design 405 granted in 1973).

The founder of the sauna heater producer Misa, Mikael Samppa, was one of the first to protect sauna heaters with design rights. On the 15th March 1972 he filed nine sauna related design right applications of which five were sauna heaters (Finnish design rights 404, 405, 406, 407 and 411). All of them were granted but none was renewed after five years and the design rights lapsed in 1977. Another active filer of sauna heater related design right applications in 1970s and 1980s was Niilo Teeri, the CEO of Kastor (see Finnish designs 2586, 2793, 4682, 7289). In total, less than 20 sauna heater and stove related design rights were filed during 1971–1990. Generally, the analysis of Finnish sauna heater related designs reveals that often the CEOs of firms (e.g., Samppa and Teeri) have doubled as designers and continue to do so.

The Finnish sauna heater industry is a mature industry. In 1938 Metos Oy produced the first factory-made electric sauna heater.[15] Some sauna heater producers are multiproduct firms and in addition to sauna heaters sell for instance fireplaces, radiators and vaporizers. Several firms operate also in the industry for sauna construction materials and offer complete "sauna solutions" (in addition to sauna heater also the whole sauna interior including panels, benches, lights, doors and windows) to customers. During the past few decades the industry has concentrated through mergers and acquisitions.[16] Harvia, Helo and Narvi are the three largest companies followed by a dozen of smaller firms. Most firms concentrate on the Finnish market but Sweden, Germany and Russia are also important export destinations.[17]

According to our interviews of sauna heater producers, the larger a firm is the more of its processes are vertically integrated: The smallest sauna heater producers rely on suppliers whereas larger ones produce most of the parts in their own factories. The image of sauna heaters as domestic products is still an important sales argument to Finnish customers, but in fact a large share of sauna heaters sold in Finland are produced abroad. Despite the fact that the Internet has made it much easier to sell products directly to customers, hardware stores remain the main sales channel according to our interviews. Annual fairs (e.g. summer

[15] Metos discontinued sauna heater production in 1983. Source: http://www.metos.com/page.asp?pageid=2,1,4&languageid=EN&title=History Accessed 2.5.2016.
[16] For instance, Kastor has been acquired by Swedish Tylö and Tylö has been merged with Helo and Aitolämpö has been acquired by Narvi.
[17] In addition Sawo is a large Philippines based sauna heater producer, which was established by a Finn.

cottage, interior design and renovation and construction fairs) have traditionally been important forums to launch new sauna heaters.[18]

European standards have become increasingly important push factor for innovating more environmentally friendly sauna heaters. In the European single market sauna stoves are required to have CE (Conformité Européenne) marking since 2013. With the CE marking "a manufacturer declares that the product meets all the legal requirements for CE marking and can be sold throughout the EEA". The European standard (CEN/TC 295/WG 7 Heat storage stoves) covers "appliance construction, performance, (e.g. efficiency and emissions), safety and commissioning requirements, together with their associated test methods and installation and operating instructions". The interviewees had contradictory views on how much the standards affect sauna heater design. One interviewee, who was involved in developing the standard stated that in practice the standards do not constraint design possibilities but focus mainly on fire safety, efficiency and carbon monoxide emissions, while another interviewee claimed that actually standard inhibits design. A few interviewees pointed out that stricter requirements for efficiency and emissions would stimulate innovation.

[18] Interviewed sauna heater producers had contradictory opinions on fairs' current role: some stated that they are still very important forum whereas others did not participate in fairs anymore. For exporting companies, international fairs are important forums to meet trade partners and import agents.

Search algorithms for finding sauna heater or sauna stove related IPRs

All design rights in PRH's design right database in Locarno class 23-03, which product class includes Finnish word "kiuas" in its different inflected forms.

All patents and utility models in PRH's PatInfo database, which were classified into A61H IPC class and the title includes Finnish word "kiuas" in its different inflected forms.

Registered design rights in Designview, which contain "sauna heater" in indication of the product and which territory of protection is "FI" or "EM".

Court cases

Helsinki District Court
Helsingin käräjäoikeus, 3. osasto. TUOMIO Nro 17735. 18.6.2009 08/27922,
Helsingin käräjäoikeus, 3. osasto. TUOMIO Nro 17736. 18.6.2009 08/34254,
Helsingin käräjäoikeus, 3. osasto. TUOMIO Nro 17737. 18.6.2009 08/34255,

Helsinki Court of Appeals
L08/27922 IKI-Kiuas vs. Harvia
L08/34254 IKI-Kiuas vs. Narvi
L08/34255 IKI-Kiuas vs. Mondex

.Event history database

Date	Event
1993	
22th Dec	Designpolis applies for a design right for a sauna stove (17063)
1995	
3rd Mar	Designpolis tries to license its sauna stove design right (17063) to Harvia
1997	
23th Oct	IKI-Kiuas Oy is founded by Jouni Kerrman
15ht Dec	IKI-Kiuas applies its first design right (19914)
1998	
13th Oct	IKI-Kiuas applies for the first design right for a mesh frame sauna stove (20399)
22th Dec	Designpolis's design right 17063 lapses
2000	
29th Dec	IKI-Kiuas applies a design right for a mesh frame sauna heater (22145)
2001	
25th Jan	IKI-Kiuas applies a design right for a sauna stove (M20010056)
27th Apr	IKI-Kiuas applies a design right for a sauna stove (22358)
20th June	PRH rejects IKI-Kiuas design right application M20010056, since it does not differ substantially from IKI-Kiuas's design right 22145
	IKI-Kiuas tries to sell its sauna heater business to incumbents
2002	
	IKI-Kiuas starts to sell sauna heaters at its own store (Saunakauppa) in Helsinki
2004	
	IKI-Kiuas applies a design right for a sauna heater (23810)
2005	
	IKI-Kiuas participates to design fair Habitare 2005
2008	
	Harvia, Mondex, Narvi, Helo, Misa and Kauhavan Rauta enter the mesh frame sauna heater market
18th Jan	Kauhavan Rauta applies for a design right for a mesh frame sauna heater (M20080008)
6th Feb	Mondex applies for its first design rigths for mesh frame sauna heaters (24922, 24923, 24924, 24925)
4th Apr	IKI-Kiuas applies a design right for an advanced mesh frame sauna heater design (M20080062)
25th Apr	Harvia applies for a design right for a mesh frame sauna heater (24926)
16th May	Harvia's design right application 24926 is disclosed
21st May	Harvia applies for a design right for a mesh frame sauna stove (24928)
	Harvia's design right application 24928 is disclosed
5th Jun	Mondex design right application 24922 is disclosed

6th Jun	PRH rejects Kauhavan Rauta's design right application M20080008, since it does not substantially differ from IKI-Kiuas's design right 23810
31st Jul	Kauhavan Rauta appeals to PRH's board of appeals about the rejection of design right application M20080008
8th Aug	IKI-Kiuas makes a claim to PRH that Mondex's design 24922 does not substantially differ from IKI-Kiuas's design rights 22145 and 23810
25th Aug	PRH rejects IKI-Kiuas's design right application M20080062, since it does not substantially differ from IKI-Kiuas's design right 22145
29th Aug	IKI-Kiuas makes a claim to PRH that Harvia's design 24926 does not substantially differ from IKI-Kiuas's design right M20080061
15th Sep	IKI-Kiuas appeals to PRH's board of appeals about the rejection of design right application M20080062
26th Sep	IKI-Kiuas sues Harvia for design right infringement claiming that Harvia is infringing design rights 20399 and 23810
15th Oct	Harvia applies for a design right for a mesh frame sauna stove (24613)
	IKI-Kiuas makes a claim to PRH that Harvia's design 24927 does not substantially differ from IKI-Kiuas's design right 22145
	IKI-Kiuas makes a claim to PRH that Harvia's design 24928 does not substantially differ from IKI-Kiuas's design right 20399 and application M20010056
17th Nov	IKI-Kiuas sues Mondex for design right infringement claiming that Mondex is infringing design right 23810
	IKI-Kiuas sues Narvi for design right infringement claiming that Narvi is infringing design rights 20399 and 22358
18th Nov	Mondex's design right 24922 is registered despite IKI-Kiuas claim
	Harvia's design right 24927 is registered despite IKI-Kiuas claim
27th Nov	Helo applies for a design right for a mesh frame sauna heater (24637)
2nd Dec	Narvi applies for a design right for a mesh frame sauna stove (24739)
2009	
15th Jan	IKI-Kiuas appeals to PRH's board of appeals about the decision to grant Mondex design right 24922
23rd Jan	IKI-Kiuas appeals to PRH's board of appeals about the decisions to grant Harvia's design rights 24926 and 24927
1st Apr	Narvi's design right application 24739 is disclosed
28th May	Helo's design right application 24637 is disclosed
15th Jun	IKI-Kiuas made a claim to PRH that Narvi's design right 24739 is non-novel and should be rejected.
18th June	Helsinki district court rules in favor of defendants Harvia, Mondex and Narvi in design right infringement cases.
31st Aug	Helo's design right 24637 is granted
2010	
29th Jan	Narvi's design right 24739 is granted
28th June	Aurinkokiuas is founded
18th May	Aurinkokiuas applies for its first sauna stove design right (24883)
29th Oct	Aurinkokiuas' design right 24883 is granted

2nd Nov	PRH's board of appels upholds the decision to reject Kauhavan Rauta's design right application M20080008
	PRH's board of appels upholds the decision to reject IKI-Kiuas's design right application M20080062
	PRH's board of appels upholds the decision to grant Harvia's desing rights 24926 and 24927
	PRH's board of appels upholds the decision to grant Mondex desing right 24922

2011

	Tulikivi enters the design sauna heater market
26th Jun	Tulikivi files its first design right application for sauna heaters at OHIM (001884263)

2013

2nd Dec	Narvi's design right 24739 lapses