

JYX



This is a self-archived version of an original article. This version may differ from the original in pagination and typographic details.

Author(s): Heikkilä, Jussi T. S.; Peltoniemi, Mirva

Title: The changing work of IPR attorneys : 30 years of institutional transitions

Year: 2023

Version: Published version

Copyright: © 2023 The Authors. Published by Elsevier Inc.

Rights: CC BY 4.0

Rights url: <https://creativecommons.org/licenses/by/4.0/>

Please cite the original version:

Heikkilä, J. T. S., & Peltoniemi, M. (2023). The changing work of IPR attorneys : 30 years of institutional transitions. *Technological Forecasting and Social Change*, 197, Article 122853. <https://doi.org/10.1016/j.techfore.2023.122853>



The changing work of IPR attorneys: 30 years of institutional transitions[☆]

Jussi T.S. Heikkilä^{a,b}, Mirva Peltoniemi^{c,*}

^a LUT University School of Engineering Science, Finland

^b Jyväskylä University School of Business and Economics, Finland

^c Tampere University, Finland

ARTICLE INFO

Keywords:

Patent attorney
IPR
Small open economy
European integration
Industry dynamics
Institutional change

ABSTRACT

Intellectual property rights (IPR) are at the core of innovation studies. Patent attorneys and other IPR experts play an important role in drafting and filing processes yet we know little of their work. We conduct an exploratory case study to shed light on how IPR attorneys adapt to changes in institutions and competitive environment that overturn the fundamentals of their business. We focus on the sector's evolution in Finland from 1990 to 2020, and analyse the impacts of globalization, European integration, and digitalization. EPC, EUTM, RCD and the London Agreement are identified as significant changes for the industry. IPR register data and expert interviews show that the business has shifted from serving foreign clients filing in Finland to serving Finnish clients filing internationally, increasing the knowledge requirements of local experts. The filing volume has increased due to globalization while billing per filing has decreased. This has triggered the development of consulting services relating to technology strategy. We contribute by analysing the sector's evolution in a small open economy where start-ups typically aim at the global market from the start. Our study also highlights the need to integrate IPR attorneys into the literatures on appropriability and propensity to file.

1. Introduction

Several studies have analysed how innovators adapt to changes in IPR institutions by shifting their filing strategies (Filitz et al., 2015; Hall and Helmers, 2019; Herz and Mejer, 2019). This literature has so far overlooked IPR service firms and how they have adapted to fundamental changes in the institutions that form the core of their business. In this paper, we focus on the evolution of the scale and scope of IPR service firms and their strategies in the face of institutional and technological changes. How do IPR service firms adapt to changes in the institutions and competitive environment that overturn the fundamentals of their business? By integrating the literatures on IPR attorneys and IPR institutions, we shed light on how the work of IPR attorneys changes and how they adapt to the new institutions in practice.

IPR systems are complex and efficient filing requires expertise. The applicants face a make-or-buy decision: to take care of the process by themselves or to outsource that expertise from IPR professionals

(Süzeroglu-Melchior and Gassmann, 2021; Wagner, 2006). This is not a trivial choice: recent research suggests that the likelihood of grants is higher when external experts are used (de Rassenfosse et al., 2023; Heikkilä, 2021), and that filing strategies pursued by external and internal patent attorneys differ (Süzeroglu-Melchior et al., 2017). Moreover, patents filed by external experts tend to accumulate more citations (Baruffaldi and Simeth, 2020). The drawback is that using external experts results in lesser accumulation in the knowledge stock of the inventing firm (Reitzig and Wagner, 2010). If an outsourcing decision is made, the firm still faces the selection of an IPR service firm. This is also a non-trivial choice because patent attorney quality appears more important than invention quality in granting decisions (de Rassenfosse et al., 2023). Despite the importance of the make-or-buy decision, the majority of research on propensity to file, appropriability and patent quality (e.g., Arundel and Kabla, 1998; Cai et al., 2020; Harabi, 1995; Higham et al., 2021; Holgersson, 2013; Hurmelinna-Laukkanen and Yang, 2022) abstract away the crucial role of IPR service firms.

[☆] Heikkilä gratefully acknowledges funding from the Finnish Cultural Foundation/Päijät-Häme Regional Fund/Anja and Jalo Paananen Foundation and the Foundation for Economic Education, Finland (Reino Rossi Memorial Fund). Peltoniemi gratefully acknowledges funding by Research Council of Finland (grant number 342980).

* Corresponding author.

E-mail addresses: jussi.heikkila@jyu.fi (J.T.S. Heikkilä), mirva.peltoniemi@tuni.fi (M. Peltoniemi).

We define the “IPR service sector” to include *the firms whose main business is to provide expert services regarding the filing of IPRs*.¹ We focus explicitly on registered IPR whereas copyright, trade secret and data protection services are beyond the scope of this article. Our empirical analysis focuses on a small open economy, namely Finland. Innovative companies in such small open economies often aim for quick international expansion and hence the expertise to operate with different national and international IPR institutions is central to their success. Finland provides a particularly interesting case because it is among the most innovative countries in the world and has advanced IPR institutions (see Dutta et al., 2021; Park, 2008; Schwab, 2019). Research on industry dynamics highlights the role of institutions – particularly IPR institutions – in determining industry structure, competitive dynamics, and innovation incentives. The IPR service sector is a revelatory case (Yin, 1994), as changes in IPR institutions have very concrete and immediate impacts on the services these firms can sell (scope) and how the revenue potential of different sources changes over time (scale).

Our contribution is threefold. First, we integrate the literatures on IPR services (e.g., Frietsch and Neuhäusler, 2019; Süzeroglu-Melchior, 2017) and changing IPR institutions (e.g., Filitz et al., 2015; Hall and Helmers, 2019; Herz and Mejer, 2019; van Pottelsberghe and Mejer, 2010) to shed light on the effects of institutional changes on the business of IPR service firms. We find that the sequence of institutional changes including Finland's accession to the European Patent Convention (EPC), introduction of EU trademarks (EUTM) and Registered Community Designs (RCD), and the London Agreement have reduced billing per filing and changed the composition of the clientele from serving foreign applicants at the Finnish IPR office to serving domestic clients at international and European offices. This means that changes regarding different filing types form an interconnected sequence of events that have progressively encouraged IPR service firms to seek alternative sources of revenue.

Second, we show that globalization and the decreasing cost of filing have increased the volume of transactions which has, to an extent, offset the reduction of revenue from smaller billing per filing. Start-ups in a small open economy are increasingly born globals and file internationally from the start. Moreover, established firms export far more nowadays compared to the early 1990s. As most countries are small open economies, this perspective adds to the existing literature that has been focused on the perspective and institutions of the largest countries and markets (primarily the US, see Kim and Lee, 2015). The IPR service providers in our sample mostly serve domestic inventors aiming at international markets and non-domestic inventors entering the Finnish market. Their perspective differs from that of US entities whose focus is often the domestic market.

Third, we show that the disappearance of some sources of revenue for the IPR service firms has triggered the development of consulting services relating to technology strategy, IPR strategy and risk management. The purpose of the institutional changes has been to decrease transaction costs for innovators. An unintended outcome has been the development of consulting services for innovators. We have included all major registered IPRs (patents, trademarks, design rights and utility models) into our analysis and this reflects the reality where the majority of IPR service firms offer the full menu. The importance of this is further highlighted by the rise of consulting services as IPR attorneys must have credible expertise in the full spectrum of IPR to sell comprehensive consulting on innovation and commercialization strategy.

We begin by reviewing the literature on IPR service firms and discuss the trends of globalization, European integration, and technological change. Thereafter, we introduce the empirical context. After describing our research procedure, we present our findings and discuss them in

¹ Law firms offering principally conflict resolution and litigation services are excluded. “Advisory activities concerning patents” and law firms represent different industry (NACE) classes.

relation to earlier literature. The final section concludes.

2. Research on and the context of the IPR service sector

2.1. IPR service firms

When companies invest in R&D they choose a strategy for the appropriation of returns, including how to protect the output (cf. Hurmelinna-Laukkanen and Yang, 2022; Teece, 1986; Teece, 2018). Budget permitting, they often contact IPR attorneys. IPR-related investments can be significant and patenting processes may take years (Harhoff et al., 2009; Thumm, 2001), resulting in trust-based, long-term relationships (Süzeroglu-Melchior and Gassmann, 2021).

Companies may decide to acquire the expertise internally or outsource from external experts (Wagner, 2006). This is not simply an economizing decision as in-house experts can help in identifying patentable ideas and managing relationships with external attorneys (Somaya et al., 2007). The tendency to use IPR attorneys varies between IPR types: Applicants are most likely to hire professional representatives for patents, followed by utility models (UM), design rights and trademarks, and individual inventors are less likely to use professional representatives than firms are (Heikkilä, 2021). There are also legal requirements in some jurisdictions for using local IPR professionals, in which case there is no “make” alternative to the “buy” option (Webster et al., 2014).

Research on the outcomes of the make-or-buy decision shows that internal and external patent attorneys pursue different filing strategies. External experts tend to go for a maximization strategy while firms relying on internal expertise draft narrower and more focused patents (Süzeroglu-Melchior et al., 2017). Internal expertise appears to predict better patenting performance (Somaya et al., 2007), yet patent attorney quality seems more important than invention quality in determining granting decisions (de Rassenfosse et al., 2023). Moreover, patent attorneys with higher grant rates in the past may show better performance in the future (Klincewicz and Szumiał, 2022). These findings indicate that IPR service providers and associated make-or-buy decisions play an important role in determining filing and firm-level outcomes.

It should be noted that acting as a patent attorney is a licensed activity in many countries, and hence entry to the sector is regulated. In Europe, attorneys are concentrated in Germany and the UK, probably due to the proximity to the European Patent Office (EPO; Munich) and language advantages (English) (Frietsch and Neuhäusler, 2019).

2.2. Trends influencing the IPR service sector

We have identified three important societal trends that have played a role in the evolution of the IPR service sector during our analysis period, including globalization, European integration and technological change.

2.2.1. Globalization

The period from 1990 to 2020 saw greatly increasing global trade and the emergence of ever more complex value chains. According to the World Trade Organization (WTO), the nominal value of world trade (value of goods exported) grew from \$3.5 trillion in 1990 to \$17.5 trillion in 2020 (WTO, 2022). Globally, IPR filings have increased exponentially in recent decades (Fink et al., 2016; WIPO, 2021). A substantial part of the growth is due to additional filings in other countries (i.e., the coverage of patent families) which highlights globalization as the driver of the trend (Fink et al., 2016).

There are international, regional, and national institutions or “rules of the game” (North, 1991) that each have an impact on industry dynamics. In the context of IPR, changes in national and regional (e.g., European) IPR institutions or international IPR treaties can influence the demand and supply of IPR services. During the 30-year period under analysis, the WTO was established, and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) was signed in 1994.

Since then, the number of trade agreements containing IP chapters and the number of signatory countries have increased, which have contributed to the strengthening and harmonization of IPR systems (Campi and Dueñas, 2019).

The Paris Convention for the protection of industrial property was originally signed in 1883 and has since extended into a treaty between 178 countries as of January 2022.² For trademarks, the Madrid Protocol of 1989 has extended into a filing treaty covering 125 countries in 2021.³ Concurrently, the WIPO-administered Hague System for the International Registration of Industrial Designs has extended to 75 contracting parties covering 92 countries.⁴

2.2.2. European integration

From 1990 to 2020, the number of EU members increased from 12 to 28 and then decreased to 27 due to Brexit in 2020. The long-term trend has been European integration also in the field of intellectual property protection. Table 1 illustrates the evolution of key European and international IPR institutions by showing the accession years for member countries.

The EPO was established in 1977. In 1990 there were 14 member-states and in 2020 there were 38. The Office for Harmonization in the Internal Market (OHIM) was founded in 1994 and its name was changed to the European Union Intellectual Property Office (EUIPO) in 2016.⁵ The first community trademark, “the first pan-European IPR title” (Herz and Mejer, 2019), was granted by OHIM in 1996 and the first community design right application was received at OHIM in 2003. Importantly, EU membership defines the geographical boundaries of EUTM and RCD. The European Union is also a contracting party in international treaties and agreements: the Madrid Protocol since 2004 and Hague Agreement since 2008.

An emerging strand of literature analyses the impact of European integration on IPR filings. Eaton et al. (2004) report that the European Patent Convention (EPC) has led to the replacement of most of the direct applications at national patent offices by a centralized granting process at the EPO. As countries join the EPC, foreign applicants immediately substitute EPO patents for domestic ones, but such a reaction is not found for domestic applicants (Hall and Helmers, 2019). The EU trademark introduction of 1996, on the other hand, benefitted applicants seeking protection in multiple and in smaller EU markets by reducing costs while the demand for national trademarks remained stable after the reform, especially in larger markets (Herz and Mejer, 2019). Filitz et al. (2015) reviewed the use of registered community designs and provided an overview of how RCDs are used by firms from selected industries and countries. Notably, none of these studies considers the role of IPR attorneys in the evolving European IPR environment. Patent attorney firms are, alongside inventing companies, the main employer of patent attorneys that have passed the EPO’s European Qualifying Examination (EQE) and have “the requisite aptitude and knowledge” to represent applicants before the EPO (see also Frietsch and Neuhäusler, 2019).

2.2.3. Technological change

Technological progress has taken leaps between 1990 and 2020. Digitalization has progressed in all industries and acted concurrently as an important enabler of globalization. Paper archives and IPR document libraries have largely been digitized. Consequently, information search costs have decreased substantially (see, e.g., Schaper, 2021). Internet and ICT technologies have enabled digital services. Computers diffused

to all business sectors, cellular phones became mainstream and in the 2000s there was a shift to smartphones. The internet was commercialized in 1995 and fax and paper mail were eventually replaced by emails. More recently, we have been witnessing rapid development in artificial intelligence (AI) and deep learning applications and the automation of information search in the field of IPR (Aristodemou and Tietze, 2018; Choi et al., 2022; Hain et al., 2022). Generally, it seems that digitalization and automation in the IPR service sector have led to skill-biased technological change as ICT capital and specialized software have, thus far, replaced relatively more demand for repetitive low-skill tasks (e.g., payment of renewal fees) compared to high-skill tasks such as drafting patents (cf. Acemoglu and Restrepo, 2019).

2.3. Empirical context

Our empirical analysis focuses on Finland from 1990 to 2020. The beginning of the period saw the end of the cold war, the fall of the Berlin wall, the collapse of the Soviet Union and Finland’s preparation to apply for EU membership. The period of analysis ends with Brexit and the outbreak of the COVID-19 pandemic.

Finland is a small open economy with a population of 5.5 million and a GDP of about €240 billion in 2020. Finland is a particularly interesting case for various reasons. First, it is highly dependent on foreign trade (BOF, 2015). Second, Finland is among the “most innovative countries” according to the WIPO’s Global Innovation Index (Dutta et al., 2021) and among the top countries with respect to protection of intellectual property rights (Park, 2008; Schwab, 2019). The patents per capita figure has been among the highest in the world for a long time. Moreover, Finland has been at the forefront of digitalization and the adoption of digital technologies since the early 1990s.

Finland joined the Patent Cooperation Treaty (PCT) in 1980 (see Table 1). In 2003, the National Board of Patents and Registration of Finland (“the Finnish Patent Office”, *Patentti- ja rekisterihallitus*, PRH hereafter) was appointed as an International Searching Authority and an International Preliminary Examining Authority under the PCT (operations started in 2005) (Löytömäki, 2006).

From the perspective of the Finnish IPR service sector, we may divide the set of institutions and clients into four categories: (1) Finnish clients applying for Finnish IPR, (2) Finnish clients applying for non-Finnish IPR (international or foreign protection), (3) non-Finnish clients applying for Finnish IPR and (4) non-Finnish clients applying for non-Finnish IPR (see the quadrants in Fig. 1).

We aim at shedding light on the industry dynamics of the IPR service sector in the face of institutional and technological change. How do IPR service firms adapt to changes in the institutions and competitive environment that overturn the fundamentals of their business? Particularly, we focus on investigating the scale and scope (“menu”) of services provided by IPR expert firms.

3. Data and method

3.1. Exploratory case study approach

Our objective is to shed light on the dynamics of the IPR service sector in the pressures of multiple concurrent megatrends – globalization, European integration, and digitalization. The “what” and “how” questions call for a qualitative research approach and the nature of this inquiry is exploratory. Since there is very little research on the industry dynamics of the IPR service sector upon which to build, an exploratory case study approach is particularly suitable in this context (Yin, 1994). Our aim is to produce “holistic knowledge that is based on detailed analysis of empirical data rich in context” (Eriksson and Kovalainen, 2012).

Following the best practices regarding case studies (Gibbert et al., 2008; Goffin et al., 2019; Ketokivi and Choi, 2014), we ensure transparency by documenting in detail our information sources, how our

² Paris Convention for the Protection of Industrial Property (wipo.int) Accessed 28 Jan 2022.

³ Madrid – The International Trademark System (wipo.int) Accessed 28 Jan 2022.

⁴ Hague – The International Design System (wipo.int) Accessed 28 Jan 2022.

⁵ Our History - EUTM (europa.eu) Accessed 24 July 2021.

exploratory case study proceeded, and what role each source played in our research process (see Table 2). We use multiple sources of evidence in order to triangulate our observations (Goffin et al., 2019). We also keep observations and interpretations separate in their own sections. We list the identified caveats in a limitations section.

3.2. Methods and information sources

We combine quantitative and qualitative data to document changes over time and to understand their relationships. We use temporal bracketing to provide structure to the study of dynamic elements within temporally organized data (Langley, 1999). Temporal bracketing proceeded through iteration as the most significant institutional changes were identified. Table 2 summarizes our information sources and their uses in the analysis. The analysis of both qualitative and quantitative data collected from multiple sources enables the triangulation and verification of findings (Gibbert et al., 2008; Goffin et al., 2019; Yin, 1994), which promotes the reliability and internal validity of the analysis.

3.2.1. IPR registers

Our quantitative analysis focuses on patent, utility model, design right and trademark register data of Finland. The registers contain information on the professional representatives that have been used in the drafting and filing of IPR applications, which allows us to identify the firms. We complemented the Finnish IPR registers with WIPO's database, EPO's database and EUIPO's trademark and design right databases. We crosschecked the firm list with PRH's professional representative registers, trade registers, attorney registers, and the webpage of the Association of Finnish Patent Attorneys. Finnish legislation regulates the qualifications of professional patent attorneys and hence they show up in PRH's listing. In the Finnish trade register, the focal (NACE) industry class is 69.103 "Advisory activities concerning patents". Firms showing up in the professional representative registers in July 2021 were contacted for interviews, whereas the IPR register data from the period 1990 to 2020 reveal the total population of professional representative firms operating during our study period. In addition, we reviewed the webpages of IPR expert firms in autumn 2021 to document the IPR services they offer (Table A.2 in Appendix A). Concurrently, we collected the publicly available financial statements of the companies from the Trade Register maintained by PRH.

3.2.2. Expert interviews

Semi-structured interviews were designed and conducted after preliminary analyses of the IPR register data. The interview outline is provided in Appendix A. We identified 25 active firms and contacted them in autumn 2021 by email or phone and conducted 14 interviews (remotely online) with CEOs, managers or patent attorneys between August and November 2021 (about 12.5 h in total, 53 min on average). Several of the C-suite interviewees were qualified IPR attorneys. The response rate was 48 % (12/25 as in two cases we interviewed two experts from the same company). All except one of the non-responses were from the smallest firms (1–5 employees). Generally, young and small firms were overrepresented among non-responses, so the interview observations are biased towards the perspectives of larger and older firms. Notably, the interviewed companies represent the vast majority (>90 %) of the sector measured in total turnover and employment. They also handled the majority (>50 %) of IPR filed between 1990 and 2020 at PRH (the majority of the rest were filed without external representative or information is missing). The interviewees' years of experience ranged from five to 40 years and some had experienced the whole 30-year period under study. Interviewee characteristics are provided in Table A.3 in Appendix A.

The interviews were transcribed, and systematic content analysis and coding was conducted by each author separately. The preliminary results and conclusions were presented both in academic seminars and at

an industry event so that both researchers and practitioners had the chance to review, comment on and criticize them. Finally, the draft of the manuscript was shared with the interviewees in early 2022 so they could comment on our observations.

4. Evolution of the Finnish IPR service sector, 1990–2020

4.1. The big picture

Fig. 2 illustrates the trends in patent, utility model, trademark, and design right filings at PRH. Utility model filings remain stable while the other filing types show declining trends. Patent filings at PRH dropped after Finland joined the EPC, which is consistent with Hall and Helmers (2019). Direct trademark filings dropped in 1996 when the EUTM was established and concurrently Finland became a party of the Madrid Protocol and the WIPO's Madrid system for international trademark filings. The drop in national filings following EUTM is in line with Herz and Mejer (2019). Design right filings dropped when the RCD system was introduced in 2003.

Fig. 3A shows that international filings by Finnish applicants have increased in all IPR categories. PCT filings by Finnish applicants peaked in 2012 and thereafter declined significantly. There is also a big jump in EUTM filings from 2014 to 2017. Fig. 3B shows the annual patent filings by Finnish applicants in selected foreign patent offices and the EPO. The big picture is that as international IPR institutions are joined, Finnish inventors quickly redirect their filing activity towards them. The increase in international filings suggests that the demand for international IPR services has grown.

Fig. A.1A in Appendix A depicts the years in which the identified IPR attorney firms were active in the market. After the financial crisis began in 2008 and the London agreement entered into force in Finland in 2011, there has been significant consolidation. Six mid-sized IPR attorney firms were acquired by larger ones between 2011 and 2019. Towards the end, several smaller new firms were established. Concurrently, turnover per unit of labour – a measure of productivity – has fluctuated (Fig. A.1B). These figures show that the IPR service sector is a dynamic industry where a drop in productivity was followed by consolidation and increasing productivity and thereafter there have been new entries.

Table A.4 in Appendix A presents the scope of services of the IPR service firms based on which types of PRH-registered licensed attorneys they employ. There are clearly three categories: (1) companies with only patent attorneys, (2) companies with only trademark attorneys, and (3) companies with patent, trademark, and design right attorneys. The table makes a distinction between industry classes and shows that (1) patent attorney firms (advisory activities concerning patents) seem to provide either a full menu of IPR services or focus solely on patent-related services, and (2) companies in other industry classes (i.e., law firms) seem to focus on either only trademark services, trademark and design services or the full menu of services.

Quotes⁶ from the interviews corroborate the division of labour between patent attorney firms and law firms: the latter are active mainly in trademarks whereas patent attorney firms tend to offer full menu or only patent services. Some interviewees also noted that several of the trademark attorneys in the Finnish law firms were their past employees.

"It has typically been in almost all patent attorney firms 20/80: 20% trademarks and 80% patents."

"For us, and probably for many other firms – except for some units that are part of law firms – it's probably always much less than half [of the revenue] from trademarks. Our ratio is about 20/80."

We reviewed the services offered by the IPR service firms on their

⁶ All interviews were conducted in Finnish and all quotes here were translated into English by the authors. All errors remain ours.

Table 1
EPO members and the evolution of selected European and international institutions.

Country	European institutions							International institutions				
	EFTA	EU	EPO	London Agreement	EUIPO		The United Nations	Intl. patent system	Intl. trademark system*		Intl. design system**	
					EUTMs	RCDs		PCT	Madrid Agreement	Madrid Protocol	Hague Agreement	Geneva Act
Belgium		1957	1977	2019	1996	2003	1945	1981	1892	1998	1979	2018
France		1957	1977	2008	1996	2003	1945	1978	1892	1997	1930	2007
Germany		1957	1977	2008	1996	2003	1973	1978	1922	1996	1928	2010
Luxembourg		1957	1977	2008	1996	2003	1945	1978	1924	1998	1979	2018
Netherlands		1957	1977	2008	1996	2003	1945	1979	1893	1998	1979	2018
Switzerland	1960		1977	2008			2002	1978	1892	1997	1928	2003
United Kingdom	1960-1972	1973-2020	1977	2008	1996-2020	2003-2020	1945	1978		1995	2018	2018
Italy		1957	1978		1996	2003	1955	1985	1894	2000	1987	
Sweden	1960-1994	1995	1978	2008	1996	2003	1946	1978		1995		
Austria	1960-1994	1995	1979		1996	2003	1955	1979	1909	1999		
Liechtenstein	1991		1980	2008			1990	1980	1933	1998	1933	2003
Greece		1981	1986		1996	2003	1945	1990		2000	1997	
Spain		1986	1986		1996	2003	1955	1989	1892	1995	1928	2003
Denmark	1960-1972	1973	1990	2008	1996	2003	1945	1978		1996	2008	2008
Monaco			1991	2008			1993	1979	1956	1996	1956	2011
Ireland		1973	1992	2014	1996	2003	1955	1992		2001		
Portugal	1960-1985	1986	1992		1996	2003	1955	1992	1893	1997		
Finland	1985-1994	1995	1996	2011	1996	2003	1955	1980		1996	2011	2011
Cyprus		2004	1998		2004	2004	1960	1998	2003	2003		
Turkey			2000				1945	1996		1999	2005	2005
Bulgaria		2007	2002		2007	2007	1955	1984	1985	2001	1996	2008
Czech Republic		2004	2002		2004	2004	1993	1993	1993	1996		
Estonia		2004	2002		2004	2004	1991	1994		1998	2003	2003
Slovakia		2004	2002		2004	2004	1993	1993	1993	1997		
Slovenia		2004	2002	2008	2004	2004	1992	1994	1991	1998	1995	2003
Hungary		2004	2003	2011	2004	2004	1955	1980	1909	1997	1984	2004
Romania		2007	2003		2007	2007	1955	1979	1920	1998	1992	2003
Iceland	1970		2004	2008			1946	1995		1997	2003	2003
Lithuania		2004	2004	2009	2004	2004	1991	1994		1997	2008	2008
Poland		2004	2004		2004	2004	1945	1990	1991	1997	2009	2009
Latvia		2004	2005	2008	2004	2004	1991	1993	1995	2000	2005	2005
Malta		2004	2007		2004	2004	1964	2007				
Croatia		2013	2008	2008	2013	2013	1992	1998	1991	2004	2004	2004
Norway	1960		2008	2015			1945	1980		1996	2010	2010
North Macedonia			2009	2012			1993	1995	1991	2002	1997	2006
San Marino			2009				1992	2004	1960	2007	2019	2019
Albania			2010	2013			1955	1995	1995	2003	2007	2007
Serbia			2010				2000	1997	1992	1998	1993	2009
European Union										2004	2008	2008

Notes: The list is intentionally limited to countries that are members of the EPO and sorted by accession year. The list of international treaties is non-exhaustive due to space limitations. Several important international contracts such as the Paris Convention (since 1883, Finland joined in 1921) and the TRIPS agreement (since 1995) are excluded. Most recently, the Unitary Patent system and the Unified Patent Court started on 1 June 2023 with Finland and 16 other EU Member States participating. See WIPO Lex for detailed country-specific information: <https://www.wipo.int/wipolex/en/index.html>.

Shaded values indicates joining year to EPO shaded as countries included in the table due to EPO membership.

webpages (see Table A.2 in Appendix A). This provides an understanding of the variability of scope across the companies. All companies provided services in patent filing and prosecution and >80 % of companies also offered services related to filing and prosecution of trademarks, design rights and utility models. More than half of the companies offered services related to domain names. Of other selected services, freedom-to-operate (FTO) analyses, novelty and/or prior art searches, and support in oppositions, appeals and invalidations were offered by >70 % of companies.

Fig. 4A shows that around 90 % of Finnish patent filings have information on representatives throughout the period. Fig. 5 suggests that

the EPO filings with a named Finnish professional representative increased strongly early on, followed by a slump and a new peak in 2013. Towards the end, the share of foreign applicant EPO filings with named Finnish representatives has increased.

Fig. 4B presents the decreasing trend in the utility model filings since the system was introduced in 1992. The share of UMs with named representative has ranged between 50 % and 70 %. As Finnish applicants have reduced filings, the share of UM filings by foreign applicants has increased from 1 % in 1992 to 7 % in 2020 (non-resident applicants must use a Finnish professional representative when filing UMs at the PRH). The interviewees saw UMs as playing only a minor role in their business,

		<u>IPR institution</u>	
		National / Finnish	International / Non-Finnish
<u>Client</u>	Resident / Finnish	1) Patent, utility model, trademark, design right	2) EPO patent, EUTM, RCD, PCT, Hague, Madrid, national filings in foreign countries
	Non-resident / Non-Finnish	3) Patent, utility model, trademark, design right	4) EPO patent, EUTM, RCD, PCT, Hague, Madrid, national filings in foreign countries

Notes: Authors' illustration.

Fig. 1. IPR filing-related services categorized by IPR institution and client types. Notes: Authors' illustration.

their main use being in faster protection and a fall-back option for failed patenting:

“Even if protection in Finland would suffice, it's preferable to apply first a patent and, if that fails, then apply for a utility model. Or alternatively to use a utility model as a quick protection method during the patent application process.”

“...we began several times by first quickly filing a utility model and then continued the patenting process.”

“...it is typically very small client firms that use utility models – those that want some kind of protection in Finland.”

Even though the volume of UM filings is small, the firms keep this expertise in their menu of services because UM filings may be a part of a client's IPR strategy despite patents being the primary concern.

For the IPR attorney firms, the big shock relating to trademarks was the EUTM in 1996 and relating to design rights the RCD in 2003. The EUTM and the RCD significantly reduced the cost of obtaining EU-wide trademark and design right protection (Filitz et al., 2015; Herz and Mejer, 2019). A significant development in trademarks is the increasing use of law firms instead of patent attorney firms. Fig. 6A and B show that the introduction of EUTMs and RCDs has led to a decrease in demand for professional representatives in filings at PRH. Prior to EUTMs, over 90 % of filings at PRH had a named representative, which has dropped to <30 %. For design rights, the decline has been even more dramatic, with only 10 design right filings at PRH with a named representative in 2020. It should be noted that as a consequence of EU-wide EUTMs and RCDs, the aggregate number of trademarks and design rights in force in Finland has multiplied between 1990 and 2020. While Fig. 6A and B show a significant increase in EUTM and RCD filings by Finnish applicants, we unfortunately do not know in how many of these IPR service providers were used.

4.2. Period 0 (1990–1995): preparation for EU membership

During the early nineties, the focus was on anticipating Finland joining the European Union. IPR professionals saw that EU membership would trigger joining international and European IPR treaties, and that would change the fundamentals of their business.

“...we tried to increase the market share among domestic clients. It was a clear investment as we knew – or there was a fear – that when Finland joined the EU, membership in the European patent system EPC would follow as a side product. And that would mean the amount of direct national filings by foreign applicants would collapse because they would use the EPC system and filings would come via the European Patent Office. And that is obviously a dramatic change to business when previously

it was some 80% of work related to filings by foreigners and we had to turn things totally around.”

This fear became reality as Finland joined the EU in 1995 and the EPC in 1996.

In 1992, Finland introduced a utility model system, a protection method particularly appropriate for small inventions and inventors. The Nordic collaboration in the development of IPR systems diverged in this case as Finland and Denmark introduced utility model systems whereas Sweden, Norway and Iceland did not.

4.3. Period 1 (1996–2003): EPC and EUTM

The main changes during the first period were EPC, EUTM and the adoption of computers and the internet. At the beginning of 1990, there were about 15,000 patents in force in Finland (see Fig. A.2 in Appendix A). After Finland joined the EPO in 1996, the number of patents in force exceeded 20,000 in 1998, 30,000 in 2003, 40,000 in 2006 and 50,000 in 2017. The trend in the number of direct national patent filings has been decreasing since the early 1990s. In 1990, about 6500 domestic patents were filed at PRH, whereas in 2020 only about 1700 (see Fig. 7A).

During the first period, the main source of revenue for the Finnish IPR service sector was foreign applicants filing for Finnish patents at PRH, and this business all but disappeared with EPC accession in 1996. We see this shift in Fig. 7A and B. The interviewees reported that this shift was a major challenge for the survival of their firms as they had to find other sources of revenue.

EPO validations in Finland became the new revenue stream which entailed translating the patent documents to Finnish and/or Swedish. Our informants reported that these translations were a very lucrative business. When the London agreement entered into force in Finland in late 2011, this obligation was lifted, which had a significant negative impact on some companies' business and turnover.

“[X] said once, when the London Agreement was coming, that they've made a calculation by reviewing financial statements of patent attorney firms and estimating their profits, and it seems that the London Agreement will wipe out the industry's profits. So, the margin from translation services was about equal to the industry's profit. The impact has been that the profit had to be found somewhere else. That's more based on billing hours and the price of labour has maybe increased. And there has been streamlining as well. Some have succeeded better than others and some firms got into trouble.”

EUTM had a significant negative impact on the national trademark system, at least from the Finnish IPR service sector's business perspective. Foreign trademark applicants at PRH had to use a Finnish IPR service firm and this business reduced significantly after 1996. Filing at

Table 2
Information sources and use in the analysis.

Information	Sources	Use in the analysis and triangulation
IPR experts, registered IPR attorneys	IPR expert registers of PRH, EPO, EUIPO/eSearch	Identify population of the Finnish IPR expert firms and their accredited professional representatives
Public company and financial information	PRH/Finnish Trade Register Websites of the IPR expert firms	Identify population of the Finnish IPR expert firms and their CEOs; track company performance; identify M&A's Identify offered IPR services. Identify M&A. Cross-check company information.
Confidential semi-structured expert interviews	IPR expert firms (mainly CEOs and patent attorneys)	In-detail qualitative information on the evolution of the industry and the impact of globalization, European integration and digitalization on each interviewed company and the industry. Cross-check events. Triangulate information from IPR filings data and interviews.
IPR filings data		
Finnish patents and utility models	PRH, WIPO IP Statistics Data Center	Track filing activity and the use of IPR firms as representatives
Finnish trademarks	PRH, WIPO IP Statistics Data Center	Track filing activity and the use of IPR firms as representatives
Finnish design rights	PRH, WIPO IP Statistics Data Center	Track filing activity and the use of IPR firms as representatives
European patent filings by Finnish applicants	EPO, WIPO IP Statistics Data Center	Track filing activity and the use of IPR firms as representatives
European patents validated in Finland	PRH	Track filing activity
Registered community designs (RCDs)	EUIPO, DesignView	Track filing activity and the use of IPR firms as representatives
European trade marks (EUTMs)	EUIPO, TMView	Track filing activity and the use of IPR firms as representatives
Filings by Finnish applicants abroad	WIPO IP Statistics Data Center, EPO, EUIPO	Track international filing activity of Finnish applicants
International patent (PCT), trademark (Madrid) and design right filings (Hague)	WIPO IP Statistics Data Center, PRH	Track aggregate filing activity in Finland.

EUIPO was cheaper than at PRH, which reduced the size of transactions, but the lower cost encouraged a larger number of filings. As no requirement for using a Finnish expert remains, there is international competition for this business.

“On the other hand, EUIPO has had a significant impact: filings from foreigners disappeared, in practice. Of course, international companies will file, if they want brand protection in Finland – or only few will have protection only in Finland – so the trademark filings to Finland are filed via EUIPO, in which case there is less market for us.”

“Also, in the field of trademark, the difference is quite glaring, few companies used to protect national trademarks as it was so damn expensive. Now we have both – it has been this globalization or European integration there – EUIPO services, the trademark is insanely cheap but similarly design right is incomprehensibly cheap. In principle, it lowered [our margins per unit but] now there are more filings. The design right, it's not so big business, but it is often a very important addition to the protection.”

The 1990s also saw the adoption of computers and the internet. Several interviewees described how the industry adopted email in the early 1990s. Concurrently, the digitization of IPR databases from paper libraries to CDs and DVDs to on-demand open access online databases has dramatically reduced IPR information search costs, for instance, in the case of prior art searches. Communication between attorneys, clients and IPR offices has become smoother as it has shifted from paper, fax and face-to-face meetings to emails and, most recently during the COVID-19 pandemic, to remote online meetings. Quotes from the interviews illustrate the reality of the 1990s.

“It used to be an asset in the early 1990s if you knew someone's fax number via which you could make things happen.”

“[In the past] we tried to find those official documents with cats and dogs⁷ and in each binder there were all the documents related to a specific case. And these folders were circulated between attorneys and assistants and in the worst places [in early 1990s] those documents were still written using

typewriters. In principle, everything was on paper and everything was sent in paper format, either using traditional letter mail or using fax. Even Telex was used in some cases.”

4.4. Period 2 (2003–2011): RCD

The main changes during the second period were the RCD, globalization among client firms, and the full adoption of e-filings at IPR offices. The creation of the RCD in 2003 led to a collapse in design right filings at the PRH as shown in Figs. 2 and 6A.

“[For us] the role of PRH has decreased as large companies file directly at EPO and EUIPO, and that has killed the Finnish design right, I mean design filings, collapsed them.”

“...in the field of design rights, after the European system was introduced, probably very few will ever file Finnish design right applications.”

Paradoxically, globalization has made the business more international while reducing business with non-resident clients. The majority of clients want to file internationally, but very few international clients file at the PRH anymore. The globalization trend of increasing exports shows up in the internationalization of the IPR service providers' clientele. In the 2000s, an increasing number of companies are “born globals” – that is, their business is planned as international and export-oriented from the start. This also means that the IPR attorneys have had to learn to increasingly operate with foreign and international IPR systems.

“As a consequence of globalization, the world has become smaller meaning that an increasingly large share of Finnish companies – particularly increasingly smaller companies – target international markets from the start and it's not anymore so Finland-centric.”

“That [globalization] has had such an impact in the longer run that Finland is not anymore an important market for several of our clients. If in the distant past this patent attorney work [and IPR protection] was very Finland-centric and it sufficed to have some elementary knowledge of Finnish IPR practices, then now it can be – and large share of our clients are Finnish – that the Finnish market is not anymore relevant. And then the Finnish patent has little importance. So, the impact of globalization has been that clients' markets are now more global and to benefit from

⁷ Looking for something with cats and dogs is a Finnish expression meaning an intensive search for something that is hard to find.

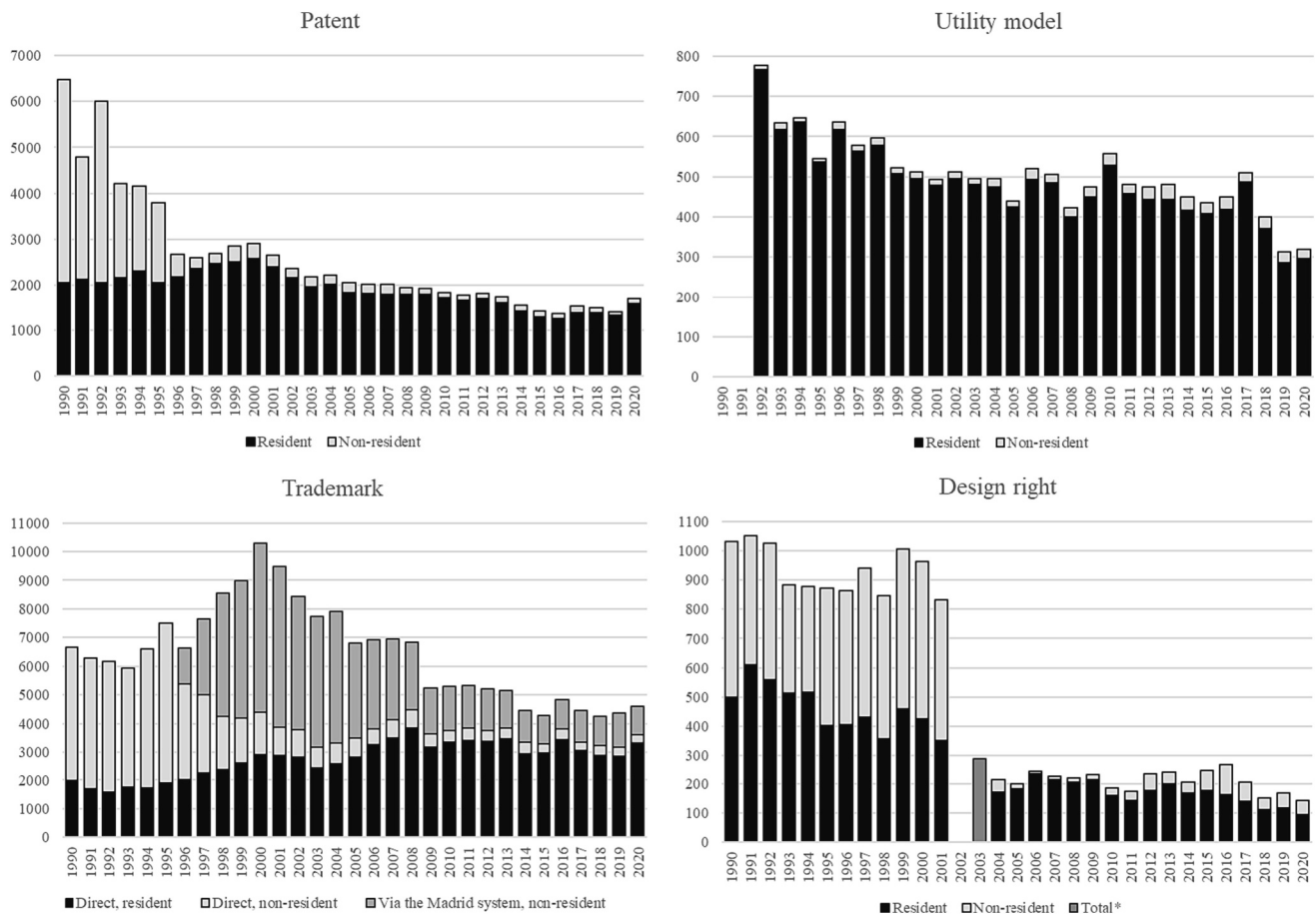


Fig. 2. IPR filings and registrations at the Finnish patent office.
 Sources: Patents: PRH; Others: WIPO IP Statistics Data Center (updated Nov 2021). For UMs, filings include both direct and PCT national phase entries. For trademarks, there are over the period 17 Madrid system filings by residents, which are not reported in the figure. *Design right filings include both direct filings and filings via Hague system. Information is missing for year 2002 and for 2003 there is no distinction between resident and non-resident filings.

patenting, the [IPR] expertise should be market-based, not based on the country of location of the company.”

Fig. 8 illustrates the digitalization development at EUIPO and in PCT filings from the perspective of Finnish applicants. During this period there was almost complete transition to e-filings, represented by a steep S-curve, which has further reduced transaction costs and hastened filing processes.

4.5. Period 3 (2011–2020): London agreement

The main changes during the third period were the London agreement and automation in renewal fee services and translations. Several interviewees referred to translations as a lucrative business, and the London agreement eliminated that business. This forced the firms to search for other sources of revenue.

“The whole industry changed completely as before [EPC] there was a secure livelihood [for firms in the industry] as foreigners were legally obligated to use a Finnish patent attorney when applying for a Finnish patent. And then when the new system came where applications are processed at the EPO and they are just validated in Finland ... that was also very profitable for the industry as less expert work was required in the translation of the patent. But then came the London agreement which took away the last ‘easy money’. These all derive from globalization since we need unified legislation, common rules of the game and lighter cost structure so that we can get IP protection for a wider geographic scope.”

As other sources of revenue, many firms have developed consulting

services relating to technology strategy, risk management and business model development. Some interviewees reported that their business used to be based on distinct transactions relating to filings, and this has changed as a wider offering of interconnected services is made available and IPR attorney firms aim at partnering with clients in a more strategic role.

“And this business has changed, modernized...there is consulting work and such increasingly.”

“The role of legal organization in business increases, consulting services are increasing constantly. So, a company's IPR environment, in these global changes and the changing competition, [leads to a situation where] services are bought regardless of location. It complicates things, and of course increases the opportunities...A lot of opportunities are still unexploited. As such the industry was very registration oriented in the 1990s. Now, there is more talk about consulting as the consulting role has grown to the front and centre...Now, we talk a lot about licensing, monetization, risk management.”

The law reforms had the effect of increasing competition between the firms as foreign clients no longer filed in Finland and the London agreement reduced the translation business. However, for the most part, international competitors have not entered Finland. Relationships with them have remained collaborative and stable.

“It should be noted regarding the toughened competition that surely it has toughened in Finland because first the need for subsequent filings was removed, and then there was no more need for [translations], and then

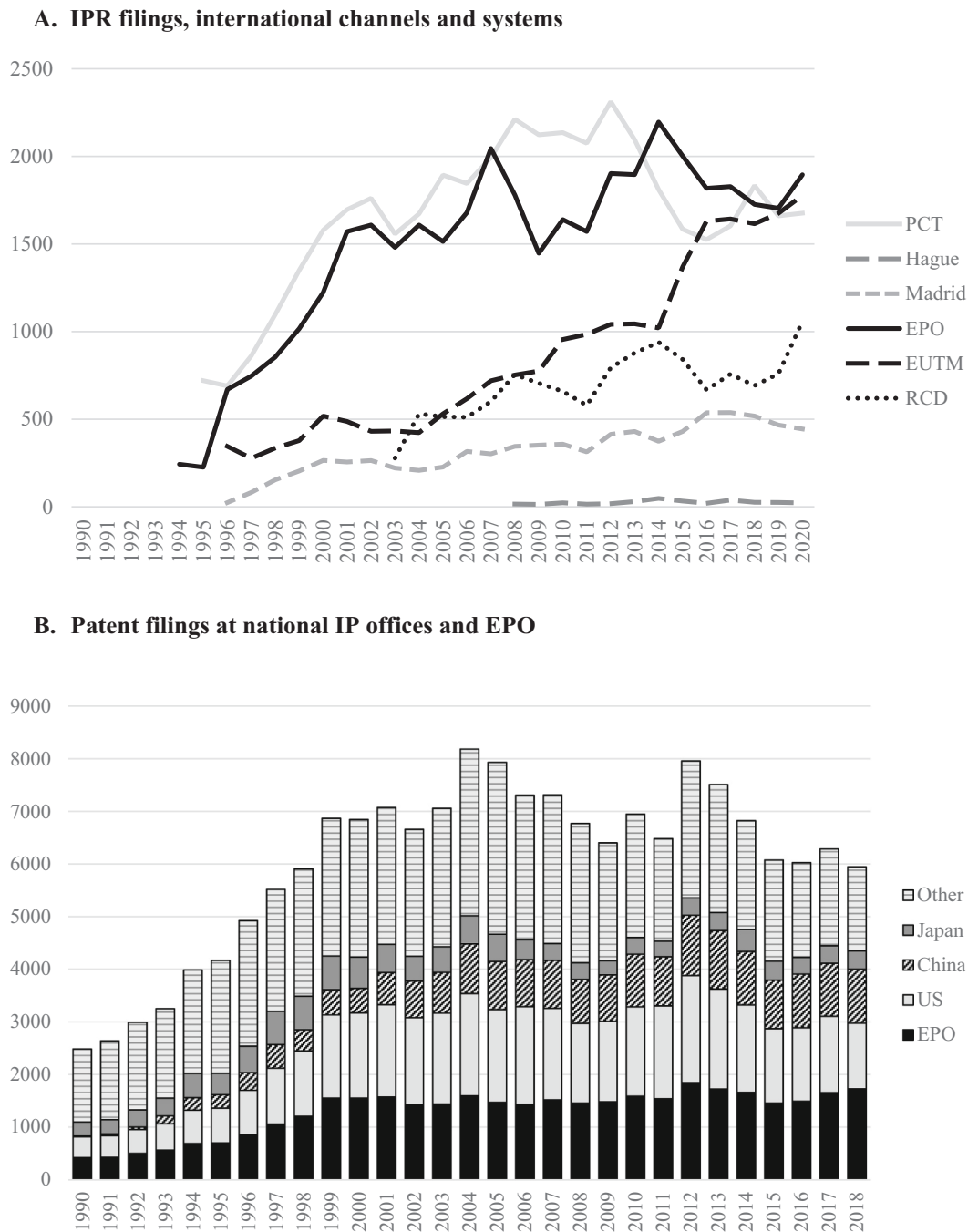


Fig. 3. International filings by Finnish applicants.
 A. IPR filings, international channels and systems.
 Sources: WIPO IP Statistics Data Center: PCT, Madrid, Hague filings, EPO filings (direct and PCT national phase entries); EUIPO: EUTMs and RCDs. EPO filings include “Euro-PCT” filings (cf. [Frietsch and Neuhausler, 2019](#)).
 B. Patent filings at national IP offices and EPO.
 Source: WIPO IP Statistics Data Center, Indicator: Foreign-oriented patent family by origin and destination office.

next everything that is related to validation will go away when the Unitary Patent comes. So, the competition is tougher than before, for sure.”

“The collaboration with [foreign] attorneys has been similar since 1990. Of course, the tools are different, no more fax and no more letter post but the modes of collaboration are very much the same. But the competition in our industry has changed so that there are these globally operating, particularly law firm chains...which have their own offices in practice in almost all countries around the world.”

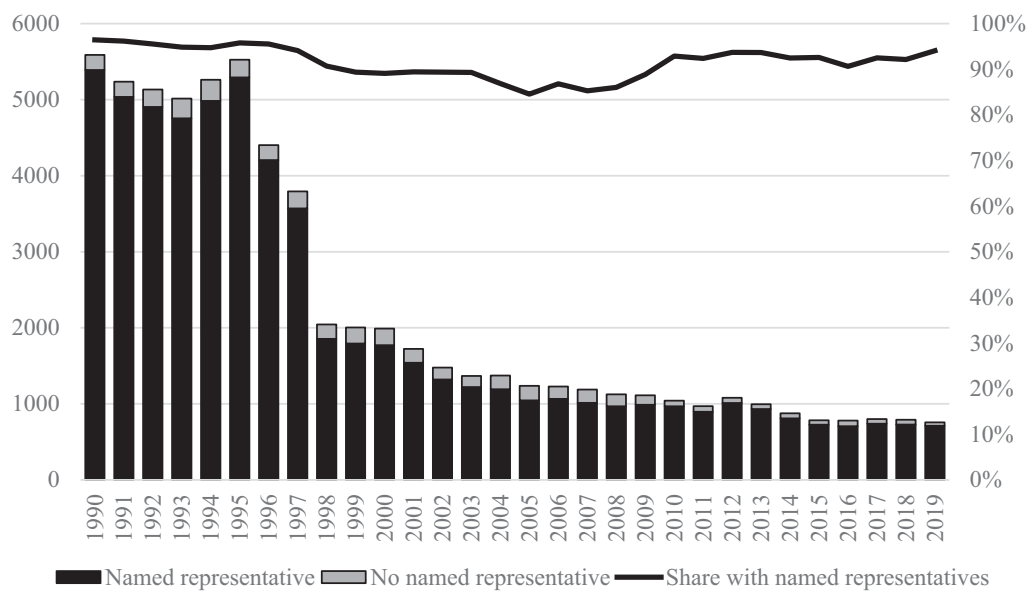
One factor limiting competition appears to be the trust-based long-

term relationships that IPR attorneys have with their clients.

“These customer relationships are very much based on personal relationships. So, thinking that obtaining other firms’ existing clients in significant numbers via marketing is probably not going to work in this type of competitive environment.”

Digitalization has led to decreased search costs and exploded the amount of prior art accessible to the IPR service firms. The possibility to use machine translations from Japanese, Korean and Chinese documents was also mentioned by some interviewees as an important development.

A. Patent filings at PRH



B. UM filings at PRH

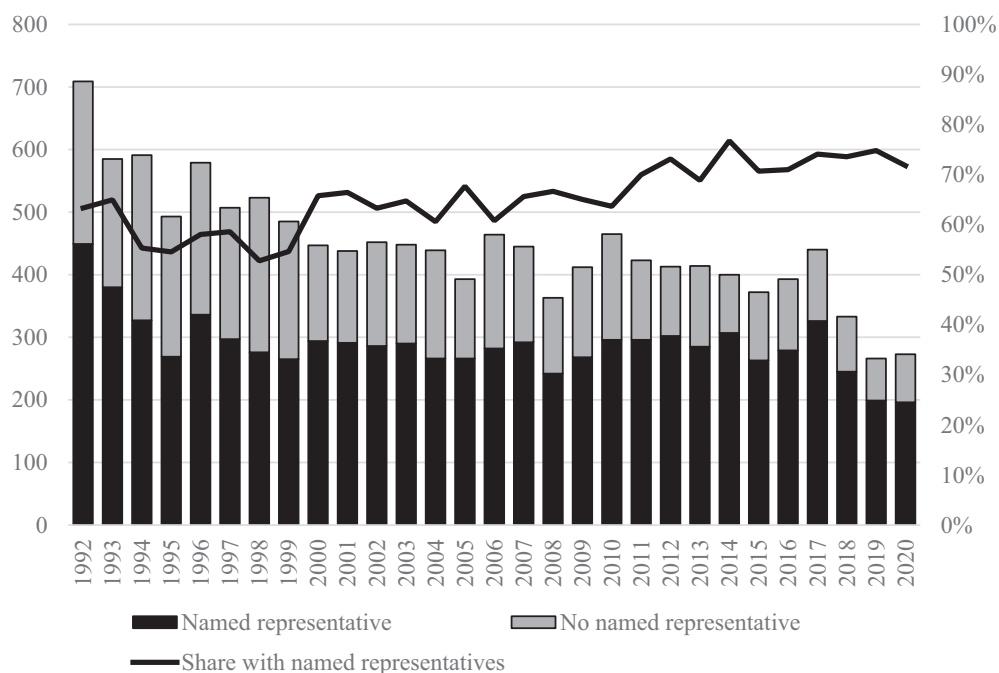


Fig. 4. Patent and UM filings at PRH and use of representatives (sources: PRH).

“This [digitalization] has been an incredible change as the availability of information is at a totally different level than in 1990 when there was not even internet subscription for consumers. The patent attorney work used to be more unhurried and also of much lower quality.... That if in 1990, you were drafting a patent application, then what was the amount of information where you could search for or compare what is prior art. You probably did not have access to more than 90% of global prior art. And now you have access to everything. And machine translations are another big development trend.... In practice, one can operate in English quite

well. This has been such a big disruption that it overshadows many other developments.”

While digitalization has provided new opportunities to the Finnish IPR service sector, several interviewees on the other hand noted that international renewal fee companies had taken that part of their business. Renewal fees have been a stable source of revenue, but these new efficient, automated service providers have taken that business and IPR attorney firms for the most part have not developed competing services.

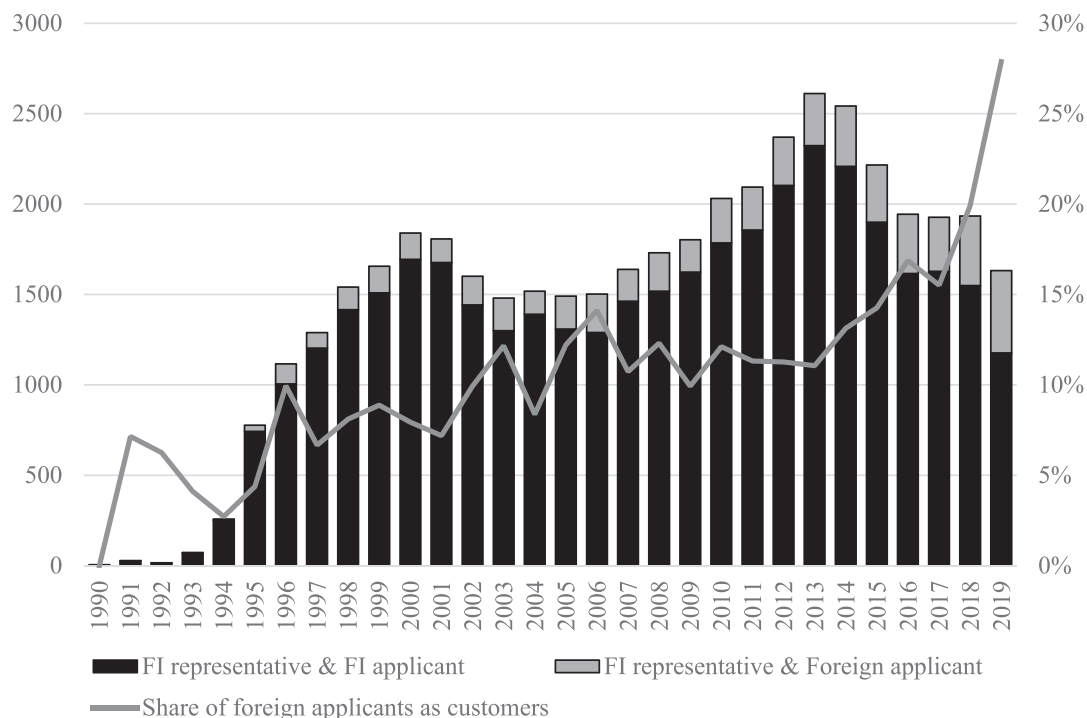


Fig. 5. EPO filings with Finnish representatives. Sources: EP full-text search online, accessed 13 Dec 2021.

“Renewal administration business. It’s where these global players have taken a piece of the value chain, which is completely standard, and digitalized and make high margins there.... We have given up this work in our industry.”

“And as a consequence of digitalization and internationalization these global players in the renewal administration business... [Renewals] were still in the 1990s and early 2000s a part of our business but these new players simplified the processes and digitalized them, reducing billable work in the industry.”

At the end of the period under analysis, COVID-19 forced remote oral hearings at the EPO, which further promoted digitalization and “death of distance” in the IPR service sector. This also decreased further the advantage of companies that are physically closer to the EPO in Munich relative to Finnish patent attorney companies.

“When the EPO decided to rely on video conferences in the case of oral hearings, the physical location became an even less important factor than before...in five years, it certainly will not matter where the work is physically done, in which case the northern location of Finland will no longer be a disadvantage but rather [an advantage] since we have a level playing field with others. Finland is a country of good ICT networks and currently we have been able to utilize them more efficiently than many others, which has been visible during the COVID era.”

4.6. The future of IPR services

Most of the interviewees considered the industry’s future to be stable or positive. Unitary Patent, Unified Patent Court, AI and a lack of new experts entering the industry were highlighted when the interviewees were asked about important factors potentially impacting the industry’s future. Several interviewees mentioned the European Unitary Patent and the Unified Patent Court as potential next big shocks from the point of view of European integration. They may have significant impact on the industry and more generally on the IPR know-how in Finland. SMEs

might be handicapped in the new environment according to some interviewees.

“If the UPC materializes and works well, then it maybe increases the value of patents in Europe. But if there is no development, then the role of Europe – and of course it also depends on the development of European economy compared to the US and China – will diminish. And if [Europe] makes decisions that these [IPR] function slowly and all the processes are slow, then it might be that the European patent is not so interesting. I do not believe in any rocket-like development in any direction. The role of Finland, I’d guess, will just get smaller due to this globalization as we have always been a relatively small market.”

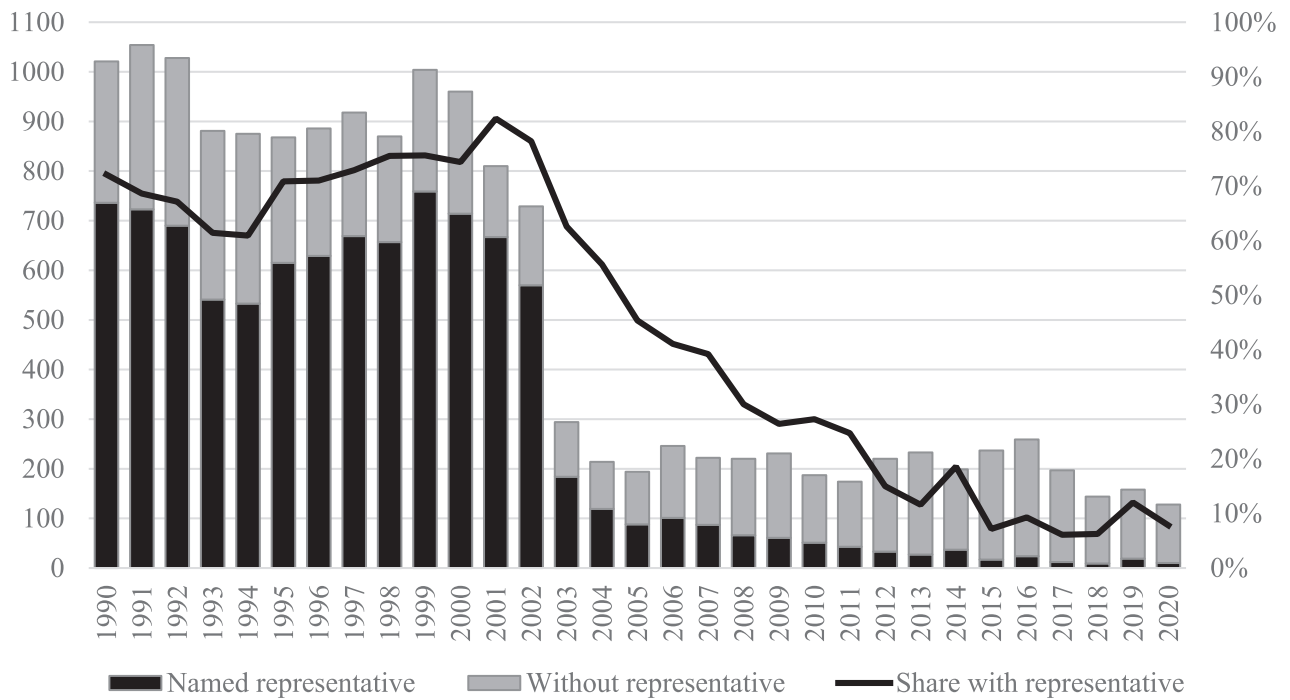
The adoption of new AI solutions and further automation were seen as potential disruptive factors.⁸ Some interviewees expected that the industry will shift more towards consulting and legal services as more and more traditional tasks of IPR firms get automated and as filing of IPR has become simpler and less time-consuming due to digitalization. Some of the larger companies have hired more lawyers to improve the legal services offering and complement filing-related services. Hence, it seems that the service menu of patent attorney firms (“Advisory activities concerning patents”, NACE 69.103) increasingly overlaps with more traditional law firms (Legal representation activities NACE 69.101 and Legal advisory activities 69.102):

“Everything that can be automated, will be automated.”

“I believe that we will continue this hyper leap with faster steps and artificial intelligence will enter all industries. It is visible for us in these information searches where one can train AI easily as there is a lot of training data available...and it will make things easier. I don’t believe it

⁸ According to some of the interviewees, EPO, EUIPO and WIPO had done important modernization work and PRH follows the standards set by EPO and EUIPO.

A. Design filings at PRH (incl. via Hague system)



B. Trademark filing at PRH (incl. via Madrid system)

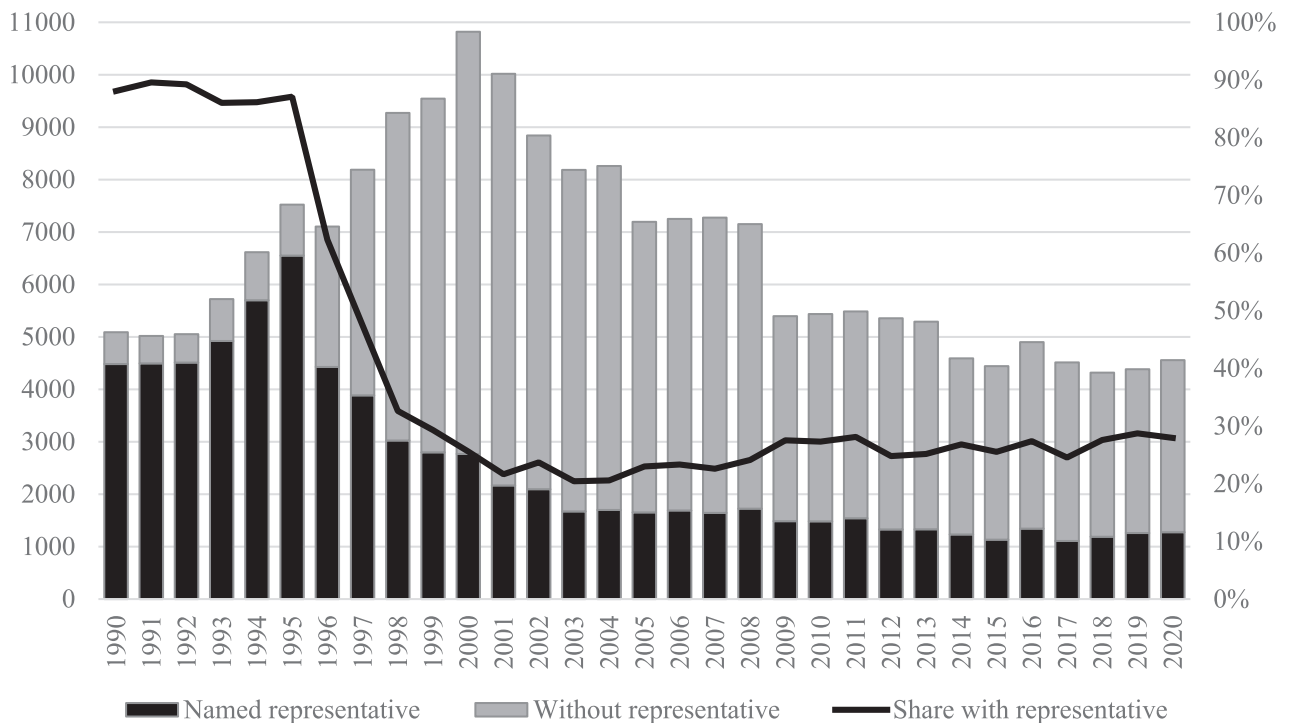
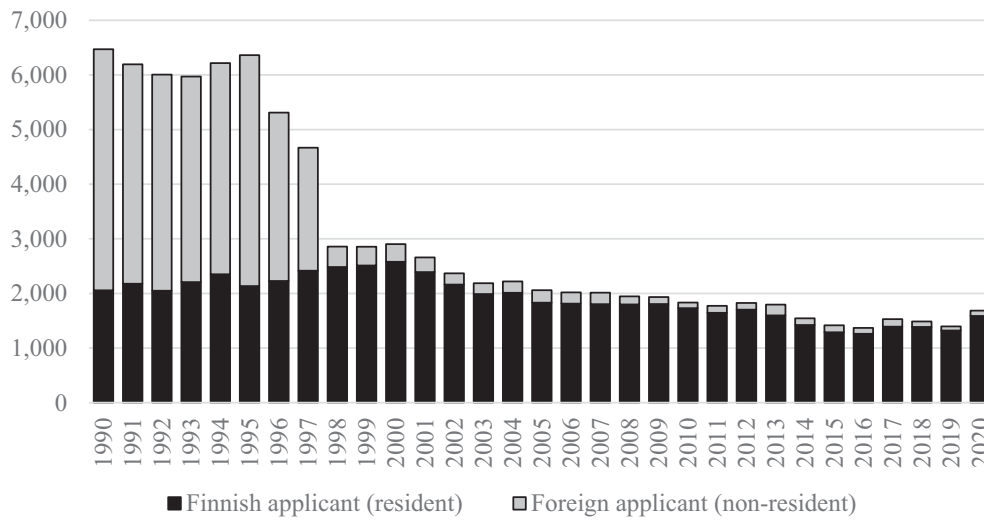


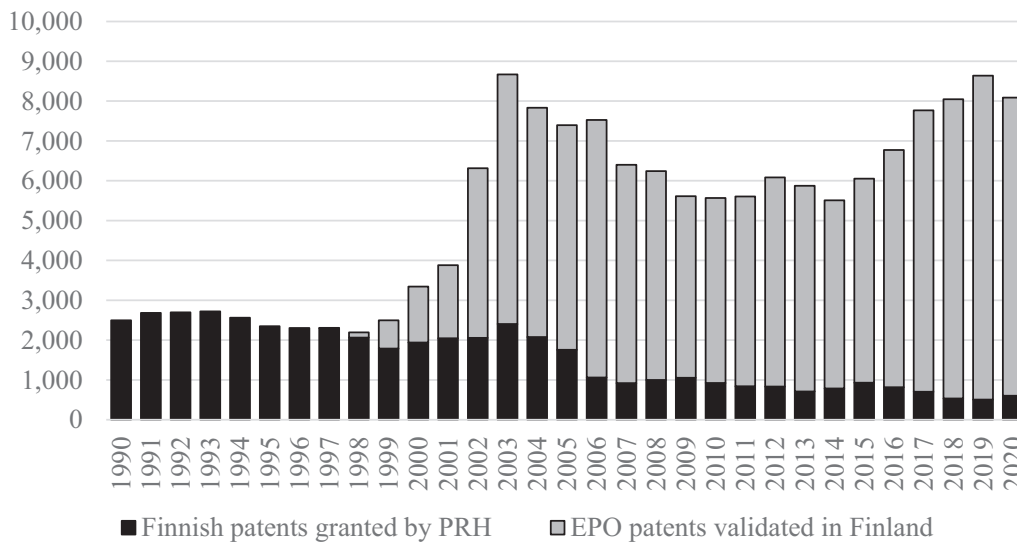
Fig. 6. Design right and trademark filings at PRH.
 A. Design filings at PRH (incl. via Hague system).
 B. Trademark filing at PRH (incl. via Madrid system).
 Source: PRH (Trademark Information Service and Design Information Service). Data collected in December 2021.

A. Finnish patent applications at PRH by applicant type



Source: PRH. NB: The numbers somewhat differ between PRH and WIPO.

B. Patents granted and validated in Finland



Source: PRH.

Fig. 7. Patent applications, grants, and validations at PRH.

A. Finnish patent applications at PRH by applicant type.

Source: PRH. NB: The numbers somewhat differ between PRH and WIPO.

B. Patents granted and validated in Finland.

Source: PRH.

will remove anything. Rather it eases some phases and adds value when we can maybe do increasingly efficient information search."

"The [IPR service firms] will increasingly focus on selling expertise. The role of expertise will just increase...But I think that in the field of interpreting the law and in legal disputes...when we have more information than before to argue and dispute about, then the conflict resolution will

become even harder. And the role of experts will be more important therein."

"...they [law firms] have also hired trademark attorneys or experts. And then there is the legal side, which thus far has been offered by only a couple of firms, maybe it is also expanding."



Fig. 8. Adoption of electronic filing by Finnish applicants.

Sources: EUTM and RCD data: EUIPO Statistical travel pack by country/territory, 01/1996 to 07/2021 Evolution, Finland. PCT: WIPO IP Statistics Data Center. *WIPO's PCT-EASY electronic filing alternative was available since 1999 but is not considered here “fully electronic filing”.

Finally, some concerns were expressed regarding the future of the industry. There were about 200 qualified European patent attorneys in Finland as of 2021.⁹ Are there enough investments to educate the new generations of IPR experts in the environment where international competition is getting tougher?

5. Discussion

5.1. Industry dynamics and their drivers in the IPR service sector

Figs. 9, 10 and Table A.5 (Appendix A) summarize the institutional and technological changes and observed industry dynamics concerning the IPR service sector. We may distinguish four interacting trends. First, joining international and European IPR systems, including EPC, EUTM, RCD, and the London agreement, have had major impacts on the scale and scope of IPR services. National filings at PRH have collapsed and filing activity has shifted towards the international or European offices. This is in line with Hall and Helmers (2019), Herz and Mejer (2019), and Filitz et al. (2015). What has not been documented before is that these shifts have resulted in smaller filing-related transactions for the IPR attorney firms and a change in the composition of their clientele. The purpose of the institutional changes has been to reduce transaction costs for inventors and hence encourage innovation and markets for technology. The outcome is that the “billing per filing” has also decreased for the IPR attorneys. The clientele has to a large extent shifted from serving non-Finnish clients with filing at the PRH to serving Finnish clients with filing at international or European offices. Paradoxically, the IPR attorney business has at the same time become more international (scope of filings) and less international (clientele).¹⁰

Second, globalization and the decreasing cost of filing have increased the filing volume. This has, to an extent, countered the trend of

decreasing revenue due to smaller billing per filing. Since the early 2000s, Finnish start-ups have increasingly been born globals and required international IPR protection from the very start. Established companies are also exporting far more now compared to the early 1990s, and international IPR activity has hence become the norm. Moreover, international and European filings offer more “bang for the buck” for clients because a single application can result in protection in a large number of countries. This has attracted new clients for the IPR attorney firms who would not have been interested in a more cumbersome country-by-country approach in filing. The international and European IPR systems have therefore changed the outcomes of cost-benefit analyses for many firms considering investing in IPR protection. This has also changed the business of IPR attorneys to consist of a larger volume of applications, but smaller transaction size per filing.

Third, the negative effects of international and European IPR systems on the billing by IPR attorney firms have triggered the development of new businesses by the attorney firms. Similarly, the emergence of automated renewal fee service firms and decreasing search costs due to digitalization have encouraged IPR attorney firms to come up with ways to offset the drops in revenue. Our interviewees highlighted especially the London agreement of 2011 that removed the need to translate the entire patent text when EPO patents are validated in Finland as a critical event forcing IPR attorney firms to develop new revenue streams. Due to digitalization, clients can also increasingly conduct initial prior art searches themselves. Most IPR service firms have increased the share of consulting services relating to technology strategy, IPR strategy, and risk management in their revenue. This is an unintended outcome of policy changes that were designed to reduce transaction costs for inventors. The reduced transaction costs have encouraged more filing and hence more intellectual property being protected, thereby enabling inventors to appropriate returns. They may also have encouraged more investment in R&D. In addition to these, we observe an unintended positive outcome of IPR attorney firms developing new knowledge and consulting services that inventive firms find useful.

Fourth, we observe that IPR attorney firms either focus on patents or offer the full menu of filing types. This has not changed during the period from 1990 to 2020. Even though patents are the main business (around 80 % for full menu firms), they continue to offer all filing types

⁹ <https://www.epo.org/applying/online-services/representatives.html> Accessed 28 Jan 2022.

¹⁰ It should be noted that several large Finnish companies have been acquired by foreign companies during the period, after which these companies occur in IPR statistics as non-Finnish companies.

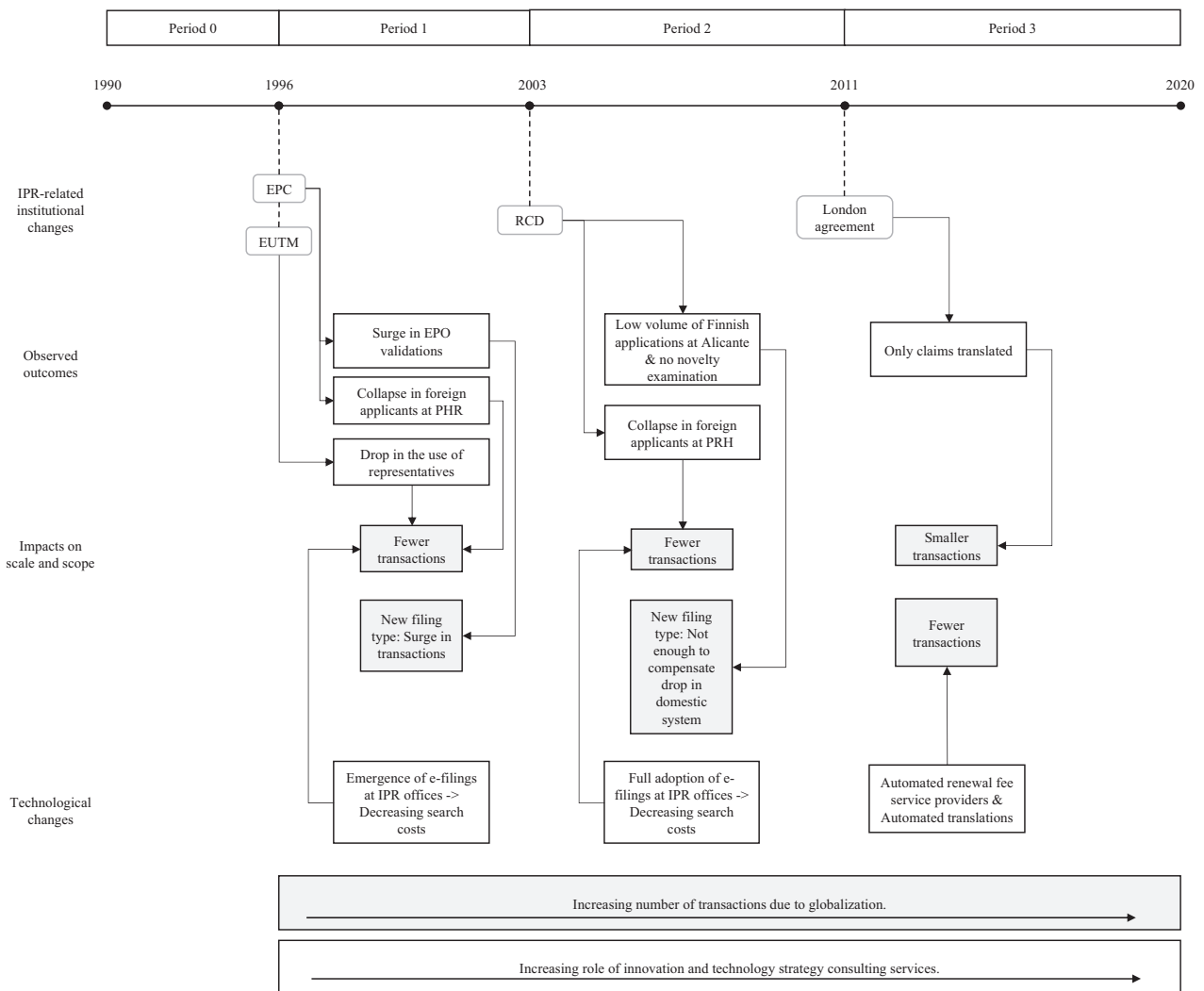


Fig. 9. Summary of observed industry dynamics. Authors' illustration.

because clients may require them. Customer relationships are long term and hence a client may choose a full menu firm even when they are currently only interested in patents but want to maintain the option for other filing types. This means that institutional changes relating to all filing types are important for full menu firms and they must keep abreast with developments in each. The concurrent trend of offering consulting services further increases the need to maintain and develop expertise relating to all filing types. Comprehensive consulting on innovation and commercialization strategy requires credible expertise in the full spectrum of IPR.

The future developments that our informants expect to affect the sector include the Unitary Patent, the Unified Patent Court, and further automation with AI. The Unitary Patent will likely further strengthen the trend of decreasing transaction costs and increasing role of consulting services. Similarly, increasing automation will continue to strip away some parts of the business. The COVID-19 pandemic has normalized virtual client meetings and official hearings at patent offices. As this will likely continue to be the new normal, the location-based benefits of IPR service firms close to IPR offices will become less important.

5.2. Limitations

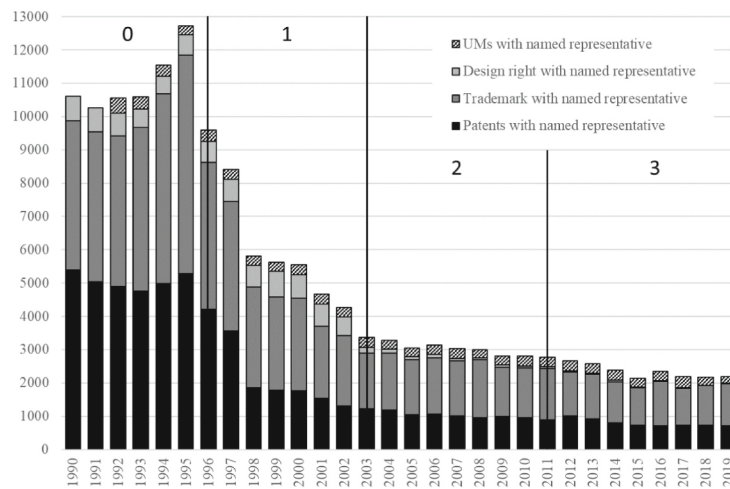
Our study has three important limitations. First, we do not have professional representative data from EUIPO, and we lack historical data

of professional representatives related to filings from the IP offices – that is, how the use of professional representatives has changed over the life cycle of specific IPR. This data would need to be manually collected from each filing which was beyond our resources. Even though changes in representation are relatively infrequent, there have been several acquisitions within the population that would bias the distribution between IPR attorneys in filing volumes per year. We recommend IP offices to improve the availability and accuracy of the data for research purposes.

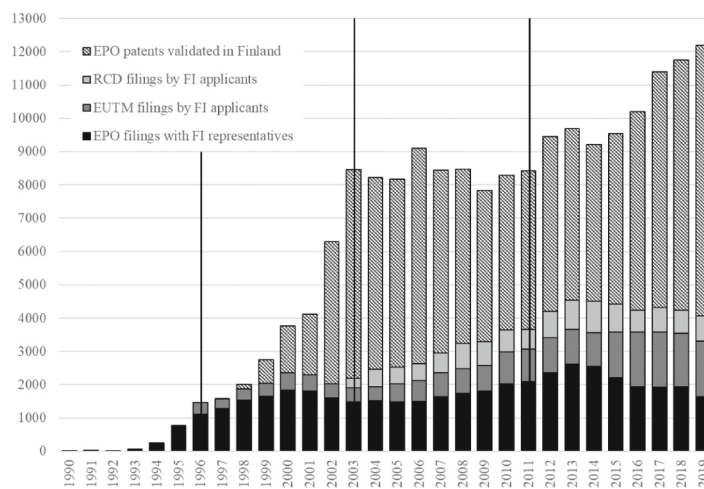
Second, our exploratory analysis has relied on expert interviews to complement the quantitative register data analysis. The expert interviews were conducted in autumn 2021 whereas the period of our analysis spans from 1990 to 2020. Most of the interviewees had more than ten years of experience in the IPR industry and a few of them had experienced the whole 30 years. Naturally, observations regarding events in the more distant past should be interpreted more critically and with caution. However, register data and financial data spanning the whole period enabled us to triangulate our findings concerning the trends.

Third, our analysis has focused on the evolution of the IPR service sector in a specific institutional context. Finland is a small open economy that became an EU member in 1995. Hence, the generalizability of our findings is strongest for European small open economies that joined the EU around the same time. Some interviewees suggested that the success

A. Direct national IPR filings



B. International filings



C. IPR filing-related services

		<u>IPR institution</u>	
		National / Finnish	International / Non-Finnish
<u>Client</u>	Finnish	Patent, utility model, trademark, design right decrease (-)	EPO patent, EUTM, RCD, PCT, Hague, Madrid, national filings in foreign countries strong increase (++)
	Non-resident / Non-Finnish	Patent, utility model, trademark, design right strong decrease (--)	EPO patent, EUTM, RCD, PCT, Hague, Madrid, national filings in foreign countries increase (+)

Fig. 10. General trends impacting the evolution of the Finnish IPR service sector.

Notes: Authors' illustrations based on information from PRH, EPO, EUIPO and WIPO IP Statistics Data Center.

Table 3
Emerging literature on patent attorneys and IPR service sectors.

Research stream	The role of patent attorneys and IPR service sector	Relationship to the present article
Filing of IPRs, patenting propensity, IP portfolio management	Patent attorneys impact IPR filing choices, strategies and outcomes (incl. IPR quality, pendency and patent citations)	Covered in prior literature (Reitzig, 2004, Süzeroglu-Melchioris, 2017, Süzeroglu-Melchioris et al., 2017, Baruffaldi and Simeth, 2020, Heikkilä, 2021, Klinecicz and Szumiał, 2022, de Rassenfosse et al., 2023)
Impact of IPR institution reforms and learning of evolving IPR institutions	IPR service firms adapt and help their clients to adapt to the changing IPR environment. The scope of services changes as a reaction to institutional change.	The present article provides novel findings on the work of IPR attorneys and how it changes as the institutional environment changes.
Return on R&D investments, appropriability	IPR attorneys' strategic advice impacts companies' returns on R&D investments	We propose the effects of IPR attorneys on appropriability as a new research direction.

of the Finnish ICT cluster spearheaded by Nokia significantly increased the demand for IPR services. This may play a role in our observation of increasing volume compensating for some parts of the business disappearing.

5.3. Implications for future research

Our findings provide several implications for future research (overview in Table 3). First, the propensity to file literature (e.g., Brouwer and Kleinknecht, 1999; Cai et al., 2020; Castaldi, 2018) has, until very recently (Klinecicz and Szumiał, 2022), overlooked the role of IPR attorneys. Inventive companies tend to have long-term, trust-based relationships with IPR attorneys. This means that the decisions to file may also depend on the advice they receive, and such strings of decisions are dependent not just on the inventor's strategy, but also on the IPR attorney's style of action. In addition, strategic delaying (Süzeroglu-Melchioris et al., 2017; Zhang et al., 2020) and withdrawal decisions (Frietsch and Neuhäusler, 2019; Schettino and Sterlacchini, 2009) related to IPR applications might be driven by IPR attorneys' tactics. Future studies could shed light on these trust-based relationships and their effects on filing decisions by analysing IPR expert–inventive company pairs over time (see Andersson and La Mela, 2020 for historical analysis).

Second, the vast literature on appropriability (e.g., Hurmelinna-Laukkanen and Yang, 2022; Teece, 1986; Teece, 2018) focuses on the role of IPR in turning R&D investments into revenue. The quality of patents can vary (Harhoff et al., 2009; Higham et al., 2021) and patent attorneys play a role in determining that quality (de Rassenfosse et al., 2023). We propose that investigating the mediating and moderating roles of patent attorneys and other IPR professionals in determining IPR filing strategies, IPR quality, and appropriability of R&D investments would shed more light on the dynamics of IPR activity in different industries.

Finally, the specialization of patent attorneys in particular technological fields showed up in our interviews (see also Menzel and Maicher, 2017). Prior studies have shown that such specialization takes place also among patent examiners (see Reiffenstein, 2009; Righi and Simcoe, 2019). There are probably repeated interactions between specific patent attorneys and specific patent examiners because both have focused on certain technology areas. Future research could shed light on how those interactions change over time and what kinds of learning takes place. This would require IP offices to provide data including changes in representation which we mentioned in the limitations above.

5.4. Policy implications and implications for management

There should be institutions that encourage innovation while fostering a balance between competition and innovation incentives. Our paper elaborates on this by pointing out that IPR institutions are not enough, but there also needs to be awareness and the know-how to

utilize the institutions efficiently. The IPR service sector has a key role here. European and international IPR institutions have simplified IPR protection for inventive companies, but still the majority hires external representatives to interact with the IPR offices. IPR experts play an important role in promoting IPR awareness at the national level and may impact the returns from and spillovers of both public and private R&D investments. Thus, countries should pay attention to investments in IPR education and the pipeline of future IPR experts. While patents and other IPR have been used as an output metric for national innovation systems (e.g., Andrade et al., 2022; Fagerberg and Srholec, 2008), the local IPR-related professional services have been an overlooked component. It is expected that the newly established Unitary Patent and Unified Patent Court systems will lead to patent attorneys advising their clients also in this transition.

Innovative growth-oriented firms in small open economies face the challenge of international IPR protection from the start. Firms in countries with large domestic markets have the option of limiting their IPR activity to the home market. This means that the IPR awareness challenge is more prominent in small open economies where the appropriability of innovation investments relies on the IPR institutions of foreign markets and international IPR treaties (see Table 1). Moreover, such entrepreneurs face the make-or-buy decision and the subsequent IPR service provider selection very early in their entrepreneurial journeys. This means that IPR service firms may play an even larger role in small open economies than they do in countries with large domestic markets.

Digitalization has democratized the access to IPR databases, and patent offices around the globe are continuously improving the quality of their IPR registers. This has already enabled many AI applications (e.g., Aristodemou and Tietze, 2018; Choi et al., 2022; Hain et al., 2022), and many more AI initiatives are under way at IP offices. Many of our interviewees believed that increasingly large parts of their traditional domain will be automated. Therefore, the quick adoption of digital solutions by IPR service firms seems critical for their survival. Recently popularized generative AI and large language models may complement human intelligence, for instance, in drafting patents but there are issues regarding trade secrets.

6. Concluding remarks

The novelty of our study comes from focusing on the perspective of IPR attorney firms. We find that institutional changes, particularly European IPR systems, have had significant impacts on the scale and scope of services offered by Finnish IPR service firms. Quantitative and qualitative analyses suggest that the most significant changes include (1) Finland joining the European Patent Convention in 1996, (2) European Union trademark system introduction in 1996, (3) European Registered Community Design system introduction in 2003, and (4) the London Agreement that came into force in Finland in 2011. Due to globalization, the Finnish companies increasingly file European and international IPR

applications, and this has become the main business of the IPR service firms. The Unitary Patent and the Unified Patent Court are the next major institutional changes, which may further increase the share of consulting services in the revenue of IPR attorneys.

IPRs have long been a central topic of innovation studies. However, the role of IPR service firms has mostly been abstracted away in empirical research on appropriability and propensity to patent. Our study shows that IPR service firms play an important role in inventive firms' IPR strategy and in the output of national innovation systems. Our approach was exploratory and hence future studies should take on explanatory designs regarding the relationships between innovative firms, IPR attorneys and IPR examiners to shed light on the determinants of invention-, firm-, and country-level outcomes in appropriability.

CRedit authorship contribution statement

Jussi Heikkilä: Conceptualization, Methodology, Data Curation, Investigation, Writing, Visualization

Mirva Peltoniemi: Conceptualization, Methodology, Investigation, Writing, Visualization.

Appendix A

Table A.1

Interview protocol.

Semi-structured interviews, question template*

1) Globalization

- How has globalization impacted your business?
 - Service offering/menu
 - Internationalization
 - Level of competition
- How has globalization impacted the business of your clients?
- What are the most important legal changes in the IPR environment at the global level?
 - Patents
 - Utility models
 - Design rights
 - Trademarks

2) European integration

- How has the European integration impacted your business?
 - Service offering/menu
 - Internationalization
 - Changing role of EUIPO and PRH
 - Level of competition
- How has the European integration impacted the business of your clients?
- What are the most important legal changes in the IPR environment at the European level and at the Finnish level?
 - Patents
 - Utility models
 - Design rights
 - Trademarks

3) Digitalization

- How has digitalization impacted your business?
 - Service offering/menu
 - Internationalization
 - Changing role of EUIPO and PRH
 - Level of competition
- How has digitalization impacted the business of your clients?

4) Future

- How do you see the future of the IPR service industry?
 - At the global level
 - At the European level
 - In Finland
- What kind of trends and changes the industry will witness
 - During the next 5-10 years?
 - In the long run?

*The original Finnish version is available from the authors upon request.

Data availability

The authors do not have permission to share data.

Acknowledgements

Earlier versions of the paper have been presented at EPIP 2021, Nordic/German Network Meeting of IPR University Center 2021, Helsinki IP Summit 2021, Lahti Science Day 2021, DRUID 2022, ERSA 2022, Eu-SPRI 2023 and seminars at LUT University, University of Jyväskylä, University of Helsinki and University of Cambridge. We would like to thank the experts that kindly participated in the interviews and PRH for providing register data. We have received helpful comments from Mika Haapanen, Juha-Antti Lamberg, Patricia Laurens, Tomi Nokelainen, Manfred Paier, Thomas Riis, Frank Tietze, anonymous IPR experts and the participants of the seminars and conferences. Heikkilä gratefully acknowledges funding from the Finnish Cultural Foundation / Päijät-Häme Foundation / Anja and Jalo Paananen Foundation, the Foundation for Economic Education (Reino Rossi Memorial Fund) and PHP Säätiö. Peltoniemi gratefully acknowledges funding by Research Council of Finland (grant number 342980).

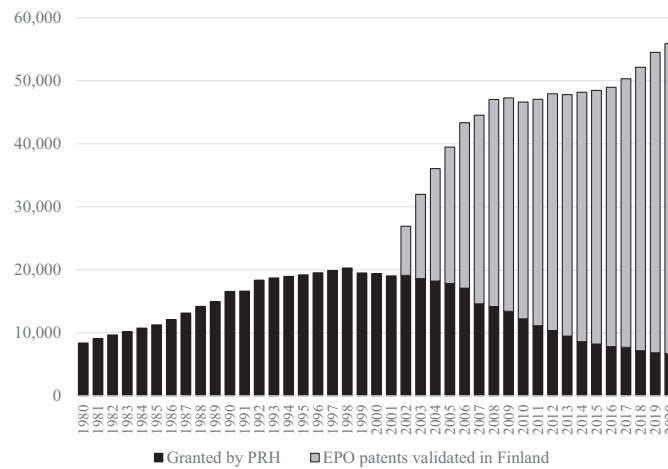


Fig. A.2. Patents in force in Finland.

Source: PRH, <https://www.prh.fi/en/patentit/Tilastoja/patentit.html> Accessed in Jul 2022.

Table A.2
Scope of services.

Service	Share of companies (N = 11)
Patenting	100.0 %
Trademark	81.8 %
Design right	81.8 %
Utility model	81.8 %
Other IP	
Domain names	54.5 %
Data	27.3 %
Copyright	27.3 %
Trade secrets	27.3 %
Selected other services	
Freedom to operate (FTO) ^a	90.9 %
Oppositions, appeals and/or invalidations	81.8 %
Novelty and/or Prior art search ^b	72.7 %
Legal support ^c	63.6 %
IP/IPR portfolio management	54.5 %
IP/IPR strategy	54.5 %
IPR valuation and due diligence	54.5 %
IP licensing ^d	54.5 %
Dispute resolution and/or litigation	54.5 %
Infringement analysis	45.5 %
Annuities/renewal fees	36.4 %
IP professional as a service/in-house IPR expert (outsourced)	36.4 %

Notes: Information was collected from the webpages of the companies in November 2021. All companies with >2 patent attorneys, >5 employees and turnover > €1 million.

Percentages over 70% bolded.

^a Incl. competitor monitoring and/or analysis.

^b Incl. novelty search, patentability evaluation, etc.

^c E.g., agreements, contracts, changes in IP ownership, employee inventions, etc.

^d Incl. transactions, sales, brokerage, transfer.

Table A.3
List of interviewees.

Interviews						
Position	Firm characteristics					Date
	Turnover (2020)	Employees (2020)	Registered professional representatives			
			Patent	Trademark	Design	
Patent attorney	>€5M	≥10	X	X	X	Aug 2021
C-suite	>€5M	≥10	X	X	X	Aug 2021
C-suite	>€5M	≥10	X	X	X	Sep 2021
C-suite	<€2M	≥10	X	X	X	Sep 2021
C-suite	€2-5M	≥10	X			Sep 2021
C-suite	€2-5M	≥10	X	X	X	Sep 2021
C-suite	>€5M	≥10	X	X	X	Sep 2021

(continued on next page)

Table A.3 (continued)

Interviews						
Position	Firm characteristics					Date
	Turnover (2020)	Employees (2020)	Registered professional representatives			
			Patent	Trademark	Design	
C-suite	€2-5M	≥10	X	X	X	Oct 2021
C-suite	<€2M	<5	X		X	Oct 2021
C-suite	<€2M	5-9	X			Oct 2021
C-suite	€2-5M	≥10	X	X	X	Oct 2021
C-suite	>€5M	≥10	X	X	X	Oct 2021
C-suite	>€5M	≥10	X	X	X	Nov 2021
Patent attorney	>€5M	≥10	X	X	X	Nov 2021

Non-responses						
Firm characteristics					Reason for non-response	
Turnover (2020)	Employees (2020)	Registered professional representatives				
		Patent	Trademark	Design		
<2 M€	5-9	X	X	X	No response	
<2 M€	5-9	X			No response	
<2 M€	<5	X			No response	
€2-5M	<5	X			No response	
<2 M€	<5	X	X	X	No response	
<2 M€	<5	X			No response	
<2 M€	<5	X			No response	
<2 M€	5-9	X	X		No response	
<2 M€	<5	X			No response	
<2 M€	<5	X			No response	
<2 M€	<5	X			No response	
<2 M€	<5	X			Refusal	

Table A.4
Scope of IPR services based on PRH's registers.

	Obs.	Patent & Trademark & Design	Trademark & Design	Patent & Design	Patent & Trademark	Only Patent	Only Trademark	Only Design	Total
Advisory activities concerning patents (69103)	20	40 %	5 %	5 %	5 %	45 %	0 %	0 %	100 %
Legal representation activities (69101)	11	27 %	9 %	0 %	0 %	0 %	64 %	0 %	100 %
Legal advisory activities (69102)	7	29 %	14 %	0 %	0 %	0 %	57 %	0 %	100 %
All	44	30 %	7 %	2 %	2 %	32 %	27 %	0 %	100 %

Notes: Based on the information retrieved from IPR attorney registers of the Finnish patent office as of November 2021.

Activities that are the focus of our study shaded.

Table A.5
Evolution of the Finnish IPR service sector.

	Period 0 1990-1995	Period 1 1996-2002	Period 2 2003-2010	Period 3 2011-2020	Future
Scale and scope	Scale: High level of national filings; Scope: Introduction of the UM system	Scale: Dramatic drop in direct national patent and TM filings; Scope: Introduction EUTM system, Finland joins EPC and Madrid agreement	Scale: Dramatic drop in direct design right filings. Scope: Introduction of RCDs, quick adoption of e-filings	Scale: Stable, stagnation; Scope: Increasing share of foreign customers; Consolidation, several traditional Finnish IPR firms exited	Scale: Demand for IPR services increases or remains the same; Scope: Increasingly consulting services
National patents	High level of demand	Negative shock to demand: shift to EPO filings, particularly by foreign applicants	Decreasing demand	Stable/decreasing demand	
National UMs	Introduced in 1992, demand peaks in 1992 and begins to slowly decrease	Stable/decreasing demand	Stable/decreasing demand	Stable/decreasing demand	
National trademarks	High level of demand	Negative shock to demand: EUTM system introduced in 1996	Stable	Stable	
National design rights	High level of demand	Stable	Negative shock to demand: RCD system introduced in 2003	Stable/decreasing demand	
EPO patent filings with Finnish patent attorneys	-	Finland joins EPC in 1996, increasing demand	Increasing demand	Stable/decreasing demand	
EPO patent validations in Finland	-	Finland joins EPC in 1996, strongly increasing demand	Decreasing demand	Increasing demand, London agreement diminishes the need for Finnish and Swedish translations of validated EPO patents	
EUTM filings by Finnish applicants	-	Introduced in 1996, increasing demand	Increasing demand	Increasing demand	
RCD filings by Finnish applicants	-	-	Introduced in 2003, increasing demand	Increasing demand	
PCT filings by Finnish applicants	NA*	Strongly increasing demand	Increasing demand	Decreasing demand	
Impacts on IPR service sector					
Globalization	Collapse of the USSR, WTO established & TRIPS into force	Finland joins the Madrid protocol for trademarks, ICT cluster boom and internationalization of Finnish companies	International value/supply chains become more complex, China's increasing role, Financial crisis begins in 2008. The EU joins Madrid protocol and Hague agreement for design rights.	Stagnation, Finland joins the Hague agreement for design rights in 2011	Mixed expectations (e.g., increasing competition), language questions
European integration	Finland joins the EU in 1995 (concurrently with Sweden and Austria). OHIM established	Finland and 7 other countries join EPC/EPO, EUTM system introduced in 1996	Registered community design system introduced in 2003 , enlargement of EU and EUIPO from 15 to 27 member states	Finland joins London agreement 2011. Croatia joins EU in 2013. 13 countries join the EPO. The United Kingdom exits in 2020.	Unitary Patent and Unified Patent Court? More cross-border competition (depends on the importance of Finnish language)
Digitalization	"Pre-commercial internet era", fax communication	Emails, webpages and digital databases become mainstream, e-filings (e.g. PCT-EASY), decreasing IPR information search costs	Fast full adoption of e-filings at IPR offices , improving digital databases, decreasing IPR information search costs	Softwarization, improving online databases, early automation/AI solutions, renewal fee services to global companies, decreasing IPR information search costs	New AI applications and automation of routine tasks, everything that can be automated will be automated?

*WIPO IP Statistics Data Center provides data starting from 1995.

The most important findings shaded.

References

Acemoglu, D., Restrepo, P., 2019. Automation and new tasks: how technology displaces and reinstates labor. *J. Econ. Perspect.* 33 (2), 3–30.
 Andersson, D.E., La Mela, M., 2020. Nordic networks: patent agents and the business of technology intermediation in Sweden and Finland, 1860–1910. *Scand. Econ. Hist. Rev.* 68 (1), 45–65.
 Andrade, E.P., Pereira, J.d.S., Rocha, A.M., Nascimento, M.L.F., 2022. An exploratory analysis of Brazilian universities in the technological innovation process. *Technol. Forecast. Soc. Chang.* 182, 121876.
 Aristodemou, L., Tietze, F., 2018. The state-of-the-art on Intellectual Property Analytics (IPA): a literature review on artificial intelligence, machine learning and deep learning methods for analysing intellectual property (IP) data. *World Patent Inf.* 55, 37–51.
 Arundel, A., Kabla, I., 1998. What percentage of innovations are patented? Empirical estimates for European firms. *Res. Policy* 27 (2), 127–141.

Baruffaldi, S.H., Simeth, M., 2020. Patents and knowledge diffusion: the effect of early disclosure. *Res. Policy* 49 (4), 103927.
 BOF, 2015. A brief history of Finnish foreign trade. In: Bank of Finland Bulletin, vol. 2015. Bank of Finland, Helsinki.
 Brouwer, E., Kleinknecht, A., 1999. Innovative output, and a firm's propensity to patent: an exploration of CIS micro data. *Res. Policy* 28 (6), 615–624.
 Cai, H.H., Sarpong, D., Tang, X., Zhao, G., 2020. Foreign patents surge and technology spillovers in China (1985-2009): evidence from the patent and trade markets. *Technol. Forecast. Soc. Chang.* 151.
 Campi, M., Dueñas, M., 2019. Intellectual property rights, trade agreements, and international trade. *Res. Policy* 48 (3), 531–545.
 Castaldi, C., 2018. To trademark or not to trademark: the case of the creative and cultural industries. *Res. Policy* 47 (3), 606–616.
 Choi, S., Lee, H., Park, E., Choi, S., 2022. Deep learning for patent landscaping using transformer and graph embedding. *Technol. Forecast. Soc. Chang.* 175, 121413.

- de Rassenfosse, G., Jensen, P., Julius, T., Palangkaraya, A., Webster, E., 2023. Is the patent system an even playing field? The effect of patent attorney firms. *J. Ind. Econ.* 71 (1), 124–142.
- Dutta, S., Lanvin, B., Rivera León, L., Wunsch-Vincent, S., 2021. *Global Innovation Index 2021: Tracking Innovation Through COVID-19 Crisis*, 14th edition.
- Eaton, J., Kortum, S., Lerner, J., 2004. International patenting and the European Patent Office: a quantitative assessment. In: *Patents, Innovation and Economic Performance: OECD Conference Proceedings*. OECD Publishing, Paris, pp. 27–52.
- Eriksson, P., Kovalainen, A., 2012. Case study research in business and management. In: Mills, A., Durepos, G., Wiebe, E. (Eds.), *Encyclopedia of Case Study Research*. SAGE Publications.
- Fagerberg, J., Srholec, M., 2008. National innovation systems, capabilities and economic development. *Res. Policy* 37 (9), 1417–1435.
- Filitz, R., Henkel, J., Tether, B.S., 2015. Protecting aesthetic innovations? An exploration of the use of registered community designs. *Res. Policy* 44 (6), 1192–1206.
- Fink, C., Khan, M., Zhou, H., 2016. Exploring the worldwide patent surge. *Econ. Innov. New Technol.* 25 (2), 114–142.
- Frietsch, R., Neuhäusler, P., 2019. The role of the patent attorney in the filing process. In: *Springer Handbook of Science and Technology Indicators*. Springer, pp. 875–888.
- Gibbert, M., Ruigrok, W., Wicki, B., 2008. What passes as a rigorous case study? *Strateg. Manag. J.* 29 (13), 1465–1474.
- Goffin, K., Åhlström, P., Bianchi, M., Richtnér, A., 2019. Perspective: state-of-the-art: the quality of case study research in innovation management. *J. Prod. Innov. Manag.* 36 (5), 586–615.
- Hain, D.S., Jurawetzki, R., Buchmann, T., Wolf, P., 2022. A text-embedding-based approach to measuring patent-to-patent technological similarity. *Technol. Forecast. Soc. Chang.* 177, 121559.
- Hall, B.H., Helmers, C., 2019. The impact of international patent systems: evidence from accession to the European Patent Convention. *Res. Policy* 48 (9), 103810.
- Harabi, N., 1995. Appropriability of technical innovations - an empirical analysis. *Res. Policy* 24 (6), 981–992.
- Harhoff, D., Hoisl, K., Reichl, B., van Pottelsberghe, B., 2009. Patent validation at the country level—the role of fees and translation costs. *Res. Policy* 38 (9), 1423–1437.
- Heikkilä, J., 2021. The demand for IPR services-to use or not to use a professional representative? *Int. J. Intell. Prop. Manag.* 11 (3), 316–324.
- Herz, B., Mejer, M., 2019. Effects of the European Union trademark: lessons for the harmonization of intellectual property systems. *Res. Policy* 48 (7), 1841–1854.
- Higham, K., De Rassenfosse, G., Jaffe, A.B., 2021. Patent quality: towards a systematic framework for analysis and measurement. *Res. Policy* 50 (4), 104215.
- Holgerson, M., 2013. Patent management in entrepreneurial SMEs: a literature review and an empirical study of innovation appropriation, patent propensity, and motives. *R&D Manag.* 43 (1), 21–36.
- Hurmelinna-Laukkanen, P., Yang, J., 2022. Distinguishing between appropriability and appropriation: a systematic review and a renewed conceptual framing. *Res. Policy* 51 (1), 104417.
- Ketokivi, M., Choi, T., 2014. Renaissance of case research as a scientific method. *J. Oper. Manag.* 32 (5), 232–240.
- Kim, J., Lee, S., 2015. Patent databases for innovation studies: a comparative analysis of USPTO, EPO, JPO and KIPO. *Technol. Forecast. Soc. Chang.* 92, 332–345.
- Klinczewicz, K., Szumiał, S., 2022. Successful patenting—not only how, but with whom: the importance of patent attorneys. *Scientometrics* 127 (9), 5111–5137.
- Langley, A., 1999. Strategies for theorizing from process data. *Acad. Manag. Rev.* 24 (4), 691–710.
- Löytömäki, M., 2006. The Finnish Patent Office as an international PCT authority. In: *IPRinfo*. IPR University Center, Helsinki.
- Menzel, K., Maicher, L., 2017. A novel method for retrieving specialisation profiles—the case of patent agent firms. *World Patent Inf.* 51, 46–56.
- North, D.C., 1991. Institutions. *J. Econ. Perspect.* 5 (1), 97–112.
- Park, W.G., 2008. International patent protection: 1960–2005. *Res. Policy* 37 (4), 761–766.
- Reiffenstein, T., 2009. Specialization, centralization, and the distribution of patent intermediaries in the USA and Japan. *Reg. Stud.* 43 (4), 571–588.
- Reitzig, M., 2004. Improving patent valuations for management purposes—validating new indicators by analyzing application rationales. *Res. Policy* 33 (6-7), 939–957.
- Reitzig, M., Wagner, S., 2010. The hidden costs of outsourcing: evidence from patent data. *Strateg. Manag. J.* 31 (11), 1183–1201.
- Righi, C., Simcoe, T., 2019. Patent examiner specialization. *Res. Policy* 48 (1), 137–148.
- Schaper, T., 2021. *Online repositories, search costs and cumulative innovation*. Available at SSRN: <https://ssrn.com/abstract=3920449>.
- Schettino, F., Sterlacchini, A., 2009. Determinants of patent withdrawals: evidence from a sample of Italian applications with the EPO. *World Patent Inf.* 31 (4), 308–314.
- Schwab, K., 2019. *The Global Competitiveness Report 2019*: World Economic Forum.
- Somaya, D., Williamson, I.O., Zhang, X.M., 2007. Combining patent law expertise with R&D for patenting performance. *Organ. Sci.* 18 (6), 922–937.
- Süzeroglu-Melchior, S., 2017. The supply side of IP management: understanding firms' choices regarding IP intermediaries. *World Patent Inf.* 50, 55–63.
- Süzeroglu-Melchior, S., Gassmann, O., 2021. Understanding outsourcing strategy within the intellectual property industry—a proposed typology. *Int. J. Technol. Manag.* 85 (1), 1–20.
- Süzeroglu-Melchior, S., Gassmann, O., Palmie, M., 2017. Friend or foe? The effects of patent attorney use on filing strategy vis-a-vis the effects of firm experience. *Manag. Decis.* 55 (6), 1122–1142.
- Teece, D.J., 1986. Profiting from technological innovation - implications for integration, collaboration, licensing and public-policy. *Res. Policy* 15 (6), 285–305.
- Teece, D.J., 2018. Profiting from innovation in the digital economy: enabling technologies, standards, and licensing models in the wireless world. *Res. Policy* 47 (8), 1367–1387.
- Thumm, N., 2001. Management of intellectual property rights in European biotechnology firms. *Technol. Forecast. Soc. Chang.* 67 (2-3), 259–272.
- van Pottelsberghe, B., Mejer, M., 2010. The London Agreement and the cost of patenting in Europe. *Eur. J. Law Econ.* 29 (2), 211–237.
- Wagner, S., 2006. Make-or-buy decisions in patent related services. In: *Discussion Papers in Business Administration*. Munich School of Management, University of Munich.
- Webster, E., Jensen, P.H., Palangkaraya, A., 2014. Patent examination outcomes and the national treatment principle. *RAND J. Econ.* 45 (2), 449–469.
- WIPO, 2021. *World Intellectual Property Indicators 2021*. World Intellectual Property Organization, Geneva.
- WTO, 2022. *The WTO Stats Portal* (28 Jan).
- Yin, R.K., 1994. *Case Study Research: Design and Methods*. SAGE Publications.
- Zhang, G., Xiong, L., Duan, H., Huang, D., 2020. Obtaining certainty vs. creating uncertainty: does firms' patent filing strategy work as expected? *Technol. Forecast. Soc. Chang.* 160, 120234.

Jussi T.S. Heikkilä (D.Sc., econ) is Adjunct Professor at LUT School of Engineering Science, Lappeenranta-Lahti University of Technology and Research Fellow at Jyväskylä University School of Business and Economics. His research focuses on economics of innovation, intellectual property rights institutions and standardization. His research has been published in, e.g., *Research Policy*, *Scientometrics*, *Economics of Innovation and New Technology*, and *International Journal of Intellectual Property Management*.

Mirva Peltoniemi is Associate Professor of technology and innovation management at Tampere University. Her research focuses on the industry life-cycle theory, technological change, and intellectual property rights. Her research has been published in, e.g., *Strategic Management Journal*, *Research Policy*, *International Journal of Management Reviews*, *Long Range Planning*, *Business History*, *Technology Analysis & Strategic Management*, and *Games & Culture*.