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Patent Aggregation in Europe: The Spotlight on Patent Licensing by Patent Aggregators

Niccolò Galli*

Abstract

Patent aggregation involves the use of patents as assets rather than as technology inputs or technology-transfer instruments. This paper investigates patent licensing as a prominent patent aggregation activity from both legal and empirical stances. After examining the European legal institutions, good-faith negotiation framework and main contractual elements of patent licenses, the paper maps the scattered available data on patent licensing, which notoriously remain confidential. Subsequently, it analyses the licensing business of patent aggregators from a qualitative perspective. A multiple-case study of four patent aggregators, namely Sisvel, France Brevets, Fractus and Qualcomm is presented based on multiple triangulated direct and secondary data sources. Overall, the paper provides transparency on the otherwise stealthy patent aggregators' licensing activities and feeds data into the academic and innovation policy debates over patent aggregation.

1. Introduction: Patent Licensing As a Patent Aggregation Activity

Price-cutting competition of global electronics product markets renders the monetisation of patents a necessary path to raise revenue and finance research and development ('R&D') investments. The activities using patents as assets rather than as technological inputs or vehicles for technology transfer fall under the label of patent aggregation. More precisely, patent aggregation comprises any venture that aggregates patents into coherent collections (so-called patent portfolios) through direct prosecution or transfer and then exploits the aggregated patents beyond manufacturing. Since patent aggregation activities do not directly match the commercialisation of new products, their effects on innovation are unclear. On the one hand, they spur technological progress alleviating patent hold-out, that is the free-riding on proprietary technologies and fragmented patent ownership issues insofar as they bring efficiencies in patent licensing and litigation, convey liquidity to inventors or internalise sunk R&D costs. On the other hand, patent aggregation activities tax innovation by enforcing substitute or otherwise dormant patents, facilitating patent hold-up or foreclosing access to commercially significant technologies. The negative scenarios trouble especially information and communications technology ('ICT') markets given the role there played by open innovation, interoperability and standardisation.[1]

Against this background, this paper analyses patent licensing, one of the patent aggregators' non-manufacturing patent exploitation options beside patent sale, enforcement and defensive holding. The analytical approach is both legal, with an EU focus, and empirical. First, it examines the legal institutions, negotiating framework and main elements of patent licenses (Section 2.). Second, it

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[1] Generally, on patent aggregation see Paola Giuri and others, *Report of the Expert Group on Patent Aggregation* (European Commission, 2015); Frauke Rüther, *Patent Aggregating Companies: Their Strategies, Activities, and Options for Producing Companies* (University of St.Gallen, 2012); Niccolò Galli, 'Patent Aggregation Redefinition and Taxonomy of Its Activities Useful for Competition Law' in Valeria Falce (ed), *Fairness e Innovazione nel Mercato Unico Digitale* (Giappichelli, 2020); Dominique Christ, Niccolò Galli and Cornelia Peuser, 'Patent Aggregation: More Than Patent Trolls' (December 2019) 54(4) les Nouvelles 238.

gathers both quantitative and qualitative evidence of patent licensing that enables a systematic understanding of its role for patent aggregation. To that end, Section 3. maps the scattered quantitative data on patent licensing, whereas Section 4. provides a multiple-case study of patent licensing by four different patent aggregators, namely Sisvel, France Brevets, Fractus and Qualcomm. Section 5. presents the case study findings, whereas the last section concludes.

2. Legal Institutions, Negotiating Framework and Elements of Patent Licenses

A patent license is a contract whereby a patentee (i.e. the licensor) grants, either for consideration or for free, certain rights concerning its patented invention to another party (i.e. the licensee) according to the contractual conditions. From a patent law perspective, licenses have the effects of non-assertion agreements, whereby the licensor promises not to sue the licensee, since patent use without a license constitutes infringement, statutory exceptions aside.[2] From a technical perspective, licenses are knowledge transfer agreements whereby the licensor transfers his patented technology to the licensee.

Because licensors´ patent rights on licensed subject matters are exhausted, even regionally in the EU, upon the first authorised sale by the licensee, licensors carefully select a single point in the supply chain where to license and monetise their patents.[3] Regarding standard-essential patents ('SEPs') encumbered by Fair, Reasonable and Non-Discriminatory ('FRAND') commitments to Standard-Setting Organisations ('SSOs'), stakeholders debate where licenses should occur in the supply chains. Implementers of the patented standard-technology, either component suppliers or original equipment manufacturers, advocate that patentees should offer licenses to everyone across the supply chain (so-called license to all argument). SEPs-holders state they can license end-user device manufacturers only while keeping access open to their standard-essential technologies to any participant of the supply chain (so-called access to all argument, pursued by all patent aggregators of our case study). Easier auditability and avoidance of transaction costs are some of the procompetitive justifications for SEP-holders to refuse multi-level licensing. The discussions are particularly vivid in light of the advent of the Internet of Things ('IoT'), whereby anything implements wireless communication standards to interoperate with anything else.[4]

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[2] Non-exclusive licenses usually encumber the patent, so that also patentees' successors in interests are bound to the license. Differently, pure covenants not to sue for the use of the patent under German and English law do not bind future owners of the relevant patent. Covenants not to sue are personal also for the recipient, so that they do not apply to subsequent purchasers or users of the infringing product. In practice, pure covenants not to sue for patent infringement do not protect the promisees against privateers enforcing patents carved out from the promisors' portfolios; see, Kenneth Adams, 'Granting Language in Patent Licensing Agreements: An Analysis of Usages' (2016) 8(3) Landslide Magazine, 3-4; European Patent Academy, *The Effects of Licences Under Patents* (Patent Litigation Block 2, 2017), 5; see Commission, 'Guidelines on the application of Article 101 TFEU to technology transfer agreements' (Communication) OJ 2014/C 89/3, para. 53 (hereinafter, 'TTBER Guidelines').

[3] Ideally, licensors that want to license at multiple points in the supply chain need patents on separate inventions directed at each point. Setting different royalties for different licensees within the same level of the supply chain without business justification would raise competition law concerns of discriminatory pricing; see Burch Harper, 'Structuring the Patent License Agreement Grant' in Mark Holmes and Joseph Yang (eds), *Advanced Patent Licensing* 2018 (Practicing Law Institute, 2018), 65; Ropes Gray, 'Continental Automotive v. Avanci: Wireless SEP Licensing Presents Challenges for Automotive Industry' (Ropes Gray Alert Intellectual Property, 4 June 2019).

[4] On the access-to-all versus license-to-all debate, see Juan Martinez, 'FRAND as Access to All versus License to All' (2019) GRUR Int. 633; Jean-Sebastien Borghetti, Igor Nikolic and Nicolas Petit, 'FRAND Licensing Levels Under EU Law' (2020) Working Paper 5 February 2020 <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3532469>.

Patent licenses may either involve bare patent rights or a complete technology-transfer combining patents, other IPRs, know-how, related services or materials.[5] Broad collaboration agreements, such as research contracts, joint-ventures ('JVs'), distribution contracts and all licenses that teach the licensee the use of the patented technology, imply technology transfer and are known as carrot licensing. Cross-licenses, patent litigation settlements and all licenses that grant rights to the licensee for patents she already infringes correspond to bare patent licenses, generally referred to as stick licensing. Patent aggregators that lack R&D capabilities and focus on monetising patents are more likely to engage in stick licensing.

At the international level, Art. 28 TRIPS recognises the patentees' right to conclude licensing contracts. Art. 73 EPC and the applicable national patent laws replicate this right for European Patent applications and national patents, respectively. Notwithstanding that patents are territorial rights, European national laws do not regulate in detail the requirements and terms of licenses. The general freedoms to conduct a business and to contract (Art. 16 EU Charter of Fundamental Rights) and right to property (Art. 17 EU Charter of Fundamental Rights) apply subject to competition and contract laws as well as other general obligations such as to act in good faith.[6]

Statutory form and official registers' recordation requirements for patent licenses vary across the EU. For the validity of the license between the parties, most States require written contracts, while a few countries do not have form requirements except for evidentiary litigation purposes.[7] Nevertheless, complex terms and conditions practically impose the written form for commercially significant licenses. Albeit recordation has in the clear majority of EU Member States declaratory effects, confidentiality concerns over the details of patent licenses often prevail and so very few contracts are

[5] The object of technology licensing is to get access to knowledge and expertise needed by licensees to introduce new goods or services or production processes; see Ashish Arora, Suma Athreye and Can Huang, *Innovation, Patenting and Licensing in the UK: Evidence From the SIPU Survey* (UKIPO Report, 2013), 6. The know-how that is licensed together with the patents is usually defined by the same licensing contract so to include all relevant information for the optimal exploitation of a patented technology, e.g. trade secrets, confidential information, personnel information and testing data; see Ethan Horwitz, "Patent and Technology Licensing" in Ethan Horwitz and Mark Holmes (eds), *Patent & High Technology Licensing 2004* (Practicing Law Institute, 2004), 11-12; Joseph Yang, 'Advanced Topics in Technology and Patent Transactions' in Marcelo Halpern, Ira Levy and Joseph Yang (eds), *Advanced Licensing Agreements* 2018 (Practicing Law Institute, 2018), 83-85. For a definition of technology transfer agreements see Article 1(1)(b) and (c) TTBER. In this sense, licensees with heavy R&D capacities and pre-existing technological knowledge make licensors' life easier and should pay a lower licensing price; see Viktor Braun, 'Licenses As a Critical Source of Innovation: Part I Theory and Japan' (December 2008) les Nouvelles 225, 226. On the IoT, see Micheal Chui, Markus Löffler and Roger Roberts, 'The Internet of Things' (2010) 2 McKinsey Quarterly; Nicolo Zingales, 'Of Coffee Pods, Videogames, and Missed Interoperability: Reflections for EU Governance of The Internet of Things' (2015) TILEC Discussion Paper no. 26.

[6] See, for example, Christof Karl, 'Germany' in Bruno Floriani (ed), *Licensing in 26 Jurisdictions Worldwide* (Getting the Deal Through, 2014), 65; Richard Posner, 'Transaction Costs And Antitrust Concerns In The Licensing Of Intellectual Property' (March 2005) les Nouvelles 1.

[7] The EU Member States that require patent licenses to be in writing ad substantiam are Belgium, Croatia Czech Republic, Estonia, France, Greece, Lithuania, Luxembourg, Malta, Poland, Spain and the United Kingdom. The EU Member States that do not impose any specific form are Austria, Bulgaria, Cyprus, Denmark, Finland, Germany, Hungary, Ireland, Italy, Latvia, Netherlands, Romania, Slovakia, Slovenia, Sweden. All relevant patent statutes are available on <https://wipolex.wipo.int/en/main/legislation>. For an analysis of the Finnish, French, German, Dutch, Polish, Spanish, Swedish and British laws, see Bruno Floriani (ed), *Licensing 2017* (Getting the Deal Through, 2017).

registered. This lack of recordations fuels information asymmetries and prevents market transparency.[8]

The negotiation between the parties determines concrete licensing terms as a natural outcome of the countervailing bargaining powers. Each industry has its customs when it comes to commercial contracts, yet certain preparatory documents generally support good faith licensing negotiations such as those envisioned by the CJEU in its 2015 *Huawei/ZTE* preliminary ruling. The first step is the conclusion of a non-disclosure agreement ('NDA') that protects the confidentiality of the proprietary information exchanged at the negotiating table setting penalty clauses for confidentiality breaches.[9] Without NDAs, the effective exchange of information between the parties, including their parents or subsidiaries, is impaired to the detriment of a successful and good-faith negotiation. Though, notices of infringement of specific patents should not require prior NDAs since patents and their assignors are public information. One-way NDAs cover the confidential information divulged by the licensor to the licensee, whereas two-way NDAs, typical of cross-licenses, cover the confidential information mutually divulged. The NDAs can also provide for standstill obligations, which preclude the parties from starting infringement or invalidity litigation usually for a shorter period than the NDA's term.

Insofar as prospective licensees must disclose during the negotiations, and actually during the entire contractual relationship, their sensitive sales data, patent aggregators only active upstream as patent licensors (i.e. Non-Practicing Entities, 'NPEs') represent more attractive non-rivalrous business partners than vertically integrated patent aggregators that both license their patents and operate downstream in product markets (i.e. Practicing Entities, 'PEs'). NPEs' licenses are also subject to lighter antitrust concerns since they usually represent vertical and not horizontal agreements, as long as NPEs do not entertain privateering ties with product-market players (i.e. the seller does not retain financial interests in the patents sold to the NPE).[10]

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[8] Registration can be important to maintain the license unaffected by patent transfers. Among EU Member States, only Lithuania imposes recordation as an obligation of the parties that produces constitutive effects. Instead, Slovenia and Sweden deprive recordation of any legal effect and leave it to the parties' will. See the relevant statutes at <https://wipolex.wipo.int/en/main/legislation>. According to one study, the European Patent Register lists only 822 granted licenses between 1999 and 2013; see Rafał Wisła and Tomasz Sierotowicz, 'Patent Licensing in Selected European Countries' (2015) 11(3) Journal of Entrepreneurship Management and Innovation, 74-75. The key importance confidentiality has for industry participants impedes transparency over patent value to the detriment of markets for technology. Nowadays, the debate over confidentiality is prominent with regard to the non-discriminatory prong of FRAND licensing commitments for SEPs; see Spyros Makris and Claudia Tapia, 'Confidentiality in FRAND Licensing After Huawei v ZTE: National Courts in Europe Searching For Balance' (September 2018) les Nouvelles 210, 212. Confidentiality also harshens the empirical research on patent licenses; see Thomas Varner, 'An Economic Perspective On Patent Licensing Structure and Provisions' (March 2012) les Nouvelles 28, 28.

[9] Examples of information exchanged during licensing negotiations are past sales data, the geographic distribution of future sales, collaboration agreements in place with third parties and comparable licensing agreements concluded; see Spyros Makris and Claudia Tapia, 'Confidentiality in FRAND Licensing After Huawei v ZTE: National Courts in Europe Searching For Balance' (September 2018) les Nouvelles 210, 212; Larry Goldstein and Brian Kearsey, *Technology Patent Licensing: An International Reference on 21st Century Patent Licensing, Patent Pools and Patent Platforms* (Aspatore Books, 2004), 33-35. On the FRAND licensing negotiating framework defined by the CJEU in *Huawei/ZTE*, see Niccolò Galli, 'The FRAND Defense Up To Huawei/ZTE' (2016) 7 Bocconi Legal Papers 155, 176-190.

[10] In a patent privateering agreement, a PE, i.e. the sponsor, assigns some of its patents to a NPE, the privateer, retaining a financial interest in the subsequent patent enforcement by the privateer. Privateering agreements are usually bilateral transactions, involving just one sponsor and one privateer. Indeed, it would be difficult to identify which patent among a large patent portfolio generates which amount of revenue and to be shared with the corresponding sponsor; see Nikolaus Thumm and Garry Gabison (eds), *Patent Assertion Entities in Europe* –

After the conclusion of the NDA, proper negotiations commence involving technical, legal and financial issues. The technical discussions touch upon patent validity, standard-essentiality when SEPs are at issue, benefits over alternative technologies and eventually infringement by the prospective licensee. To demonstrate infringement or standard-essentiality patentees provide evidence of use documents, also-known-as claim charts (see figure 1), which compare patent claims to descriptions of the prospective licensees' products or the standard specifications.[11]

Figure 1. Simplification of an Evidence of Use/Claims Chart

Patent XYZ (patent family geographical validation)	
Infringer: OEM Co.	
Infringing Product: Super Smartphone	
Patent Claim 1: claim sentence from the patent	Evidence of how Super Smartphone infringes all elements of Claim 1
Patent Claim 2: claim sentence from the patent	Evidence of how Super Smartphone infringes all elements of Claim 2
Patent Claim 3…	…

Table edited by the author.

Technical discussions of massive patent portfolios, such as those of patent aggregators, are in practice limited to just a representative sample of patents. Patentees bring forward proud lists of their patents, the so-called crown jewels or proof packages, while prospective licensees look for weak patents. Based on the few patents analysed, each party tries to generalise the value of the entire portfolio in his respective interest, assuming that some patents may be invalid.[12]

Having set the merits of the patented technology, or at least of a hopefully representative sample of the patent portfolio, legal and financial discussions follow. To facilitate the drafting of an agreed contract, the parties can exchange term sheets highlighting in key points the respective starting positions and possibly draft contracts.

Then, everything comes down to the license price. Above all stands the value of the licensed patents determined under four primary methodologies simplified as follows.[13] The so-called income approach uses forecasts of the income that the licensed patents will generate for the licensee. The costs saving method relies on estimates of savings brought using licensed patents instead of alternative technologies. The asset cost approach considers what the to-be-licensed patent costed to the patentee as a minimum license price, while what would cost to the prospective licensee to design around the patent or to adopt the next best non-infringing alternative as the maximum license price. Last, the comparable market approach benchmarks akin licenses of the same patents between different parties

Their Impact on Innovation and Knowledge Transfer in ICT Markets (JRC, 2016), 31-32; Daniel Rubinfeld, ´IP Privateering in the Markets for Desktop and Mobile Operating Systems´ (2018) 33 Berkeley Technology Law Journal 85, 102-108.

[11] See David Smith, Patents, *Cloaks & Daggers: Inside the Secretive Patent Trade* (CambridgeManhattan, 2014), 69-72.

[12] See Koren Wong-Ervin, 'OECD Competition Committee: Roundtable on "Licensing of IP Rights and Competition Law"' (6 June 2019), 7-8.

[13] See WIPO, *Successful Technology Licensing* (WIPO IP Asset Management Series, 2015), 9-13. From a licensee's perspective, a license price is reasonable when it is lower than litigation costs, time value of money and likely litigation outcome. Vice-versa, from a licensor's perspective, a license price is reasonable when it is higher than litigation costs, time value of money and likely litigation outcome. The difficulty is to find the market price between such two opposite stances. Furtheremore, value is time-dependent and party-dependent; see WIPO, *Exchanging Value: Negotiating Technology Licensing Agreements. A Training Manual* (WIPO International Trade Centre, 2005), 34-38; Robert Reilly, 'Intellectual Property Valuation Approaches and Methods' (September 2011) les Nouvelles 198, 199-207.

or of similar technologies, if available. Cross-checking the results of different methodologies avoids discrepancies of highly volatile evaluations.[14]

Notably, for SEPs licensing, within the negotiating framework established by the CJEU in *Huawei/ZTE*, it is the SEP-holder who must submit the first written offer for a FRAND license, specifying the royalty amount and its calculus, to the prospective licensee and not the other way around. Both the Attorney General's opinion and Court' judgment repute such a duty proportionate and implicit in the FRAND commitment given to the relevant SSO, whereby the patentee has accepted to exploit his SEPs through FRAND licenses and not to restrict its access. Besides, the Non-Discriminatory part of FRAND can better be fulfilled by the patentees' offer, especially in light of previous licenses for the same SEPs.[15]

Not always novelty of technology will correspond to high price tags if it lacks proof of application or its advantages over alternative technologies are unclear. Indeed, the profitability of the patent implementing goods, intended as their sale potential and profit margins, must account for implementation costs and non-patent-related profits deriving from production processes, distribution networks or marketing. Early-bird license fee discounts can off-set part of such costs and incentivise the adoption and accelerate the diffusion of unproven technologies. Because of the risks of early-stage technology licensing, most patent aggregators concentrate on licensing patents over pervasive and well-established general-purpose technologies such as ICT standards. Inherently, licensing SEPs is more convenient than non-SEPs, since no one can implement a standard without infringing truly-essential non-optional patents. During SEP licensing negotiations, patent aggregators that prove the non-optional standard-essentiality (of at least one claim) of their SEPs make licensees aware that the litigation sword of Damocles is pending over their standard-compliant products. Once standard-essentiality is proven, patent aggregators can license across entire standard-implementing industries achieving economies of scale in repeat SEPs licenses. To put it differently, most patent aggregators play it safe and go for the gold-mining business of SEPs licensing rather than place the lottery-ticket bet of licensing unproven patented technology.

Other objective factors in determining the due consideration are the scope and term of the license. Long, renewable or exclusive licenses are usually more expensive than short term or narrow scoped ones. Industry practices, court adjudicated royalties, legal strength of the patents and the value attributed by consumers to the patented feature added to the product influence licenses' price tags, too. Finally, licensees' characteristics such as particular use for the licensed patent, their size and expected revenues, position in the product marketplace and life-span of the licensed technology are also relevant.[16]

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[14] The income approach better suits the evaluation of mature patented technologies, whereas the costs saving method the evaluation of early-stage unproven patents not producing any income yet. Patent valuation guidance is to a certain extent provided also by commercial databases of licenses, scholarly publications and other industry sources; see Damien Salauze, 'A Simple Method for Calculating a "Fair" Royalty Rate' (September 2011) les Nouvelles 210, 210.

[15] See Case C-170/13 *Huawei v ZTE* [2015] EU:C:2015:477, paras. 59-64; Case C-170/13 *Huawei v ZTE* [2014] EU:C:2014:2391, Opinion of AG Whathelet, paras. 83-86.

[16] Licensees that commit early to implement a novel technology sustain more risks and therefore should receive a lower price than late-comers that conclude a license when the technology is proved and widely adopted; see Michala Meiselles and Hugo Wharton, *International Licensing Agreements: IP, Technology Transfer and Competition Law* (Wolters Kluwer, 2018), 55-57; Koren Wong-Ervin, 'OECD Competition Committee: Roundtable on "Licensing of IP Rights and Competition Law"' (6 June 2019), 1-2.

The struggle between high and low license consideration sees good arguments on both sides. Licensors argue that they incurred costly R&D investments to invent, that they bear the costs and legal risks of protecting the inventions or that licensing income fuels their further R&D, which is likely to add value to the licensees' operations. Licensees counter-argue that licensors have incurred inevitable sunk costs, that licensees sustain the most substantial part of innovation risks as they produce, promote and sell the patent-implementing products, that implementation requires costly investments or that the licensor´s patents are worthless without the licensee´s implementation, which in turn enhances the licensor´s return on investment.[17] Unsurprisingly, portfolio licensing negotiations can last for months or even years in electrical engineering industries and often licenses already provide for a specified after-term re-negotiation period.

Beyond the typical financial and timing threat points, patent licensing negotiations involve specific escalation strategies on both sides that peril good faith negotiations. On the one hand, if prospective licensees already infringe the patent, patentees can leverage the filing of infringement litigation that could lead to injunctions disrupting the infringers' businesses, unnecessary litigation costs and damage awards. Vertically integrated patentees that are also component suppliers (e.g. Qualcomm) can also leverage threats to withhold or delay supplies. On the other hand, the prospective licensee could adopt delaying tactics, sue the patentee for patent invalidity or declaration of non-infringement, complain before competition law authorities for abusive exploitation by dominant patentees, design around the offered patent or turn to substitute patented technologies. Though, prospective licensees' revocation or declaration of non-infringement actions are not suitable if patentees hold vast amounts of patents to assert. In this case, prospective licensees' best defence is the ability to threaten back retaliatory infringement litigation of their own significant patent portfolios against approaching licensors. Such a mutually-assured-destruction ('MAD') setting leads to peaceful cross-licenses, provided approaching licensors have product-market operations to be disrupted by patent infringement litigation, namely as long as the licensor is not an NPE. Given the possible escalations, licensing due diligence should prepare each negotiating party to anticipate or respond to the other party's strategy, not to be caught unprepared for litigation.[18]

Within the analysed general legal requirements and negotiating framework, patent licenses have four elements, namely, scope, limitations, consideration parameters and additional clauses.

2.1. Scope of Patent Licenses

Patent rights that the licensor out-licenses and the licensee in-licenses encompass all or a subsection of rights conferred by patents in each respective territory where they are granted. In practice, the business objective of the licensee isolates the categories of patent rights he needs, such as the rights to make, have made, use, offer for sale, sell and import the patented invention. The license can further confine the grant of patent rights to specific technical fields of application, product markets and

[17] See Michala Meiselles and Hugo Wharton, *International Licensing Agreements: IP, Technology Transfer and Competition Law* (Wolters Kluwer, 2018), 16.

[18] Facing infringement litigation, the prospective licensee risks direct economic losses because of damage awards and litigation costs, as well as an indirect economic loss if business operations are injuncted. Even if groundless, patent invalidity or declaratory litigation is time-consuming for the patentee, which also risks of losing its exclusive IPRs. Instead, filing a competition law complaint with a national antitrust authority has almost zero costs for the infringer but big risks for the patentee. See, Article One Partners, 'Best Practices for IP Monetisation' (Webinar, 2017), <https://www.rws.com/rws-resources/rws-ip-services/best-practices-for-ip-monetization/>.

industrial sectors (i.e. field of use) or the satisfaction of given demands (i.e. captive use restriction and exclusive customer group).[19]

Patent portfolio licenses, as opposed to individual patent licenses, grant rights for defined packages of patents that are needed altogether to implement a sophisticated technology. Since portfolios evolve, with new granted patents and old expired ones, usually portfolio licenses provide for a capture date by which the licensee receives rights for the patents added up to that date without the need for renegotiations. Alternatively, portfolio licenses provide for post-signing bi-directional fee adjustment clauses to handle portfolio reductions due to invalidity or unenforceability judgments or increases due to acquisitions of external patents. Portfolio licenses, a characteristic feature of patent aggregators, are efficient when they save resources and negotiation costs otherwise necessary to determine the value of individual patents. However, they can also be used to inappropriately exert market power bundling needed patents (e.g. SEPs for a given standard) to unnecessary ones (e.g. non-SEPs, or SEPs for unneeded standards). The anti-competitive concerns are exceptionally high if the license fee is invariant to the number of patents so discouraging licensees from challenging the validity of individual patents.[20] To re-assure that portfolio licenses only reflect efficiencies and not bundling, certain patent aggregators (e.g. France Brevets) explicitly offer licenses for specific patents out of their portfolios up to the licensees' needs.

The party that retains rights to the licensed patents differentiates licenses between non-exclusive, sole and exclusive ones. Non-exclusive licenses permit the licensor himself to use the licensed subject matter and to grant additional licenses. Sole licenses reserve the right on the licensed subject matter exclusively to the licensor and licensee, without further licensing possibilities. In contrast, exclusive licenses give the licensed rights to the licensee only at the expense also of the licensor. Parallel exclusive licenses can exist for different fields of use or territorial limitations. Because exclusive licensees have full control over the licensed patents, licensors often impede their non-use through minimum performance requirements, best-effort guarantees and deadlines to exclusivity (so-called 'head-start-only' exclusive licenses). Maintenance clauses, especially for exclusive or sole licenses, allocate the parties' obligations regarding renewal payments and enforcement duties against third party infringements. FRAND licenses for general-purpose technologies and industry standards represent the most non-exclusive licensing category, standing on the opposite side of the spectrum of exclusive-licenses for early-stage chemicals technologies requiring large investments in further R&D by licensees.[21]

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[19] See Michala Meiselles and Hugo Wharton, *International Licensing Agreements: IP, Technology Transfer and Competition Law* (Wolters Kluwer, 2018), p. 425; TTBER Guidelines, paras. 208-215.

[20] See Marvin Blecker, Tom Sanchez and Eric Stasik, 'An Experience-Based Look At The Licensing Practices That Drive The Cellular Communications Industry: Whole Portfolio/Whole Device Licensing' (December 2016) les Nouvelles 231, 232-233; Peter Picht, 'Post-Signing Adjustment Of SEP/FRAND Licenses' (June 2018) les Nouvelles 99, 103; Daniel Rubinfeld and Robert Maness, ´The Strategic Use of Patents: Implications for Antitrust´, in François Lévêque and Howard Shelanski (eds), *Antitrust, Patents and Copyright: EU and US Perspectives* (Edward Elgar, 2005), 90.

[21] For the EU competition law definition of exclusive patent licenses, see TTBER, Art. 1(1)(p); for the EU competition law analysis of licensees' minimum performance requirements, see TTG, paras 190 and 194; Michala Meiselles and Hugo Wharton, *International Licensing Agreements: IP, Technology Transfer and Competition Law* (Wolters Kluwer, 2018), p. 38; Sophie Lawrence, 'The Competition Law Treatment of No-Challenge Clauses in Licence Agreements: An Unfortunate Revolution?' (2014) 9 Journal of Intellectual Property Law & Practice 802, 810.

Licenses can also provide up-front for rights to improvements of the licensed technology, with or without bidirectional remuneration adjustments. On the one hand, the licensor will likely develop his proprietary technology or patent portfolio further. On the other hand, the licensee, by implementing the technology, acquiring market insights and receiving customer feedback might as well enhance the technology and patent such improvements.[22]

2.2. Territorial and Temporal Limitations of Patent Licenses

Given the territorial nature of patents, implementers only need licenses for those subsets of countries where they operate and where relevant patents exist. Furthermore, patentees can limit their licenses to a subset of countries where patents are valid. For example, a patentee can conclude exclusive parallel licenses with different licensors in different countries. Instead, worldwide or multi-country licenses are useful for patent families composed of widely validated patents, for early-stage technologies with still-pending patent applications and technologies belonging to global markets such as those belonging to industry standards.[23]

Another limitation of patent licenses is their duration. One solution is to match the term of the license with their life-span if just a few patents are licensed. Shorter fixed terms work for patent portfolio licenses, whereby the evolution of the portfolio composition justifies the need to renegotiate licenses over time. The introduction of new patented technology (e.g. 5G) as much as the depreciation of old patented technology (e.g. 3G) both call for licensing adjustments. Licenses that couple patent with non-patented subject matters can also last without term or beyond the life of the licensed patent. Finally, the parties can also agree to the automatic renewal of the license upon termination.[24]

2.3. Consideration Parameters of Patent Licenses

The financial parameters of licenses allocate innovation risks between licensors and licensees. Consideration in exchange of licensed subject matter can be monetary or not. Licenses without monetary payments are called royalty-free ('RF'), yet they can embroil non-monetary consideration such as cross-licenses, grant-backs, research collaboration, equipment supply, consulting, R&D or manufacturing outlays. The main types of monetary consideration are lump sum, running royalties and a mix of the two. Lump sums, also-known-as flat-fees, are fixed payments due at defined time-intervals or events, such as upon the closing of a fully-paid up license or the reaching of a performance milestone. Assignments by licensees to licensors of equity, stock or stock options can also be structured

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[22] Non-exclusive licenses with grant back clauses for improvements function as R&D hub and spokes, whereby licensors benefit from different licensees´ capabilities and improve their core technology via external partners; see WIPO, *Exchanging Value: Negotiating Technology Licensing Agreements. A Training Manual* (WIPO International Trade Centre, 2005), 53.

[23] Patentees could impose financial consideration based on sales of licensed products also in countries where no patent protection exists. In practice, patent licenses often provide for consideration based on world-wide product sales regardless of where the patent is granted It is debatable whether such practice is legal.

[24] The antitrust treatment of bare patent licenses that extend after the patent expiration date differs between the EU and the US. In the EU, such licenses are lawful provided that the licensee can terminate the contract any time after the expiration date. Instead, in the US patent licenses that extend post-expiration of the patent constitute per se patent misuse insofar as they represent means for the patentee to charge the licensee for use of the patent after its entry into the public domain. Similar reasoning applies in case of patent invalidity, non-enforceability or non-infringement judgments. For the EU, see C-320/87 *Kai Ottung* ECLI:EU:C:1989:195; C-567/14 *Genentech* ECLI:EU:C:2016:526; TTBER Guidelines, para. 187. For the US, see *Brulotte v. Thys Co.*, 379 U.S. 29 (1964); *Kimble v. Marvel Ent't LLC*, 133 S. Ct. 2401 (2015); Gracie Mills and Jessica Roberts, 'Brulotte Per Se Ban on Post-Expiration Royalties Remains but Options for Negotiating Post-Expiration Payments Exist' (AIPLA Patent Law Committee Newsletter, May 2016) <https://www.finnegan.com/en/insights/brulotte-per-se-ban-on-post-expiration-royalties-remains-but.html>.

similarly to fixed payments. Royalties are variable and recurring fees calculated by applying either a percentage (e.g. 3%) or a fixed (e.g. €0.05) royalty rate to a determined royalty base during a specific period. Royalty bases are sales-related (e.g. shipments, items, volume, sales or users) or profits-related. Parties can agree to minimum and maximum royalty caps, payment deadlines and missed or late payment penalties. To demonstrate royalty compliance and facilitate auditing, licenses set recordkeeping obligations, rights to inspect financial records, to the rendering of accounts of revenues and sales figures or requirements of certified royalty statements by independent public accountants.[25]

Generally, running royalties lead to win-win situations, whereby licensors are rewarded depending on licensees' performance in the licensed product market. Flat-fees or lump sums create an all-or-nothing approach to the allocation of innovation risks between licensors and licensees, resulting in either overpayment or underpayment. Hence, running royalty licenses align the parties interests, making them more partners than rivals. Paid-up licenses work well when the future revenue of the licensee from the use of the licensed patents is foreseeable, their demand is certain and the parties are not likely to dispute over price. Instead, running royalties can adjust to the profitability and life-cycle of the licensed technology that usually has a growth phase, saturation phase and decline phase providing flexibility to parties. For example, parties can agree to royalty reduction provisions if patents are invalidated or held unenforceable. Alternatively, anti-stacking clauses reduce the royalty rate if licensees are required to take other licenses from third parties for the originally licensed products.[26] Other royalty adjustments can refer to time so that the initial royalty rate decreases over the term of the license and to the volume of patent implementing products sold so that more sales correspond to lower royalty rates. Finally, part paid-up licenses mix lump sums and running royalties, whereby the lump sum can either represent an advance against future royalties or complement running royalties.

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[25] Paid-up licenses can also provide for instalments; see Michala Meiselles and Hugo Wharton, *International Licensing Agreements: IP, Technology Transfer and Competition Law* (Wolters Kluwer, 2018), 48; Eric Brousseau and others, 'The Diversity Of Technology Licensing Agreements And Their Cause' (December 2005) les Nouvelles 179, 187. For an example of equity as licensing consideration, see the PatentShield program by InterTrust and Google, <https://www.intertrust.com/patentshield/>. Advancements against royalties are sometimes payable upon execution of the license agreement. They are important insofar as licensed products will not generate earned royalties for a long time after the conclusion of the agreement. The advanced fee is then fully creditable against royalty obligations; see Gregory Battersby and Charles Grimes, *Licensing Desk Book* (Aspen Law & Business, 1999), 189-192. Gross receipt royalty is a percentage of the gross receipts from sales of licensed products by the licensee during a specific time period. Net revenue royalty is a percentage of the licensee's net revenue from sales of licensed products after costs. When the licensee is a competitor of the licensor, royalties should be based on gross quantities such as end-user sales price often public, not to open books to competitors; see Joseph Yang, 'Advanced Topics in Technology and Patent Transactions' in Marcelo Halpern, Ira Levy and Joseph Yang (eds), Advanced Licensing Agreements 2018 (Practricing Law Institute, 2018), 108-109. For example, Sisvel requires licensees to send by email within one month after each calendar quarter the so-called royalty statement indicating the number of licensed products sold and purchased.

[26] See WIPO, *Exchanging Value: Negotiating Technology Licensing Agreements. A Training Manual* (WIPO International Trade Centre, 2005), 18-20. The price burden imposed by licenses on licensees is maximum for paid-up or lump-sum licenses, whereby the licensees pay everything up-front but can freely exploit the technology. Licensees sustain decreasing consideration risks in the following order: minimum royalty licenses, fixed per-license royalty or running per-unit payment, volume or revenue-based discounted royalty, list-based royalty and net-based royalty; see Alan Leal, 'Applied Royalties In The High-Tech Industry' (March 2011) les Nouvelles 60, 61-62. In the early phase, patentees must be open to vast implementation to set the dominant design, then tighten patent protection and support different applications in different uses, finally in the decline phase aggressively enforce; see Henry Chesbrough, 'Licensing In The Context Of The Business Model: One Size Does Not Fit All' (September 2007) les Nouvelles 508, 512-513; Ethan Horwitz, 'Patent and Technology Licensing' in Ethan Horwitz and Mark Holmes (eds), *Patent & High Technology Licensing 2004* (Practicing Law Institute, 2004), 27-32.

Regarding SEPs portfolio FRAND licensing, a disputed issue is whether the royalty base should correspond to the price of the final device (so-called entire market value rule 'EMVR') or of the individual component implementing the patented technology (so-called smallest saleable patent practising unit 'SSPPU'). Patentees advocate the device price as the royalty base as it better shows the value created by the licensed patents. Arguably, large patent portfolios comprise diverse patents that cover at the same time various components alone, various components in combination, complete devices alone and complete devices in networks. Therefore, having the final device as the royalty base avoids disputes, saves transaction costs and provides freedom to operate to licensees to develop new devices and change component suppliers. Licensees instead advocate that the SSPPU better reflects the relative contribution of the patented technology to the whole product. . In line with the SSPPU argument, licensors of a patented component may not fix the price at which manufacturers incorporating the licensed component must sell their end products. The parties' agreement on royalty caps, setting both lower and upper payment bounds, solves the EMVR/SSPPU quarrel by guaranteeing both the minimum reasonable compensation to licensors for the value of their patents and the maximum price for licensees reflecting the contribution of the licensed patents to the licensed products.[27]

2.4. Additional Patent Licenses Clauses

Licenses between arms´ length parties contain most boilerplate business contracts clauses regulating the contract amendment procedure, the severance of provisions separately held invalid, the language of the contractual relationship, the address for written notifications and force majeure circumstances. Confidentiality, governing law and dispute resolution clauses are also customary.[28]

Representations, warranties and indemnifications edge the parties against various risks and depend on the nature of the licensed subject matter. Usually, these clauses concern validity and the licensor's ownership of the licensed patents. They also pinpoint the liens or encumbrances such as previous licenses or licensing terms commitments pending on the licensed patents, if any.[29]

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[27] Para. 184 TTG recognises that the EMVR is generally not anti-competitive if the final product upon which royalties are calculated incorporates the licensed patents; see, also, US AG's National Committee to Study the Antitrust Laws, *Report of the Attorney General's National Committee to Study the Antitrust Laws* (US Gov. Printing Office 1955, vol. 1), 236; Marvin Blecker, Tom Sanchez and Eric Stasik, 'An Experience-Based Look At The Licensing Practices That Drive The Cellular Communications Industry: Whole Portfolio/Whole Device Licensing' (December 2016) les Nouvelles 231, 241-242; Thomas Varner, 'Technology Royalty Rates in SEC Filings' (September 2010) les Nouvelles 120, 126. For example, adopting the SSPPU FRAND SEP-royalties calculation methodology instead of the EMVR one, Sierra Wireless, a Canadian wireless equipment designer and manufacturer, reduced the estimate of its contingent wireless SEPs royalty obligation by US$13 million from 2015 to 2016; see Sierra Wireless, *2018 Annual Report* (2019) <https://www.sierrawireless.com/company/investor-information/annual-reports-and-regulatory-filings/>, 41.

[28] Brousseau and others find that the applicable law is the licensor´s country in 73.1% of the contracts they surveyed, while only in 11.1% of the cases is the law of a neutral country; see Eric Brousseau and others, 'The Diversity Of Technology Licensing Agreements And Their Cause' (December 2005) les Nouvelles 179, 186. In the rare absence of a choice of governing law, private international law determines the applicable law. In the EU, according to Art. 4, para. 2 of Rome I regulation, licenses follow the laws of the country of the abitual residence of the party required to effect the characteristic performance of the contract. For example, in non-exclusive bare patent licenses, whose characteristic performance is the payment of fees from the licensee to the licensor, the habitual residence of the licensor determines the applicable law. If the licensee bears more obligations that qualifies him as the party of the characteristic performance, his residence would determine the applicable law. Common breaches of patent licenses include infringement, violation of payment obligations, ordinary contract breaches and violation of secrecy.

[29] See WIPO, *Successful Technology Licensing* (WIPO IP Asset Management Series, 2015), 27-28.

Termination clauses identify the grounds that give rise to the right to terminate the license, such as material breaches by the parties, insolvency, change of control or ownership, occurrence of force majeure events or the provision of sufficient notice. Termination effects are also fixed, since individual issues besides the rescission of rights can withstand termination either temporally, such as confidentiality and past-due payments, or indefinitely, such as indemnities. A patent-specific ground for termination is the licensee´s challenge of the validity or standard-essentiality of the licensed patents, which is subject to EU case-by-case competition law assessment when inserted in non-exclusive licenses. Close to such patent-specific termination clause, no-challenge clauses comprise all direct or indirect obligations not to challenge the validity of the other party's patents and are subject to case-by-case EU competition law assessment too.[30]

When licenses grant sub-licensing rights to licensees, the licensor usually retains some ownership control by imposing various limits, such as notification obligations, prior written authorisations, sub-licensees selection criteria and veto powers. Different from sub-licensing rights are license assignment restrictions limiting either party´s right to assign rights and obligations under the license.

Grant-back clauses govern the license back to the licensor of the licensee´s improvements of the licensed technology or other patents, effectively turning licenses into cross-licenses. If grant-backs are not exclusive, they do not raise EU competition law concerns. Licensors might impose on top of a grant-back also a feed-on clause, which allows them to license the granted-back improvements or other patents to third parties.

Finally, non-compete clauses oblige the licensee not to use third party technologies that compete with the licensed subject matter. Most-favoured licensee ('MFL') and licensee parity clauses grant licensees the right to obtain terms as favourable as had been granted to other licensees. However, since licenses are context-specific and several limitations apply, licensees claiming parity should accept all terms of the MFL without cherry-picking terms.[31]

After the examination of the legal institutions, negotiating framework and main elements of patent licenses, the next section opens the empirical analysis of patent licensing by mapping its limited quantitative data available.

3. Quantitative Data on Patent Licensing

No general publicly-accessible database exists on patent licensing activities at the firm level. The rare registrations of licenses into patent offices' official registers only disclose the date of the agreement, the patent number, the names and addresses of the parties. Some proprietary databases exist, such as KTmine, Questel Orbit, RoyaltyRange or RoyaltySource, but their data are limited as they mostly rely on voluntary disclosures from contractual parties and financial reports coming from publicly listed firms. A small fraction of licenses, albeit often in redacted form, is known being determined by courts during patent infringement damages or contract lawsuits. In this sense, there are more examples of common law jurisdictions than civil law ones, especially regarding SEPs. Some licensing details are

[30] Exclusive licensees do not have great interest to invalidate the licensed patents risking to lose monopoly;see TTBER Guidelines, paras. 133-140.

[31] See WIPO, *Exchanging Value: Negotiating Technology Licensing Agreements. A Training Manual* (WIPO International Trade Centre, 2005), 49-50 and 53; TTBER Guidelines, paras. 129-132.

available for SEPs portfolios licensed by patent pools, which nevertheless represent a minority of SEPs licenses as most SEPs are licensed individually (91% as of 2015).[32]

The widespread secrecy on licensing financials is intense, notwithstanding that patents and the descending revenues, especially for start-ups, signal technological quality and facilitate access to capital. Gu and Lev find that royalty income statements bolster investors' perceptions of licensors' technological capabilities and alleviate uncertainty over R&D outcomes.[33]

Such a signalling effect and perhaps other strategies are behind the royalty rate declarations that many electronics firms make regarding licenses of their SEPs portfolios for each generation of telecommunication standards (so-called 'headline rates'). Between 2017 and 2019, prominent patentees have already announced 5G SEPs per-device royalty rates, namely Nokia (€3), Ericsson (US$2.50 to 5), Qualcomm (2.275% for 5G-only, 3.25% for multimode 3G/4G/5G) and InterDigital (0.60%, capped at between US$0.10 and 1.20).[34] Analogous statements occurred for 4G as reported by Table 1.

Table 1. 4G Announced Royalty Rates

Patentee	Announced royalty rate per device	Royalty rate for 2016 average priced 4G device (€240)
Nortel	1%	€2.40
Qualcomm	3.25%	€7.80
Motorola License	2.25%	€5.40
Alcatel-Lucent	2%	€4.80
Ericsson	1.5%	€3.60
Huawei	1.5%	€3.60
Nokia	1.5%	€3.60
Nokia-Siemens Network	0.8%	€1.92
ZTE	1%	€2.40
Sisvel 4G Portfolio	€0.66 to €0.53	Idem
InterDigital	0.50% (caps US$0.1-1.0)	Idem

Table adapted by the author from: Eric Stasik, 'Royalty Rates And Licensing Strategies For Essential Patents On LTE (4G) Telecommunication Standards' (September 2010) les Nouvelles 114; <https://www.interdigital.com/rate-disclosure> and <https://www.sisvel.com/licensing-programs/wireless-communications/mcp/license-terms>.

If the 4G headline rates were actually applied, the cumulative royalty burden would amount to more than US$50 for an average US$400 smartphone. Considering that smartphones implement a wide array of other technologies (e.g. memory, battery, display, Bluetooth, GPS, NFC, camera, video, audio…) one estimate of the cumulative royalty stack for all technologies surpasses 30% of a smartphone's price, almost equal to its components' costs. However, headline rates are rarely applied *as is,* they are aspirational rates, as they occur before the widespread implementation of the underlying standard and set the upper ceiling to licensing negotiations. Galetovic, Haber and Zaretzki

[32] See Jiaqing Lu, 'The Myths and Facts of Patent Troll and Excessive Payment: Have Nonpracticing Entities (NPEs) Been Overcompensated?' (2012) 47(4) Business Economics 234, 240; Chryssoula Pentheroudakis and Justus Baron, *Licensing Terms of Standard Essential Patents: A Comprehensive Analysis of Cases* (JRC Science for Policy Report, 2017), 40-41; Tim Pohlmann and Knut Blind, *Landscaping Study on Standard Essential Patents (SEPs)* (EC DG Grow – IPlytics, 2016), 36.

[33] See Maria Pluvia Zuniga and Dominique Guellec, 'Who Licenses out Patents and Why? Lessons from a Business Survey' (2009) OECD Working Paper 2009/05, 5-6; Feng Gu and Baruch Lev, ´The Information Content of Royalty Income´ (2004) 18(1) Accounting Horizons 1, 8-9.

[34] See Nokia, Nokia Licensing Rate Expectations for 5G/NR Mobile Phones (Nokia Press Release, 21 August 2018), <https://www.nokia.com/about-us/news/releases/2018/08/21/nokia-licensing-rate-expectations-for-5gnr-mobile-phones/>; Ericsson, Ericsson's FRAND Licensing Terms for 5G/NR in 3GPP Release 15 (Ericsson Press Release, 3 March 2017); <https://www.ericsson.com/assets/local/patents/doc/frand-licensing-terms-for-5g-nr-in-3gpp-release-15.pdf>; Qualcomm, Qualcomm 5G NR Royalty Terms Statement (Qualcomm Press Release, 19 November 2017), <https://www.qualcomm.com/media/documents/files/qualcomm-5g-nr-royalty-terms-statement.pdf>; <https://www.interdigital.com/rate-disclosure>.

contrast the smartphone royalty stack estimation and individuate, based on disclosed royalty earnings of licensors divided by the total value of mobile phone shipments, a 5.6% average cumulative royalty yield, excluding non-cash values of cross-licenses and patent pass-through rights.[35]

Notwithstanding the empirical evidence, the strongest argument for the pro-innovation function of patent aggregation is precisely its role against royalty stacking. Arguably, patent aggregation solves the double-marginalisation and Cournot-complements (i.e. anti-commons) problems posed by fragmented ownership of complementary patents in patent-dense ICT industries. Indeed, patent aggregators provide one-stop-shop and transaction costs licensing efficiencies inasmuch as collective management organisations do for copyright-dense media industries.

Despite the reluctance to disclose concrete licensing information, a few empirical efforts investigate patent licenses relying on data from surveys or proprietary databases. The variety of samples and methodologies impedes to draw generalisable conclusions outside the relevant studies, which nevertheless shed useful light on the otherwise mysterious patent licensing business.

There is consensus that technology licensing has increased over the years, with a few early-adopters of open innovation strategies driving such increase. For Arora, Athreye and Huang, the level of spending for technology in-licensing increases with firm size and R&D expenditure, while the relationship between firm size and probability to out-license is U-shaped. Such results hint to diversified R&D paths by large firms and comparatively more out-licensing by small and big firms than mid-sized ones.[36]

According to Radauer and Dubenbostel, only small parts of patent portfolios are out-licensed (between 5 and 10%) with SMEs accounting for larger shares than big firms. However, cross-licensing is rare between small firms and occurs more often between large patentees, showing that the sizes of patent portfolios drive the attractiveness of firms as cross-licensing partners. Indeed, capital intensive firms with sunk R&D costs are more prone to cross-license with symmetric firms so to achieve freedom-to-operate and moderate litigation costs. The usual specialisation of SMEs in their core technologies could also mean that they have less cross-licensing needs compared with large firms with vast operations.[37]

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[35] See Ann Armstrong, Joseph Mueller and Timothy Syrett, 'The Smartphone Royalty Stack: Surveying Royalty Demands for the Components Within Modern Smartphones', (2014) Working Paper available at <https://www.ssrn.com/abstract=2443848>, 2 and 14; Alexander Galetovic, Stephen Haber and Lew Zaretzki, 'An Estimate of the Average Cumulative Royalty Yield in the World Mobile Phone Industry: Theory, Measurement and Results', (2018) 42 Telecommunication Policy 263. Cumulative royalties for ex-works selling price (i.e. first selling price on leaving the factory) in the telecommunication industry was normally 2-5% before 2G GSM. High cumulative royalties act as a barrier to entry, produce a slanted field of competition since the major PEs produce substantial royalty reductions through cross-licensing; see Larry Goldstein and Brian Kearsey, *Technology Patent Licensing: An International Reference on 21st Century Patent Licensing, Patent Pools and Patent Platforms* (Aspatore Books, 2004), 44.

[36] See Ulrich Lichtenthaler and Holger Ernst, 'Managing An Out-Licensing Program: The State-Of-The-Art' (June 2007) les Nouvelles 436, 436-437; Ashish Arora, Suma Athreye and Can Huang, *Innovation, Patenting and Licensing in the UK: Evidence From the SIPU Survey* (UKIPO Report, 2013), 11.

[37] See Alfred Radauer and Tobias Dubenbostel, *PATLICE Survey on Patent Licensing Activities by Patenting Firms* (EC DG Research and Innovation, 2013), 28. According to Torrisi, cross-licensing is more likely to occur for more controversial, broad and contestable patents, which heavily build upon earlier patents and patents with more overlapping claims. Cross-licensing helps concentrate R&D resources on technologies where the firm has a comparative advantage and obtain IP rights from others in other fields where the firm has no advantage. It can also force a new entrant to share its technological edge with incumbents, protect worthless patents from invalidity challenges, facilitate collusion on substitute technologies representing non-aggression agreements; see

Licensing activities mostly happen intra-group. Zuniga and Guellec determine that only a minority of firms licenses their patents to non-affiliated partners, prevalently within the licensors' industries (i.e. to customers, suppliers and competitors) rather than across industries, indicating the strategic function of freedom-to-operate licensing. The advent of the IoT is already challenging such industry-silos characteristic of patent licensing. As electrical engineering technologies cut across entire industries, bringing, for example, Wi-Fi chips from routers and laptops to aeroplanes and fridges, patentees, including aggregators, face an expanding market for cross-industry licensing. The Avanci patent pool, gathering many large patentees, already offers ad-hoc licenses for cellular telecommunication patents to the car manufacturing, smart meters and connected homes industries (so-called 'IoT verticals').[38]

There are several recognised motivations for licensing-in and licensing-out patented technology. In the electrical engineering sector, achieving freedom-to-operate is the first motivation to both in-license and out-license (second motivation to out-license across all industries). Other motivations to in-license, in order of importance, are to close technical gaps within the firm, access complementary assets, accelerate innovation processes, substitute internal R&D or expand it to non-core areas. Instead, motivations to out-license are to earn revenue, stop infringements, enable joint R&D, set standards, outsource manufacturing and share technology with others.[39]

Focusing on vertically-disintegrated patent aggregators, namely NPEs, the licensing motivations drastically change. On the one hand, NPEs rarely in-license because they do not need freedom-to-operate in product markets. When NPEs in-license they do so to build patent portfolios through exclusive-licenses with sublicensing rights. On the other hand, only the rent-seeking and standard-setting out-licensing motivations belong to NPEs. Since NPEs do not benefit from patent exclusivity in any product market, even patent infringements do not harm their out-licensing business as long as they can recover damages in court.

For both Vonortas and Jun Kim and Anand and Khanna, the chance of concluding a license increases depending on prior interactions among firms and on prior independent licensing experiences, which implies that moral hazards and transaction costs, in terms of screening markets, negotiating, monitoring and enforcing contracts are significant impediments to patent licensing. Such finding echoes the perceived main obstacles to out-licensing, which both Zuniga and Guellec and Radauer and Dubenbostel rank, in order of importance, as the potential loss of competitive or technological edge, difficulties to find partners, complexity and costs of contracting, lack of readiness of the invention, difficulties to monitor or enforce the license and price mismatch. Parallelly, barriers to in-license are unacceptable licensing terms, refusal to license, no-need to license, risks of divulgating own tech

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Salvatore Torrisi, 'Cross-licensing, Cumulative Inventions and Strategic Patenting' (2011) DRUID Working Paper, 9, 14-16 and 21-22.

[38] Only 1/5 of European firms and ¼ of Japanese ones in Zuniga and Guellec's sample license their patents to non-affiliated partners; see Maria Pluvia Zuniga and Dominique Guellec, 'Who Licenses out Patents and Why? Lessons from a Business Survey' (2009) OECD Working Paper 2009/05, 5-6; see <http://avanci.com/>.

[39] See Ulrich Lichtenthaler and Holger Ernst, 'Managing An Out-Licensing Program: The State-Of-The-Art' (June 2007) les Nouvelles 436, 438; Alfred Radauer and Tobias Dubenbostel, *PATLICE Survey on Patent Licensing Activities by Patenting Firms* (EC DG Research and Innovation, 2013), 35-41 and 67-71; Jerry Sheelan, Catalina Martinez and Dominique Guellec, 'Understanding Business Patenting and Licensing: Results of a Survey' in OECD, Patents, Innovation and Economic Performance: OECD Conference Proceedings (OECD, 2004), 96-97; Maria Pluvia Zuniga and Dominique Guellec, 'Who Licenses out Patents and Why? Lessons from a Business Survey' (2009) OECD Working Paper 2009/05, 17-18.

strategy, absence of a patent market, screening costs and lack of experience.[40] Both out-licensing and in-licensing barriers risk being exceptionally high for start-ups without prior independent licensing experience and market insight. In contrast, patent aggregators represent licensing specialists with the potential of overcoming many of the described obstacles. Their business is not to retain patent-related competitive and technological edges for themselves but to spread such edges as much as they can maximise their revenue. Clearing licensing transaction costs and determining market licensing terms are also integral parts of successful patent aggregation.

Radauer and Dubenbostel also report that only a minority of firms does not out-license to competitors, confirming that transaction costs considerations, therefore, prevail over competitive fears as licensing hurdles. Licensors' preferred ways to find licensees, overcoming screening and matching costs, are informal networks, active research, being contacted by the licensee, trade fairs or conferences, formal networks, research in patent databases, discovery of infringement, website advertisement, intermediaries and online marketplaces.[41]

Brousseau and others discover in their sample that the majority of licenses (60%) are bare patent licenses, while a non-negligible minority (40%) of patent licenses occurs within broader transactions. In Varner's sample, the average royalty rates of bare patent licenses are lower (between 1.1% and 2.2%) than those of production, distribution and settlement agreements. The largest licensors and the most profitable licenses in the analysed samples skew annual licensing revenues; namely, a few licensors and a few licenses account for the highest licensing revenues. This finding is in line with the highly skewed value of patents, whereby a few of them account for the highest share of the total value.[42]

Brousseau and others report the types of remuneration adopted by patent licenses like Radauer and Dubenbostel also do. In both samples, most contracts are part paid-up (62.1% and 81%), whereas a very few are RF (5.1% and 7%). Part paid-up licenses compromise the needs of licensors for quick consideration and of licensees for adjusting the consideration to the profitability of the licensed patents. Royalties-only is more common than lump sum-only (21.2% vs 11.6% and 26% vs 16%) reflecting the uncertain all-or-nothing approach to the allocation of innovation risks of lump sum-only licenses. In Brousseau and others, when licenses have lump sums, they are more often up-front than spread throughout the contractual relationship or due upon milestone achievements.[43]

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[40] See Nicholas Vonortas and Young Jun Kim, 'Technology Licensing' in OECD, *Patents, Innovation and Economic Performance* (OECD Conference Proceedings, 2004), 197; Bharat Anand and Tarun Khanna, ´The Structure of Licensing Contracts´, (2000) 48(1) Journal of Industrial Economics 103, 114; Maria Pluvia Zuniga and Dominique Guellec, 'Who Licenses out Patents and Why? Lessons from a Business Survey' (2009) OECD Working Paper 2009/05, 20-21; Alfred Radauer and Tobias Dubenbostel, *PATLICE Survey on Patent Licensing Activities by Patenting Firms* (EC DG Research and Innovation, 2013), 42 and 72-73.

[41] See Alfred Radauer and Tobias Dubenbostel, *PATLICE Survey on Patent Licensing Activities by Patenting Firms* (EC DG Research and Innovation, 2013), 32 and 52.

[42] See Eric Brousseau and others, 'The Diversity Of Technology Licensing Agreements And Their Cause' (December 2005) les Nouvelles 179, 180; Bharat Anand and Tarun Khanna, ´The Structure of Licensing Contracts´, (2000) 48(1) Journal of Industrial Economics 103, 105-112; Thomas Varner, 'Technology Royalty Rates in SEC Filings' (September 2010) les Nouvelles 120, 124-125; Ulrich Lichtenthaler and Holger Ernst, 'Managing An Out-Licensing Program: The State-Of-The-Art' (June 2007) les Nouvelles 436, 438; Alfonso Gambardella and others, The Value of European Patents: Evidence From a Survey of European Inventors (EC Report, 2005), 43 - 45.

[43] See Eric Brousseau and others, 'The Diversity Of Technology Licensing Agreements And Their Cause' (December 2005) les Nouvelles 179, 189; Alfred Radauer and Tobias Dubenbostel, *PATLICE Survey on Patent Licensing Activities by Patenting Firms* (EC DG Research and Innovation, 2013), 51-55.

Most licenses are non-exclusive, especially for electronics industries where fields of use and geographical restrictions are less common than temporal ones given the importance of standard-setting, the dynamic composition of large portfolios and the incompatibility of FRAND licensing with exclusive dealing. According to Radauer and Dubenbostel, exclusivity is more common in the health care sector, characterised by one-patent-one-product features. Even when there is exclusivity, parties usually limit it to certain fields of use and territories and rarely conceive it unlimited worldwide. Anand and Khanna explain that exclusive licensing offers greater dissemination effects in concentrated industries compared to fragmented ones. Ex-ante technology transfer is also exceptional for electronics technologies and more common, for example, for chemicals, whose market players often sign patent licenses before the development of the technology whereby licensees provide R&D financing to licensors in exchange for future exclusive rights to the resulting technologies.[44]

Regarding the contractual contents, Brousseau and others find that most licenses contain ADR clauses (65.9%), field of use restrictions (60%), grant-back (52.3%) and minimal performance guarantees (51.9%). Less common are renegotiation provisions (43.5%), sub-licensing rights (35.7%), most-favoured licensee provisions (19.9%), formal supervision mechanisms (17.9%) and rights to assign the license (16.8%).[45]

Against the quantitative background on patent licensing, the next section presents a multiple case study of the licensing practices of four patent aggregators, namely, Sisvel, France Brevets, Fractus and Qualcomm. The qualitative data provides greater insight into patent licensing as a patent aggregation activity

4. Patent Licensing by Patent Aggregators: Multiple-Case Study of Sisvel, France Brevets, Fractus and Qualcomm

Case studies, providing detailed accounts of single or multiple units of analysis, deepen the understanding of complex phenomena through the investigation of their real-life context. In a case study, the researcher, being both the data collection instrument and analysist, observes the sampled units of interest to gain insight on their activities. The confidentiality of patent licensing and the resulting scarcity of empirical evidence motivate a case study analysis of patent aggregators with the exploratory research objective of understanding how they license their patents but also their broader business models, the way they operate, their market positions and interactions. Despite not being designed to make generalisations from non-random samples to the entire population of patent aggregators, the current multiple case study adopts a maximum variation sampling technique. This way, the sample captures diverse types of patent aggregators to make comparisons among differentiated units and to improve the so-called ecological validity of the findings.[46] The undertakings studied are two vertically dis-integrated patentees operating only upstream in the value chain as

[44] See Nicholas Vonortas and Young Jun Kim, 'Technology Licensing' in OECD, *Patents, Innovation and Economic Performance* (OECD Conference Proceedings, 2004), 187-188; Bharat Anand and Tarun Khanna, ´The Structure of Licensing Contracts´, (2000) 48(1) Journal of Industrial Economics 103, 114 and 118; Alfred Radauer and Tobias Dubenbostel, *PATLICE Survey on Patent Licensing Activities by Patenting Firms* (EC DG Research and Innovation, 2013), 29 and 56-59.

[45] See Eric Brousseau and others, 'The Diversity Of Technology Licensing Agreements And Their Cause' (December 2005) les Nouvelles 179, 189 - 191.

[46] The ecological validity or verisimilitude of a qualitative study is the degree to which its findings mirror the real-world situation. See Robert Lawless, Jennifer Robbennolt and Thomas Ulen, *Empirical Methods in Law* (Wolters Kluwer, 2016), 34; Burke Johnson and Larry Christensen, *Educational Research: Quantitative, Qualitative and Mixed Approaches* (SAGE, 2010), 236-239 and 395-398; Robert Yin, C*ase Study Research and Applications: Designs and Methods* (Sage 6 edn, 2018), 15.

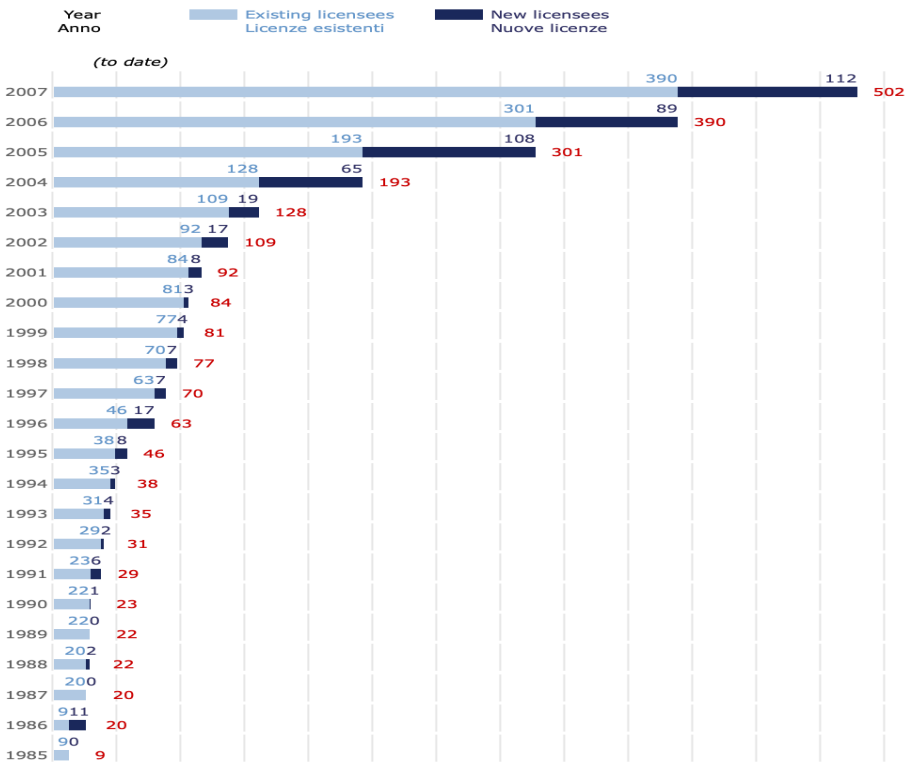
technology licensing providers (i.e. NPEs) and two vertically integrated patentees supplying products and technology licenses (i.e. PEs). The NPEs are Sisvel and France Brevets, whilst the PEs are Fractus and Qualcomm.

The case study triangulates multiple direct and secondary data sources. Direct data sources are judicial and company documents, current and archival official website information. Secondary data sources come from literature, legislative documents and databases, namely, patent-related data from Questel Orbit, while litigation data from Darts-IP and Stanford NPE Litigation Dataset. Together the data sources shed light on the origin, technology focus, patent portfolios and licensing programs of each unit of analysis.

4.1. Sisvel: The Italian-born Patent Aggregation Trailblazer

Società Italiana per lo Sviluppo dell'Elettronica, Sisvel for short, started in 1982 near Turin as an R&D and licensing JV between Indesit, Seleco, Brionvega and Imperial, four Italian manufacturers of TVs and other consumer electronic products. In 1983, Sisvel bought the entire patent portfolio (more than 200 patent families) of the then financially distressed Indesit. Sisvel's original corporate object was to enforce its patents and those of the JV members against far-east price-cutting imitators. Between 1985 and 1995, Sisvel reports having concluded 46 licenses (see Figure 2 below).

Figure 2. Representation of Sisvel Licensing Agreements 1985 – 2007



Source <https://web.archive.org/web/20060805233206/http://www.sisvel.it/chartP.asp>.

In 1996, Sisvel began to manage the licensing programs of third parties' patent portfolios, initially of Philips, Orange, TDF and IRF (Institut für Rundfunktechnik GmbH) for their digital audio technologies.[47]

[47] IRT is the research centre of several German, Austrian and Swiss public broadcasters, namely, ARD, ZDF, DLR, ORF, SRG and SSR. Between 2016 and 2017, IRT sued Sisvel and an intermediary patent attorney, respectively in Mannheim and Munich, for breach of the MPEG patent licensing administration contract and demanded about €280 million in lost license payments. IRT settled the Munich proceedings against the patent attorney for €60 million. In September 2019, the Manneheim Regional Court dismissed the action against Sisvel rejecting IRT's claims for contractual damages and retroactive adjustment of the licensing administration contract. The court

In so doing, patentees outsource to Sisvel the negotiation, conclusion, execution and administration of their licenses. Sisvel then collects licensing payments from licensees and redistributes them to the patentees upon retaining a service fee. Over time, Sisvel has partnered with over thirty patentees.[48]

Sisvel's ownership is private without shareholders active in any business related to its licensing activities. As of February 2020, more than 65 employees belong to the Sisvel group, almost half being licensing experts. The headquarter is in Luxembourg, while subsidiaries are in Italy, Germany, Spain, UK, US, Japan and China. Sisvel Technology is the R&D subsidiary, which collaborates with TTOs, participates to SSOs and technically supports the group's licensing negotiations as well as those of Sisvel's partners through patents landscape and search analyses or infringement assessments. Certain subsidiaries oversee licensing programs for specific patent portfolios, such as 3G Licensing for 3G SEPs, EDICO for the Teletext portfolio, Audio MPEG for the US video coding patents. Other subsidiaries are special purpose vehicles through which Sisvel has acquired patents from PEs. In this sense, Hera Wireless is the assignee of Sanyo's patents, Aegis 11 of LG, Enact IP of Samsung and Xylene of Mitsubishi Electric. Portfolio-specific subsidiaries ease monitoring compliance on sales reporting obligations by licensees, upon which Sisvel calculates payable royalties.

Overall, Sisvel describes itself as a specialised provider of licensing services and it argues that its private ownership structure avoids any conflict of interests between licensors or licensees, protects its partners' confidential information from competition risks and shields antitrust concerns. Free from hedge funding and venture capital, Sisvel can avoid short-term aggressive patent enforcement to lever on the litigation value of its patents. In practice, Sisvel licenses patents, especially SEPs, owned by third parties or externally acquired, through patent pools, joint licensing platforms and other forms of aggregation. The impartiality argument becomes questionable when Sisvel contributes its patents to the patent pools and joint licensing platforms it manages. Residually, Sisvel also prosecutes patent applications either stemming from its R&D or corresponding to the geographical and technical enlargement of acquired patent families.

To establish a SEPs pool, Sisvel publishes a call for essential patents open to any patentee. Public patent calls are critical to ensure open, non-discriminatory and transparent participation to the pool of every SEP-holder. Interested parties submit their patents, whose essentiality is evaluated by an independent expert with reference, *inter alia*, to the patent claims, standardisation literature and patent prosecution history too. Then, Sisvel and the SEP-owners set the licensing terms, including its service fees and profits distribution scheme. Once the patent pool license is set, Sisvel obtains exclusive licenses from the SEP-owners with sub-licensing rights and then out-licenses the pooled patents to implementers. Since 2019, Sisvel also participates with its own 2G/3G/4G SEPs in the IoT patent pool Avanci.[49]

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recognised that IRT agreed to a lump-sum fee and did not have a right to information concerning the actual proceeds generated by Sisvel. See Kostanze Richter, 'German Broadcasters' Million-Euro Lawsuits Fails in Mannheim' (JUVE Patent, 20 Setpember 2019) <https://www.juve-patent.com/news-and-stories/cases/german-broadcasters-million-euro-lawsuit-fails-in-mannheim/>.

[48] The publicly known partners include 3M, British Broadcasting Corporation (BBC), Columbia University, DTVG Licensing (a subsidiary of DIRECTV), Electronics and Telecommunications Research Institute (ETRI), IRT, Orange; Fraunhofer IIS, HP, LG, Motorola, NTT DoCoMo, Nokia, Panasonic, RAI, KPN, Philips, Sanyo, Samsung, Siemens, SIDSA, SK Telecom, TB Invent, TDF, Telecom Bretagne, Telecom Italia, ThingMagic, JVC and Zebra Technologies.

[49] See Tomaya Yanagisawa and Dominique Guellec, *The Emerging Patent Marketplace* (OECD, 2009), 24. Since 2016, Sisvel also operates a patent commercialisation platform offering intermediary services to patent sellers and buyers with a technological focus close to Sisvel's core competences. The intermediation activity of Sisvel covers wireless communication, broadband, personal tracking, wearable technology, user interface, automative

As of July 2019, the Sisvel group is the former and current assignee of a total of 405 patent families prosecuted on average in 8.1 countries (usually US, China, Germany, UK, France, Italy, Japan and South Korea).[50] It is important to remark that the total number of patents assigned to the Sisvel group is only a lower bound estimation of all patents Sisvel manages given its third-party licensing activities. Expired and lapsed patents (so-called 'dead' patent families) are also valuable since Sisvel requires remuneration for past infringement. Twenty-three patent families consist of only pending applications, 211 patent families have at least one granted and alive patent, while 171 patent families are no longer in force at all either being expired (108), lapsed (38) or revoked (25). Of all patent families, 66 are standard-essential and 59 have been opposed, mostly before the EPO. The 211 patent families with at least one alive patent belonging to the Sisvel group have a mean age of eleven years.

Sisvel is also known not to hesitate to initiate patent infringement actions against reluctant licensees. Between 2002 and 2018, Darts-IP renders 56 litigation instances involving the Sisvel group in Europe, 43 being infringement actions and 13 preliminary injunctions proceedings (mostly filed in the Netherlands).[51] The preferred fora to litigate infringement are Germany with 25 cases (10 in Düsseldorf, 8 in Mannheim, 4 Berlin, 3 Karlsruhe) of which 3 cases appealed before the Patent Division of the German Federal Court of Justice (i.e. Bundesgerichtshof, 'BGH'), then France with 22 cases, Italy 4, Spain 2 and the Netherlands 2. Between 1997-2017, Sisvel asserted three European patents more than twenty times each (i.e. EP0402973(B1), EP0599824(B1), EP0660540(B1)). On the defendant side, the entities of the Sisvel group are involved in eight invalidity cases, two non-infringement declaratory actions and one procedural case. Eighty-eight are instead the oppositions brought before the EPO against Sisvel group's patents. In the US, the Stanford NPE Litigation Database reports that Sisvel, either directly or through affiliates (Hera Wireless, Sisvel UK, Audio MPEG, 3G Licensing) initiated 22 infringement lawsuits, mostly in the District of Delaware between 2002 and 2018 against, *inter alia,* Samsung, Creative, SanDisk, Microsoft, HP, BlackBerry, and Amazon.[52] Instead, Sisvel sustained three declaratory actions of non-infringement by Creative in 2002 (Northern District of California), SanDisk in 2006 (Northern District of California) and Microsoft in 2016 (Southern District of New York).

Sisvel has been criticised for its practices of suing alleged infringers during industry fairs or consumer shows. The practice involves Sisvel sending license offers at least a few days before the events and then filing for criminal investigations for patent infringement that lead to confiscation of products during the exhibitions. This way, Sisvel concludes licenses by leveraging the infringers' bad publicity reputation concerns as well as their executives' fear of imprisonment.[53]

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and intelligent transportation, e-health, navigation, localization, broadcasting and LED lighting. For Sisvel's participation in Avanci, see <https://www.businesswire.com/news/home/20190515005164/en/Sisvel-Joins-Avanci-Licensing-Marketplace>.

[50] The patent search has been conducted on Questel Orbit on 31 July 2019 with the following assignee query: Sisvel OR "SISVEL CDMA2000" OR "SISVEL INTERNATIONAL" OR "HERA" OR "SISVEL" OR "SISVEL TECHNOLOGY" OR "3G LICENSING" OR "EDICO" OR "AUDIO MPEG" OR "Aegis 11" OR "Enact IP".

[51] See Joint Research Center, *Patent Assertion Entities in Europe – Their Impact on Innovation and Knowledge Transfer in ICT Markets* (JRC Science for Policy Report, 2016), 136-137.

[52] See Shawn Miller and others, 'Who's Suing Us? Decoding Patent Plaintiffs since 2000 with the Stanford NPE Litigation Dataset' (2018) 21 Stanford Technology Law Review 235, <https://npe.law.stanford.edu>.

[53] Examples of infringement proceedings brought during industry fairs or consumer shows by Sisvel are in 2005 and 2008 at IBC Show of Amsterdam against Orce Electronics, Homecast, Shenzen Coship Electronics, Shenzen Success Digital Technology and Altech UEC, in 2006 at IFA of Berlin against SanDisk (repeated also in 2008 and 2016) and in 2008 at CeBIT of Hanover against Sagem and Hyundai; see Marieke Optiz and Tim Pohlmann, ´Typology of the Patent Troll Business´ (2013) 43 R&D Management 103, 113. See also Sisvel, 'Sisvel's Participation at the IFA and IBC' (Sisvel Press Release, 18 September 2008) <http://www.sisvel.com/news-

Sisvel also uses border detention procedures with customs authorities in the EU Member States against unlicensed consumer electronics products such as digital decoders, TV sets, MP3 players or cellular phones under EU Regulation No. 608/2013.[54] In light of customs IPR enforcement procedures, Sisvel used to urge EU importers of electronics products to check whether its website listed the relevant manufacturers as licensees.

Sisvel's more than 30 years-long licensing expertise, especially on SEPs, derives from certain licensing programs nowadays discontinued whose patents expired, involving Teletext/TOPTeletext, DECT, Telemetry and DVB-T technologies. In 2019, Sisvel discontinued the ATSS, WSS and H.264 SVC licensing programs too.

The focus on standard technologies reflects the fact that corresponding licensing markets are global and with limited competition since only optional SEPs can be replaced while keeping the standardised functionality. Sisvel's German subsidiary even acknowledges in its financial statements filed from 2011 to 2014 the global geographic size of its licensing activities and the absence of technology competition for SEPs.[55] Currently, its licensing programs cover wireless communications, digital video and display technologies, audio and video coding/decoding, broadband and localisation technologies. For most of its licensing program, Sisvel makes available on its website the licensing terms, contract templates and additional information on FRAND royalty rate determination. Generally, Sisvel's licensing programs for patents essential to ETSI's standards are more transparent than its licensing programs relating to non-SEPs or other standards, hinting to different FRAND IPR policies and related case law.

4.1.1. Recurring Licensing Conditions of Sisvel's Contracts

Sisvel imposes several recurring provisions in all of its patent portfolios licenses, which facilitates the administration of contracts. Regarding remuneration, Sisvel usually couples a lump-sum fee upon closing of the license plus fixed royalty rates, that are sometimes proportional to the number of licensed units manufactured or otherwise disposed of. Therefore, the more licensees produce, the less they proportionally pay. Sisvel does not employ percentage royalty rates but rather sets fixed rates with regards to the average selling price ('ASP') of the licensed device for the year when it launches the licensing program. Such fixed royalty rates based on the ASP, adopting the EMVR, favour high-end device manufacturers and penalise low-cost manufacturers. Licensees must usually provide bank guarantees to assure fulfilment of their obligations, whose amounts vary on the licensor's case-by-case determinations. Retroactive royalties for pre-contract use and expired patents are also due.

Licensees, at least for wireless communications and television technologies, must report within one month after the end of each calendar quarter their royalty statements, indicating the total number of licensed units sold. Royalty payments, as calculated by the royalty statements, are also due within one month after the end of the corresponding quarter.

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events/news/sisvel-s-participation-at-the-ifa-and-ibc>; Sisvel, 'Sisvel Enforces 3G Patents at IFA 2016 for Its 3G Licensing Program' (Sisvel Press Release, 7 September 2016) <http://www.sisvel.com/news-events/news/sisvel-enforces-3g-patents-at-ifa-2016-for-its-3g-licensing-program>; Sisvel, 'Sisvel and SanDisk at IFA 2006 for MP3 Players' (Sisvel Press Release 15 December 2006) <http://www.sisvel.com/news-events/news/sisvel-and-sandisk-at-ifa-2006-for-mp3-players>.

[54] Sisvel completed several successful border detention procedures in 2004: at Malpensa Airport in September, La Spezia harbour in September and May, Trieste harbour in June and Taranto harbour in April. Oddly enough, the infringing products confiscated in May 2004 at La Spezia harbour were consequently donated to charity. See <https://web.archive.org/web/20060813110055/http://www.sisvel.it/>.

[55] See Sisvel Germany's financial statements from 2011 to 2014, available at <https://www.unternehmensregister.de/ureg/>.

By contract, patent exhaustion applies insofar as licensed products are fully paid for and only if the licensee is fully compliant with the license agreement. Hence, Sisvel recognises that licensees do not have royalty obligations when they sell or buy licensed products to or from other good standing Sisvel's licensees that have agreed to pay for such products. Accordingly, licenses are open for any point of supply chains, as long as component suppliers agree to pay royalties based on the EMVR. Usually, Sisvel retains the right to have an independent certified public accountant to audit the financial records of licensees once per year subject to five days prior notice. The audit costs are upon the licensor except if licensees happen to be non-compliant.[56]

Sisvel does not warrant or represent the validity or scope of any of the licensed patents, nor freedom from infringement or completeness of standard-essentiality. The usual initial term of licenses is five years automatically renewed for periods of five years unless a party provides written notice of termination six months before the contract term. The parties agree on German law as the applicable contract law and grant exclusive jurisdiction to the District Court of Mannheim. Lastly, the assignment of the license by the licensee requires the Sisvel's prior written consent.[57]

The next paragraphs analyse in detail Sisvel's individual and patent pool licensing programs for wireless communications. Interested readers can find in the Annex additional analyses of Sisvel's other licensing programs for audio-video, television and broadband patent portfolios.[58]

4.1.2. Sisvel's 2G, 3G, 4G Own SEPs Portfolio (Acquired from Nokia)

Sisvel individually licenses its portfolio of 33 SEPs families, consisting of more than 450 patents and applications, acquired in 2011 from Nokia and covering 2G (GSM), 3G (e.g. UMTS, WCDMA, HSPA) and 4G (LTE, LTE-Advanced) fields of use. Such a multi-standards license, called the 'Sisvel Wireless Portfolio License', provides for a one-time lump-sum payment of €5,000 at the closing of the contract, bank guarantee or security deposit of €100,000 and a fixed per-unit royalty rate that varies according to the number of licensed products manufactured or otherwise disposed by the licensee during the year (so-called 'standard per-unit rate'). Fully compliant licensees benefit of reduced rates (so-called 'compliant per-unit rate'). In all Sisvel's licenses, contractual compliance specifically comprehends timely payments in full under truthful royalty statements and it so lasts until the first day of the

Table 2. Sisvel Wireless Portfolio License

Yearly number of licensed products manufactured or otherwise disposed	Standard per-unit rate Current vs 2017	Compliant per-unit rate Current vs 2017
1 – 500,000	€0.14 - 0.50	€0.11 - 0.40
500,001 – 2,500,000	€0.10 - 0.35	€0.075 - 0.28
2,500,001 – 5,000,000	€0.075 - 0.20	€0.06 - 0.16
5,000,001 - above	€0.06 - 0.15	€0.05 - 0.12

Source https://www.sisvel.com/licensing-programs/wireless-communications/wireless/license-terms and <https://web.archive.org/web/20171227033416/http://www.sisvel.com:80/licensing-programs/wireless-communications/wireless/license-terms>.

[56] See, for example, Sisvel Wi-Fi Joint License Agreement, sections 4.2 and 4.3, available at <https://www.sisvel.com/2016/Wi-Fi-License-Agreement.pdf>; Sisvel Wireless License Agreement, Article 6, available at <https://www.sisvel.com/images/documents/Wireless/Sisvel_Wireless_Sublicense_Agreement_v4.pdf>.

[57] See, for example, Sisvel DVB-T2 Patent Portfolio License Agreement, Articles 3, 8-9 and 17, available at <https://www.sisvel.com/2016/DVB_T2-Portfolio-License-Agreement.pdf>.

[58] Sisvel also has a licensing program for localisation-based service, a tracking technology that uses position data from cellular towers antenna of mobile phone service providers instead of GPS. It is often implemented to monitor and manage vehicle fleets in real-time. Sisvel's localisation portfolio license covers eleven patents, mostly owned by Kongelf Holding, a Swedish corporation. However, the relevant license terms are not disclosed.

reporting period when non-compliance eventually occurs. Table 2. below reports all applicable rates, noting that they significantly decreased at the end of 2017.

4.1.3. 3G – 4G Patent Pools

Sisvel licenses two portfolios of SEPs respectively covering 3G and 4G standards (not 2G). Such portfolios comprise Sisvel group's own SEPs, also licensed independently under Sisvel's Wireless Portfolio License, as well as all present and future (because under prosecution or under evaluation of essentiality) SEPs belonging to Airbus, KPN, Mitsubishi Electric, TNO and Orange. As of January 2020, the 3G portfolio amounts to about 80 SEPs families with expiration dates between 2011 and 2036, whereas the 4G portfolio to over 100 SEPs families with expiration dates between 2016 and 2036. The two portfolios are available separately under individual licenses or together under a single license, whose royalty rate was simply the sum of the individual licenses' rates (so-called Mobile Communication Program).[59] Similarly to the Wireless Portfolio License, licensees must pay a one-time lump-sum payment of €5,000 for 3G and €10,000 for 4G and provide a bank guarantee of an undisclosed amount for 3G and €100,000 for 4G. Royalty rates are fixed and reduced for fully compliant licensees. Initially, the 4G license had early-bird discounts and royalty rates proportional to the number of licensed products manufactured or otherwise disposed of (see Table 4.).

Table 3. Sisvel 3G and 4G Licenses

Field of use	Standard per-unit rate	Compliant per-unit rate
3G	€0.45	€0.35
4G	€0.66	€0.53
3G + 4G	€1.11	€0.88

Source <https://web.archive.org/web/20190406031202/http://www.sisvel.com/licensing-programs/wireless-communications/mcp/license-terms>.

Sisvel explains that its royalty rates are FRAND since they are determined considering industry practices, comparable offerings and court adjudicated royalties. Other objective factors Sisvel considers are the value the patents contribute to the standard technology, the legal strength of the patents, enforcement actions taken and the value attributed by consumers to the patented feature added to the product. Furthermore, Sisvel states that the rates account for the possibility of relevant patent applications being granted and patents lapsing or expiring during the term of the licenses.

Table 4. Initial Sisvel 4G License

Annual number of licensed products manufactured or otherwise disposed of	Normal per-unit royalty rate	Early bird per-unit royalty rate
1 – 100,000	€0.99	€0.60
100,001 – 2,000,000	€0.80	€0.48
2,000,001 – 5,000,000	€0.70	€0.42
5,000,001 – 20,000,000	€0.60	€0.36
20,000,001 – 50,000,000	€0.50	€0.30
50,000,001 – above	€0.40	€0.24

Source <https://www.sisvel.com/licensing-programs/wireless-communications/lte-lte-a/license-terms>.

[59] Mobile communication is a form of wireless communication where radio waves allow to communicate also between mobile points. The mobile communications market comprises patent license market, the components markets and the handset market. See Sisvel Mobile Communication Program Master Agreement, available at <https://web.archive.org/web/20190213171812/http://sisvel.com/MCP/License_Agreement.pdf>.

Interestingly, Sisvel benchmarks mobile communication royalty rates with those announced by several patentees as per Table 5 (for the sake of completeness, the author adds InterDigital).

Table 5. 3G Announced Royalty Rates

Patentee	Announced royalty rate	Royalty rate for 2016 average priced 3G device (€200)
SIPRO W-CDMA	1 to 2,500,000: $1 per-unit 2,500,001 – 6,250,000: $0.75 per-unit 6,250,001 – 12,500,000: $0.55 per-unit 12,500,001 – 25,000,000: $0.41 per-unit 25,000,001 – 50,000,000: $0.30 per-unit 50,000,001 – above: $0.22	US$1 to 0.22
Qualcomm 3G CDMA	4-5% of product sales price	€8.40-10.50
Motorola	2.25% of product sales price	€4.73
InterDigital	0.40% of product sales price	Capped at US$0.40
Sisvel	€0.35-0.45	

Source <https://sisvel.com/licensing-programs/wireless-communications/mcp/inquiries> and <https://www.interdigital.com/rate-disclosure>.

4.1.4. Wi-Fi/W-LAN Patent Pool

Concerning wireless communication technologies, Sisvel has a FRAND licensing program for about 50 patent families (as of November 2019) relating to IEEE's Wi-Fi/W-LAN standards,[60] which it owns or manages on behalf of Fraunhofer, Orange, KPN, Columbia University and Mitsubishi Electric Corporation. The license requires a € 5,000 lump-sum upon closing plus a fixed royalty fee per Wi-Fi enabled device of €0.30. As usual with Sisvel, fully-compliant licensees benefit of a reduced rate of €0.25. The royalty rate is fixed notwithstanding that Wi-Fi-enabled devices comprise a varied range of products with very different characteristics and costs, such as cameras, laptops, smartphones, car systems or printers. In its explanation of the FRAND royalty calculation, Sisvel provides a comparison of various available Wi-Fi licenses (see Table 6).

Table 6. Comparison of WiFi Licensing Programs

Licensor	Participating patentees	Royalty Rate
Sisvel	Sisvel, Columbia University, Fraunhofer, Orange, KPN, Mitsubishi Electric	Standard rate: €0.30 per-unit Compliant rate: €0.25 per-unit
AT&T	AT&T	Consumer electronics: US$0.12 per-unit Commercial networking: US$0.27 per-unit
Philips	Philips	EU: €0.13 / US: US$0.05
Via Licensing	ETRI, LG, Nippon Telegraph and Telephone Corp.	1 – 500,000: US$ 0.5 per-unit 500,001 – 1,000,000: US$0.50 per-unit 1,000,001 – 5,000,000: US$0.45 per-unit 5,000,001 – 10,000,000: US$0.30 per-unit 10,000,001 – 20,000,000: US$0.20 per-unit 20,000,001 – 40,000,000: US$0.10 per-unit 40,000,001 – above: US$0.05
Vectis	Wi-Fi One LLC (originated from Ericsson and Panasonic)	US$0.17 per-unit (optional implementation patents license fee of US$0.075 per unit)
InterDigital	InterDigital	US$0.05 per unit

Source <https://web.archive.org/web/20190213233417/http://sisvel.com/Wi-Fi/Wi-Fi_Royalty_Rate.pdf>.

[60] Namely, IEEE Std 802.11-2007 IEEE Std 802.11n-2009 IEEE Std 802.11-2012 IEEE Std 802.11ac.

4.2. France Brevets: the French Sovereign Patent Fund

In 2010, under Art. 8 Law no. 237 of 2010 (Future Investment Program), the French government, the national research agency (Agence Nationale de la Recherche) and the national public investment bank (Caisse des dépôts et consignations) agreed to create France Brevets, a sovereign patent fund inspired by Asian counterparts as well as by Intellectual Ventures. To date, France Brevets is the only sovereign patent fund in Europe, despite a 2010 French-led initiative to replicate its model at the EU level.[61]

The Government and the public investment bank have initially contributed €50 million each to France Brevets intending to ameliorate the liquidity of the patent market and improve the international exploitation of intellectual property originating from France's public and private research sectors while obtaining a return on investment of 8%. The financing has been released in subsequent steps. Initially, in 2011 France Brevets received €2 million to realise its business plan and proof of concept, like start-ups do. Then, €8 million in 2012, €40 million in 2013, €40 million in 2015 and €10 million in 2016. Since 2014, France Brevets also manages a second fund of €100 million, the Sovereign Fund of Intellectual Property (Fond Souverain de la Propriété Intellectuelle, FSPI), created by the French Government and by the public investment bank under law no. 1278 of 2013 (Second Future Investment Program). As of 2018, France Brevets accessed €150 million of the available €200 million. Its staff counts less than twenty highly-qualified employees with legal, financial and technical backgrounds.[62]

France Brevets aggregates patent portfolios (so-called *grappes de brevets cohérentes*) through either direct purchases or worldwide exclusive licenses with sub-licensing rights in order to license and, eventually, enforce them. Usually, to keep up-front patent acquisition investments low, France Brevets does not directly acquire patent ownership but instead sustains the patent maintenance, licensing and enforcement costs on behalf of patentees. Alternatively, it merely concludes success-based patent valorisation contracts without acquiring patent ownership or control. In both cases, patentees participate in the licensing and enforcement proceeds after France Brevets' costs and remuneration.[63]

France Brevets' monetisation services benefit its partners insofar as patent portfolios are more attractive for large-scale commercialisation than individual patents. Furthermore, thanks to the expertise and network of France Brevets, the portfolios can be monetised into industries far from the patentees' core expertise without creating new competition in their own industries (so-called

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[61] See Convention of 2 September 2010 between the Franch State, National Research Agency and the Caisse des dépôts et consignations regarding the program of investments for the future (France Brevets action) <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000022788092&dateTexte=&categorieLien=id%7C>; Alfonso Gambardella and others, Options for an EU Instrument for Patent Valorisation (EC Expert Group Report, 2012), 45-46; <https://ec.europa.eu/cip/files/docs/consultation-france-french-government-doc3_fr.pdf>.

[62] For a seminal analysis of state aid issues posed by France Brevets, see Thibault Schrepel, 'France Brevets: a State-Owned Patent Troll, Harmful…and Illegal?' (2014) New Direction Discussion Paper; France Brevets, 'Rencontre avec l'Un des Pères Fondateurs de France Brevets' 29 March 2019, <https://www.youtube.com/watch?v=fuNaUnmYDDw>; Convention of 23 December 2014 between the Franch State and the Caisse des dépôts et consignations regarding the program of investments for the future (Sovereign Fund of Intellectual Property action); Annexe Au Projet de Loi de Finance Pour 2019, Rapport Relatif à la Mise en Œuvre et au Suivi des Investissements d'Avenir, <https://www.performance-publique.budget.gouv.fr/sites/performance_publique/files/files/documents/jaunes-2019/Jaune2019_investissements_avenir.pdf>.

[63] See Jean-Yves Le Déaut and Bruno Sido, Rapport au nom de l'Office Parlamentaire d'Évaluation des Choix Scientifiques et Technologiques sur l'Évaluation de la Stratégie Nationale de Recherche "France Europe 2020" (Report before the French National Assembly and Senate, 6 March 2017), <https://bit.ly/2MJiYet>, 75-79.

cannibalistic competition). Beside portfolio licensing, France Brevets is open to licensing specific subsets of patents depending on the implementers' situation and needs.

France Brevets operates in several technological areas characterised by fragmented ownership of large amounts of patents (i.e. patent thickets), such as electrical engineering, aerospace, life sciences and energy. It selectively scouts for patents with strategic monetary and technological potential that can be profitably licensed and litigated. It classifies patents into three types depending on their value: first, patents without licensing value, despite relating to key features of the patentees' products, are the majority of patents; second, licensing grade patents are often SEPs or commercially essential patents whose validity has been tested by opposition proceedings or invalidity litigation and whose infringement is supported by evidence. Last, litigation grade patents are licensing grade patents of clear validity and infringement, for example, established during litigation or arbitration.[64]

In 2015, France Brevets owned or controlled a total of 154 patent families. In 2017, France Brevets owned 169 patent families and controlled 220 ones. As of 31 July 2019, it appears current or previous assignee on Questel Orbit of 200 patent families of which 129 are alive, 17 pending and 54 dead (i.e. 17 revoked, 14 expired, 23 lapsed). Such numbers are far from the forecasts France Brevets had at the beginning of its operations, which estimated a portfolio of about 4,000 patents by 2015. The average patent family is valid in 2.7 states and 12 years old.[65]

France Brevets differentiates its patent fund operations from PAE allegations stressing the fact that it commits long-term with its partners and not short-term like most PAEs. Further, it redirects revenues to patentees and its public status imposes much more transparency on its activities and funding than it exists for private patent aggregators. Notwithstanding its clear patent fund status, France Brevets resorted to infringement litigation as a remedy of last resort to bring infringers to the negotiating table. Between 2010 and 2018, Darts-IP lists 15 infringement lawsuits by France Brevets and its affiliate NFC Technology, all before the Landgericht Düsseldorf, except one before the Tribunal de Grande Instance de Paris. HTC (with its distributor Ingram Micro Mobility), LG, AMX, Samsung, Huawei, Nintendo, NXP and Apple have been its defendants. There are also five invalidity proceedings before the German Bundespatentgericht and one opposition before the EPO. In the US, the Stanford NPE Litigation Database reports two infringement lawsuits, both in the Eastern District of Texas against HTC and LG

[64] To a certain extent, France Brevets has protectionists effects as it prevents that French technology and IPRs are acquired by foreign actors; see Dominique Caillaud and Jean Michel, Rapport d'Information par la Commission de la Défense Nationale et des Forces Armées sur les PME et la défense, 13 juillet 2011, <http://www.assemblee-nationale.fr/13/rap-info/i3663.asp>, 27-28; Yann Dietrich, 'France Brevets: A New Approach to Create Value with Patents' (Propriété et Communs: Les Nouveaux Enjeux de l'Accès et de l'Innovation Partagés, Paris 25-26 April 2013) <http://anr-propice.mshparisnord.fr/25-26_avril/dietrich_france-brevets.pdf>.

[65] See Daniel Dubois, Avis Présenté Au Nom de la Commission des Affaires Économique sur le Projet de Loi de Finance pour 2018: Tome V Recherche et Enseignement Supérieur (French Senate, 23 November 2017), 53-78. The patent search has been conducted on Questel Orbit on 31 July 2019 with the following assignee query: "France Brevets" or "Inside Technologies" or "NFC Technoloogy". The viability and profitability of France Brevets' business have been questioned by French members of parliament. The French court of auditors (i.e. Court des Comptes) estimated that between 2011 and 2015, France Brevets reached €30,4 million of losses. See Daniel Dubois, Avis Présenté Au Nom de la Commission des Affaires Économique sur le Projet de Loi de Finance pour 2018: Tome V Recherche et Enseignement Supérieur (French Senate, 23 November 2017), 64 and 73; Daniel Dubois, Comptes Rendus de la Commission des Affaires Economiques: Projet de loi de finances pour 2018 - Mission « Recherche et enseignement supérieur » - Examen du rapport pour avis, (French Senate, 29 November 2017), <https://bit.ly/2YIWz7c>.

in 2013 and against Samsung in 2015, plus a 2014 non-infringement declaratory action in the Northern District of California by NXP.[66]

In contrast to PAEs, France Brevets also cooperates with TTOs, with which it has in place 24 collaboration framework contracts as of 30 June 2018. It also participates in SSOs, can manage patent pools and helps SMEs to conclude in-licenses to the technologies they need. Its publicly known clients and partners are more than twenty.[67]

France Brevets has in place three patent monetisation programs that are for Near-Field Communication ('NFC'), Global Navigation Satellite Systems ('GNSS') and magnetic refrigeration ('KIONE') technologies. Other programs France Brevets is working on relate to security, smart-metering (Smart IP Alliance), automotive, microprocessors (for smartphones application, radiofrequency and power management), smart homes (in discussion with Netatmo, Hager and Bosch), biometric-recognition (with Morpho) and drones (with Parrot) technologies.[68] The next paragraphs focus on the NFC and GNSS licensing programs as well as on France Brevets' Fabrique à Brevets, its patent strategy service for start-ups.

4.2.1. NFC Patent Licensing Program

In 2012, Verimatrix (previously Inside Secure) and Orange (previously France Telecom) granted France Brevets an exclusive license with worldwide sublicensing rights to their respective NFC patent portfolios. NFC is a wireless communication standard developed by the NFC Forum, an SSO established in 2004 by Nokia, Philips and Sony, which covers contact-less communication technology based on radio frequencies. NFC enables electronic devices, such as smartphones or wearables to communicate, connect and share data by bringing them close to each other. It is also used to read RFID chips and for mobile payments. Participants in the NFC Forum must declare their standard-essential patents and applications and commit to grant worldwide non-exclusive RAND licenses.[69]

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[66] See Shawn Miller and others, 'Who's Suing Us? Decoding Patent Plaintiffs since 2000 with the Stanford NPE Litigation Dataset' (2018) 21 Stanford Technology Law Review 235, <https://npe.law.stanford.edu>.

[67] France Brevets' publicly known clients and partners are intuiLab, Salveco, Flying Whales, Safetyin, Oledcomm, InsideSecure, Alpha Mos, mobiLead, Netatmo, EnergySquare, Télécom Bretagne, Télécom Paris Tech, Université Bretagne Sud, Vitirover, Thomson Video-Network, Eshard, Secure IC, Skeyecode, CNES, GreenTropism, Acoustical Beauty, ENAC, Action Air and Unseen Labs.

[68] France Brevets is also developing leads with large patentees such as TVN, Orange, STMicroelectronics, Atos, Bull, LG and Panasonic; see Annexe Au Projet de Loi de Finance Pour 2018, Rapport Relatif à la Mise en Œuvre et au Suivi des Investissements d'Avenir <https://www.performance-publique.budget.gouv.fr/sites/performance_publique/files/farandole/ressources/2018/pap/pdf/jaunes/jaune2018_investissements_avenir.pdf>, 49. In 2019, France Brevets bought a patent portfolio relating to magnetic refrigeration technology from the judicial liquidation of Cooltech Applications. The twenty-four patent families relate mainly to air conditioning systems, heating and cooling systems.

[69] See Matt Hamblen, 'A Short History of NFC: Where Near Field Communication Has Come From' (Computer World 19 December 2012) <https://www.computerworld.com/article/2493888/a-short-history-of-nfc.html>; NFC Forum, Intellectual Property Rights Policy, 4 June 2015, Rule 3 <https://nfc-forum.org/wp-content/uploads/2013/11/NFC-Forum-IPR-Policy.pdf>.

As of 25 March 2019, France Brevets' NFC license comprises 46 patent families widely validated across Europe, as well as in the US, China, South Korea and Japan.[70] RAND licenses are available to NFC-enabled end products manufacturers, distributors, integrators and operators. Like Sisvel, France Brevets applies a fixed per-unit royalty rate for its entire NFC portfolio, yet proportional to the number of units licensed (see Table 7.). Implementers can request a license to only some NFC patents out of the whole portfolio, with presumably cheaper conditions.

Table 7. France Brevets NFC Royalty Rates

Yearly licensed products	Per-unit rates						
	Smartphones and smartwatches	Tablets and notebooks	Decoders	TVs	POS readers	Smart meters	Smart appliances
1 to 1,000,000	US$0.61	US$0.98	US$0.38	US$1.15	US$1.53	US$0.26	US$0.89
1,000,001 – 10,000,000	US$0.41	US$0.66	US$0.26	US$0.77	US$1.02	US$0.17	US$0.60
10,000,001 – 100,000,000	US$0.31	US$0.49	US$0.19	US$0.57	US$0.77	US$0.13	US$0.45
100,000,001 – above	US$0.20	US$0.33	US$0.13	US$0.38	US$0.51	US$0.09	US$0.30

Source <https://www.francebrevets.com/fr/10-programme-de-licence-nfc>.

The NFC monetisation program has more than ten end-product manufacturers as licensees, among which LG since 2014, Sony (bringing €1.3 million to Verimatrix in 2016), Samsung (bringing €12.6 million to Verimatrix in 2016) and HTC since 2016, Canon and Huawei. Intel, which is a component manufacturer, is not licensed by France Brevets but directly by Verimatrix.[71]

4.2.2. GNSS Licensing Program

CNES (the French *Centre National d'Études Spatiales*) granted France Brevets the exclusive right to sublicense its patent portfolio relating to GNSS technology, which allows users to determine their coordinates, altitude and speed through satellites signal. The license, which as of January 2020 covers 36 widely validated patent families (over 100 patents) expiring between 2024 and 2038, is available for all actors in the value chain of GNSS implementing products. The license has a 5% per unit royalty rate, which is computed and payable annually. Use of GNSS is free of charge for firms with annual total turnover below €2 million. Listed licensees are AnyWaves and Teria.

4.2.3. Fabrique à Brevets

The second most important activity, after patent monetisation, is the so-called Fabrique à Brevets (i.e. patents factory), which involves the advice and financing of start-ups' patent prosecution strategies. France Brevets consults and finances start-ups with high market potential, break-through and disruptive inventions regarding the identification of patentable inventions, the drafting and prosecution of patents and the application of a medium- to long-term innovation strategy.

Initially, France Brevets's remuneration was success-based and corresponded to a share of the revenues from the licensing of the obtained patents. However, such remuneration is incompatible with those start-ups that want to develop and commercialise their innovation in-house and are against out-licensing their patents. Therefore, since 2017, France Brevets requires a lump-sum depending on the amount and term of the granted loan. €95,000 over one year in consideration of the out-sourcing to

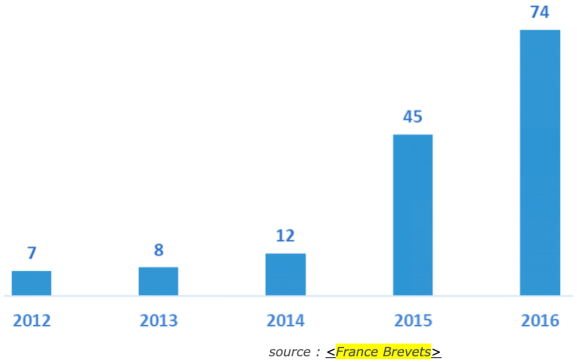
[70] A list of all patents with a corresponding exemplary licensed field of use is available on the website of France Brevets; see <https://www.francebrevets.com/_file_uploads_/List-of-NFC-patents-as-of-march-25-2019_%20simplifiedpdf>.

[71] See Inside Secure, 'Document de Reference' (filed with the French Financial Markets Authority, 28 March 2017), 199-200; <https://www.verimatrix-finance.com/en/Financial-Results/2017>.

France Brevets of the entire patent strategy and the financing of the whole prosecution costs, with one-year extensions available for €20,000 each. Just the outsourcing of the patent strategy costs €25,000 over two years. This way, start-ups keep all profits originating from the commercialisation of their inventions. On its side, France Brevets obtains a quicker return on investment since revenues from the commercialisation of patented inventions often take eight to ten years from patent filing to materialise.[72]

As of 30 June 2017, twenty Fabrique à Brevets programs resulted in more than 150 priority patent applications, a slight majority coming from public research and on technology fields of security, 5G, geolocalisation and smart-homes.[73] Up to June 2018, about twenty Fabrique à Brevets were active. Always in 2018, France Brevets received support from Qualcomm to launch Patent Factory Europe, a European replica of the Fabrique à Brevets.[74]

Figure 3. Fabrique à Brevets Priority Patent Applications per Year



4.3. Fractus: Patent Aggregator Out of Necessity

In 1999, Carles Puente, then an assistant professor at Polytechnic University of Catalonia and Rubén Bonet started Fractus in Barcelona as a customised antenna manufacturer for leading smartphone, telecom network operator and peacemaker manufacturers. Its customers included Samsung, LG, RIM, HTC, Sharp, Palm and Motorola. The supply agreements of customised multiband miniaturised antennae always provided that Fractus would retain ownership of any IPRs deriving from the products or services it delivered. In so doing, Fractus' patent portfolio grew from 2 patent families in 1999 to about 40 in 2007 covering its geometry-based (so-called fractal) compact antenna technology with multi-band functionality.[75]

Since 2007, Fractus' clients started to hold-out, namely, to discontinue the supply contracts and to replicate the previously received antennae without taking a license for the relevant patents. Facing financial difficulties, in 2008 Fractus partnered with IPontetial, the contingency-based patent monetisation consultancy behind the 2006 *NTP v Blackberry* US$615 million patent infringement settlement, to sue many of its former clients for patent infringement in the US. Notably, Motorola became the first licensee without being sued. The first lawsuit of 5 May 2009 in the Eastern District of Texas involved the assertion of 13 US patents against ten smartphone OEMs, many being its previous customers like Samsung, LG, RIM and HTC. Among the defendants, only Samsung did not settle and

[72] See <https://www.fabriqueabrevets.com>.

[73] See Daniel Dubois, Avis Présenté Au Nom de la Commission des Affaires Économique sur le Projet de Loi de Finance pour 2018: Tome V Recherche et Enseignement Supérieur (French Senate, 23 November 2017), 66-67.

[74] After Patent Factory Europe, France Brevets and Qualcomm, together with the French research institutes EURECOM and Institut Mines-Télécom, concluded in 2019 a joint-research greement for 5G technology. See <https://www.iptalks.eu/press-release-france-brevets-and-ip-europe-aim-to-lead-european-sme-entrepreneurs-through-the-innovation-valley-of-death/ https://www.iam-media.com/finance/qualcomm-france-brevets-and-ip-europe-join-forces-create-new-funding-initiative>; <https://www.qualcomm.com/news/releases/2019/03/04/france-brevets-qualcomm-eurecom-imt-hold-5g-conference-paris>.

[75] For another case study on Fractus, see European Patent Academy, *Case Study: Fractus, S.A.* (EPO, 2017); Philippe Simon, 'Snowflake Pattern Precipitates New Application For Antennae' (December 2017) les Nouvelles 306.

went on to trial where it lost. The patents were found valid and willfully infringed. Thus, in 2011, Fractus was awarded over twenty-three million dollars of damages for past infringement plus fifteen million dollars of enhanced damages in 2012. The settlements with other defendants amount to about US$70 million.[76]

In 2015, Fractus focused its operations on patent licensing by spinning-off its antenna technology R&D and manufacturing operations to Fractus Antennas. Nowadays, 90% of Fractus' revenue comes from patent licenses (for example, US$100 million in 2015) and 10% from the supply of products and services.[77]

On Questel Orbit, Fractus with its affiliates Advanced Automotive Antennas and Intelligence Software Components appear current or former assignee of 61 alive patent families, 12 of which are pending. The average patent family comprises 3.4 national patents (mostly US, European, Chinese and German ones) and is eight years old.[78] Notably, Fractus' patents are neither essential for any standard or encumbered by FRAND-commitments, yet they are commercially-essential for any consumer electronics product incorporating modern antennas.

After the first US lawsuit of 2009, Fractus sued ZTE for patent infringement in 2017 (in both the Eastern and Northern Districts of Texas) and in 2018 several major telecom operators, namely, AT&T, Sprint and Verizon and their supplier Commscope all in the Eastern District of Texas. The last lawsuit led to US$55 million settlement in October 2019. In total, the Stanford NPE Litigation Database reports nine patent infringement lawsuits initiated by Fractus.[79]

Regarding European litigations, Darts-IP shows nine preliminary injunctions proceedings before the Barcelona Commercial Courts between 2017 and 2018 against Crosscall, Huawei, Wiko and various Chinese companies. Both years, such preliminary injunction requests occurred in concomitance with the Mobile World Congress ("MWC"), the largest mobile trade fair in the world with more than 2,400 exhibitors, which happens annually at the end of February beginning of March in Barcelona. Since 2015, the Barcelona Commercial Courts have facilitated such actions during the MWC by adopting a Protocol in agreement with GSMA, the organiser of MWC, which defines fast-track procedures to obtain industrial property ex parte preliminary injunctions against alleged infringing exhibitors. Fractus borrows the practice of suing alleged infringers during industry fairs or consumer shows directly from Sisvel. In fact, since 2017, Fractus has Vectis IP as a licensing partner, which is led by Giustino de Sanctis former Sisvel's CEO. Thanks to the collaboration with Vectis IP, Fractus is also pursuing a licensing

[76] See Fractus, 'Fractus and IPotential Announce Patent Licensing Management Relationship' (Press Release, 23 October 2008) <http://www.fractus.com/fractus-and-ipotential-announce-patent-licensing-management-relationship-world-leader-in-fractal-antenna-ip-to-optimize-portfolio-value/> ; Fractus v Samsung, Case no. 6:09-CV-203, Memorandum Opinion and Order 28 June 2012, Eastern District of Texas; Fractus, 'Fractus Awarded $41M in Patent Infringement Suit' (Press Release, 31 July 2012) <http://www.fractus.com/fractus-awarded-41m-in-patent-infringement-suit/>.

[77] See Philip Simon, 'Fractus: Snowflake Pattern Precipitates New Application for Antennae' (EPO SME Case Studies, 2017), 34.

[78] The patent search has been conducted on Questel Orbit on 31 July 2019 with the following assignee query: Fractus or "Fractus Automotive Antennas" or "Intelligence Software Components".

[79] See Shawn Miller and others, 'Who's Suing Us? Decoding Patent Plaintiffs since 2000 with the Stanford NPE Litigation Dataset' (2018) 21 Stanford Technology Law Review 235, <https://npe.law.stanford.edu> ; <https://www.sec.gov/ix?doc=/Archives/edgar/data/1517228/000156459019041186/comm-10q_20190930.htm>.

campaign in China, where it sued Vivo and Oppo, two Chinese OEMs, before the Shanghai IP Court in late 2018.[80]

Vectis IP manages the licensing program of Fractus' patent portfolio, composed as of July 2019 of about 130 patents. Licenses are worldwide for fixed royalty rates, varying between US and non-US products, based on EMVR of finished consumer products implementing Fractus' antenna patents. In addition, reduced rates benefit companies that take a license without admission or findings of infringement, namely, companies that spontaneously take a license. For US products, the per-unit royalty rates are US$0.60 and US$0.20. For Non-US products, they are US$0.25 and US$0.08.[81]

4.4. Qualcomm: The Vertically Integrated Patent Aggregator Worrying Antitrust

Irwin Jacobs, a former MIT professor, founded Qualcomm in San Diego in 1985. Qualcomm, a group of more than 120 affiliates the most significant of which are Qualcomm CDMA Technologies ('QCT'), Qualcomm Technology Licensing ('QTL') and Qualcomm Technologies Inc. ('QTI'), established itself as a semiconductor and telecommunication equipment supplier. QCT sells products and services; QTL owns the patent portfolio and runs the licensing business, while QTI carries on engineering and R&D activities. Its success derives from its cutting-edge baseband modem chips coupled with the vast patent portfolio built around Code Division Multiple Access ('CDMA') digital cellular wireless communication technology, which Qualcomm introduced in 1989. Initially, despite high performances of CDMA, neither the US nor the EU competent SSOs choose it as a 2G standard, respectively the Cellular Telecommunications Industry Association ('TIA') opting for Time Division Multiple Access ('TDMA') and ETSI for Global System for Mobile Communications ('GSM'). Subsequently, CDMA was adopted given its superiority by TIA in 1993 and formed the basis of global 3G standards, such as CDMA2000 and Wideband CDMA ('WCDMA', also-known-as UMTS).[82]

Being a PE, Qualcomm derives revenue from supplying products, mainly modem chipsets (also-known-as baseband chips or application-specific integrated circuits, 'ASIC'), related services and from licensing its patents. Its practice of denying cellular modem chips supply to prospective clients without a prior patent license (so-called 'no license, no chip' policy), including threating to withhold such supply to non-compliant licensees, is unique both to the semiconductor industry and to Qualcomm's other lines of business. All other semiconductor manufacturers sell their products exhaustively without the need for a separate license, nor does Qualcomm require prior patent licenses to supply non-cellular chips such as Wi-Fi ones.

Since 2008, concomitantly with the US Supreme Court's *Quanta* decision that strengthened the patent exhaustion doctrine, Qualcomm also stopped to license its portfolio to rival modem chips

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[80] See <http://www.poderjudicial.es/cgpj/es/Poder-Judicial/Tribunales-Superiores-de-Justicia/TSJ-Cataluna/En-Portada/Protocolo-juzgados-mercantil-Mobile-World-Congress-Barcelona-2019> ; Jacob Schindler, 'What It's Like to Sue a Chinese Company for Patent Infringement in China' (IAM Media 31 May 2019) <https://www.iam-media.com/litigation/what-its-sue-chinese-company-china 31 August 2019>.

[81] See <https://www.vectis.com/programs-2/#ANTENNA>.

[82] CDMA relies on spread-spectrum radio signals, which are sent and scattered over a wide range of frequencies. The receiver then collects back all signals into their original frequency. Initially, it was used by the US Army for battlefield communications, given the difficulty to jam or intercept it. See Simon Romero, 'Qualcomm's Shrinking Act Could Pay Off Big; Company Prospers by Shedding Divisions and Focusing Fiercely on Patents' (New York Times 23 August 2000); Quentin Hardy, 'Qualcomm CEO's Innovation Has Telecom Giants on Edge' (Wall Street Journal 6 September 1996); Federal Trade Commission v Qualcomm Inc., Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019), 3-4 and 158-160.

manufacturers.[83] As a result, original equipment manufacturers ('OEMs') sourcing their modem chips from Qualcomm's competitors still need a license to Qualcomm's SEPs. Instead of patent licenses, Qualcomm currently concludes with its modem chips rivals royalty-free agreements not-to-sue or to-sue-last. Like Qualcomm's pre-2008 chipmakers patent licenses, the agreements not-to-sue or to-sue-last prohibit chipmakers from supplying non-Qualcomm licensees and provide for burdening monitoring reporting obligations to Qualcomm on customers identities, quantities supplied and chips prices. The practice of licensing just OEMs rather than component suppliers is at the basis of the access to all arguments regarding SEPs FRAND licensing, supported by Avanci, Nokia, Ericsson and other patent aggregators.

Qualcomm does not publish much information about its patent portfolio and licenses, much less than Sisvel, France Brevets and Fractus. Its website contains a so-called 'issued patents country list' indicating that its patents are valid in more than 130 countries. Only for China, Qualcomm publishes a detailed list of about 3,000 patents declared as standard-essential to ETSI's cellular standards in compliance with the antitrust behavioural remedy imposed in 2014 by the Chinese National Development and Reform Commission ('NDRC'). Inventories of licensees are also retrievable according to five categories of licensed products among which subscriber unit products (i.e. handsets) count over 400 licensees and Orthogonal Frequency-Division Multiple Access products ('OFDM/A') about 340 licensees.[84]

Details of Qualcomm's patent portfolio are not public. Nor does Qualcomm provide patent lists and claim charts to prospective licensees during negotiations. However, annual financial reports to the US Securities and Exchange Commission disclose some pieces of information.[85] From 1996 to 2009,

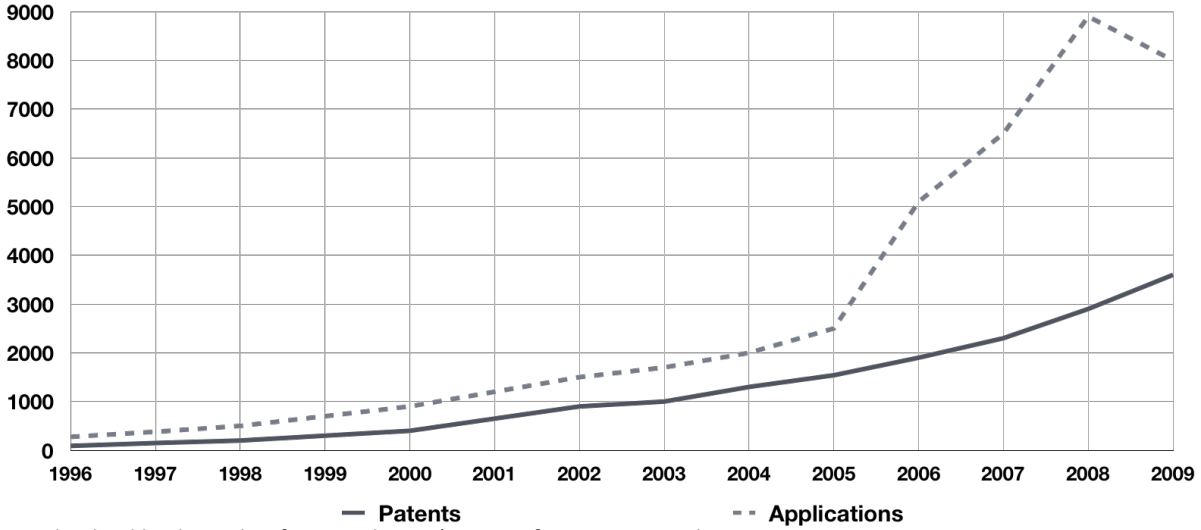
[83] See Quanta Computer v LG Electronics (2008) 553 US 617. Before 2008, Qualcomm licensed many rival chipmakers, such as Philips, LSI Logic, Prairie Communication, TI, NEC, Infineon, EoNex, Agere, Motorola, Lucent, Via Telecom, Fujitsu and Renesas; see Qualcomm's 2008 financial report to the US Securities and Exchange Commission, available at <https://www.sec.gov/cgi-bin/browse-edgar?action=getcompany&CIK=0000804328&type=10-K&dateb=&owner=include&count=40>.

[84] Both lists are updated to 19 June 2019; see <https://www.qualcomm.com/invention/licensing>. The other three categories of licensed products are: 1) infrastructure products with 21 licensees (e.g. Cisco, Huawei, Nokia, Panasonic, Samsung, Ericsson and ZTE); 2) test equipment licensed products with 12 licensees (e.g. Pannasonic, Ericsson); 3) small cells licensed products with 31 licensees (e.g. Huawei, Samsung, Ericsson, ZTE).

[85] Funny enough, Qualcomm collectively refers to all of its patents as 'patent wall' with both a physical depiction at Qualcomm's San Diego headquarters and online on its website; for the physical 'patent wall' see <https://www.engadget.com/2012/11/29/qualcomm-patent-wall/>; for the website 'patent wall' see <https://www.qualcomm.com/invention/qroniclesofinvention/index.html>. Qualcomm's financial reports to the US Securities and Exchange Commission from 1996 to date are available at <https://www.sec.gov/cgi-bin/browse-edgar?action=getcompany&CIK=0000804328&type=10-K&dateb=&owner=include&count=40>.

Qualcomm declared the approximate numbers of its US patents and applications (see Figure 4). Thereafter, it merely referred to its patents as a 'leading intellectual property portfolio'.

Figure 4. 1996-2009 Qualcomm US Patents and Applications



Graph edited by the author from Qualcomm's US SEC form 10-K annual reports.

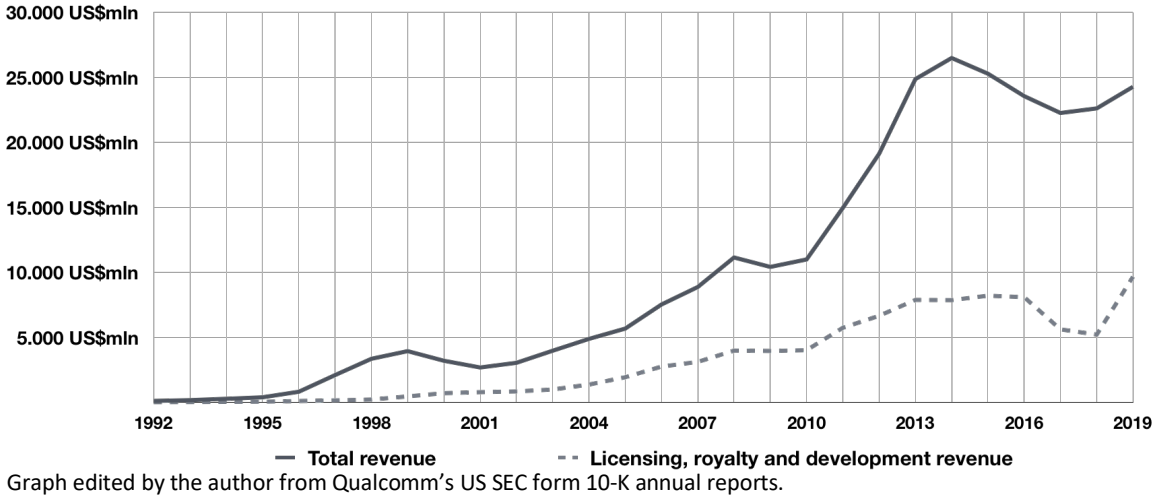
As of July 2019, Qualcomm is on Questel Orbit current or previous assignee of 40,751 patent families, of which 24,580 alive, 8,388 dead and 7,603 pending.[86] At a certain point after 2009, Qualcomm granted patents surpassed the number of pending applications. One hundred fifty-five patent families have been litigated, 1,536 opposed and 2,685 are standard-essential (of which 2,109 alive SEP families). Qualcomm's patent portfolio covers telecommunications and semiconductors, but also computer, measurement and audio-video technologies. The average family is eight years old, and its size is of 6.6 countries, corresponding to the biggest markets of the US, China, India, Europe (often Germany), Japan and South Korea. Beside directly filing patent applications, Qualcomm also builds its patent portfolio through acquisitions of other firms with patented technology (e.g. acquisitions of Flarion with its Wireless Orthogonal Frequency Division Multiple Access patents in 2005 for US$800 million, or of Atheros with its Wi-Fi and Bluetooth patents in 2011 for US$3.5 billion) or direct patent purchases (e.g. acquisition of over 1,400 patent families from HP in 2014).[87]

Qualcomm's licensing revenue is a proxy of the value of its patent portfolio, especially when compared to the total revenue deriving from all its operations (see Figure 5 below). Since Qualcomm separated in 1998 its products and services operations from the patent licensing ones, respectively assigning them to QCT and QTL, the average annual licensing revenue has corresponded to about 30% of total

[86] The patent search has been conducted on Questel Orbit on 31 July 2019. Annex B states the assignee query.
[87] See <https://www.qualcomm.com/news/releases>.

revenues. Notably, Qualcomm's patent dispute settlement with Apple and its contract manufacturers for approximately US$4.7 billion doubled Qualcomm's 2019 licensing revenue.[88]

Figure 5. 1992-2019 Qualcomm Annual Revenue



Graph edited by the author from Qualcomm's US SEC form 10-K annual reports.

A spreadsheet titled 'CDMA and WCDMA License Agreements Signed Between OEMs and Qualcomm' presented as evidence no. QX9148 in the *FTC v Qualcomm* case reveals informative data on Qualcomm's subscriber unit licenses.[89] Qualcomm distinguishes its licenses between those negotiated under foreign governments' interventions (i.e. the Chinese and South Korean licenses) and non-government licenses. The non-government licenses usually cover the entire Qualcomm's patent portfolio, while at least the Chinese contracts, signed after the 2015 NRDC's corrective order, are SEPs-only. In a few instances, the contractual terms are shorter than five years, whereas they are often of 10 years or perpetual. All licenses grant rights to existing and future patents granted during the license term. The oldest disclosed license (with NEC) dates back to 15 December 1994, while the newest licenses are from 2017. Usually, non-government licenses have running royalty ranges depending on the number of products sold rather than a fixed royalty rate. The royalty range for CDMA field of use varies from 2.65% to 7% and for WCDMA field of use from 4% to 6.5%, yet most of the time there is a unique royalty range for both CDMA and WCDMA between 5% and 6.5%. The Chinese contracts have a fixed royalty rate of 3.25% for both CDMA and WCDMA. To Samsung, Huawei and BlackBerry Qualcomm conceded a royalty cap, allegedly capping the royalty base at US$400. The non-government licenses always require grant-backs of the licensees' IPRs, which are almost often for free and rarely dimish Qualcomm's royalties. The court mentions only Sony and Samsung as licensees whose patent

[88] See Qualcomm's financial reports to the US Securities and Exchange Commission, available at <https://www.sec.gov/cgi-bin/browse-edgar?action=getcompany&CIK=0000804328&type=10-K&dateb=&owner=include&count=40>.

[89] Notwithstanding many parts are redacted for confidentiality, key variables of license agreements are visible. These are the licensees' identities, licenses' scope (i.e. whether to the entire portfolio or just to SEPs), effective date and duration for both CDMA and WCDMA patents and lower and upper royalty bounds for both CDMA and WCDMA patents. Two variables of the spreadsheet are completely concealed as much as the values of the column 'upfront payment'; See Federal Trade Commission v Qualcomm Inc., Document 1439-7 QX9148, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019), <https://www.docketbird.com/court-documents/Federal-Trade-Commission-v-Qualcomm-Incorporated/Exhibit-QX9148/cand-5:2017-cv-00220-01439-007>, 141 – 157 and 227-233.

portfolio grant-backs determined a royalty reduction from 5% to 3,5% and quarterly royalty credits, respectively.[90]

For patent litigation, Qualcomm's status as PE makes it at times patent asserter and at others alleged infringer. Darts-IP renders 16 infringement actions by Qualcomm, two against Nokia, respectively in Düsseldorf in 2007 and before the Patents Court of England and Wales High Court in 2008, two against Meizu Technology in Mannheim and Paris in 2016 and thirteen against Apple in Mannheim and Munich between 2017 and 2019. In 2016, Qualcomm together with LG also initiated an invalidity action against Parkervision before the Bundespatentgericht. Moreover, Qualcomm brought 70 opposition proceedings to the EPO. On the defendant side, between 1997 and 2019, Qualcomm appeared in 59 oppositions before the EPO and in only one infringement action initiated by Globalfoundries before the Landgericht Düsseldorf in August 2019. In the US, the Stanford NPE Litigation Database reports that Qualcomm initiated 16 infringement lawsuits between 2002 and 2018, while it resisted 77 cases as an alleged infringer between 2000 and 2018.[91]

Beside financial reports and private patent data providers, the other source of information regarding Qualcomm's patent portfolio and licensing practices are antitrust decisions by courts and enforcement authorities. Qualcomm has been and continues to be involved in competition law proceedings regarding its chips sales and SEPs licenses across the world, namely, in Japan, Europe, China, South Korea, Taiwan and the US.[92] Generally, antitrust troubles started after the firm changed its licensing policy in 2008 and stopped to license rival modem chips manufacturers. The recurring theme of such competition law cases is that Qualcomm has monopoly power on both the market for the licenses of its SEPs and on the market for its modem chips and that it leverages each market power onto the other market. On the one hand, Qualcomm refuses to license its FRAND-encumbered SEPs to rival chipmakers, which increases its modem chips business. On the other hand, Qualcomm refuses to supply OEMs that do not previously take a license to its whole patent portfolio, which increases its patent licensing business. Allegedly, Qualcomm further forecloses competition by charging high patent royalties while granting exclusivity rebates to its chips customers.

The following paragraphs describe the competition law issues raised worldwide against Qualcomm insofar as they shed light on the patent licensing activities of one of the most prominent patent aggregators.

4.4.1. Qualcomm Competition Law Cases: Jurisdictions, Violations and Outcomes

Qualcomm competition law cases concern abuses of market power except for the Japanese violation of general unfair trade practices prohibition.[93] Over time, Qualcomm defended quite successfully

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[90] See Federal Trade Commission v Qualcomm Inc., Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019), 7-8 and 52-62.

[91] Alleged infringers of Qualcomm's US patents have been, inter alia, Broadcom, Nokia, Apple (including its major components suppliers) and Philips. On the defendant side, Qualcomm resisted infringement lawsuits by both competitors, such as Apple, Broadcom, Tessera, Nvidia or Parkervision and by NPEs, such as Godo Kaisha IP Bridge, Autotext Technologies or Intravisual. See Shawn Miller and others, 'Who's Suing Us? Decoding Patent Plaintiffs since 2000 with the Stanford NPE Litigation Dataset' (2018) 21 Stanford Technology Law Review 235, <https://npe.law.stanford.edu>.

[92] See Patrick Moorhead, 'The 10 Most Bizarre Things About the Qualcomm-FTC Case' (Forbes, 31 March 2019), <https://www.forbes.com/sites/patrickmoorhead/2019/03/31/the-10-most-bizarre-things-about-the-ftc-qualcomm-case/ >.

[93] Qualcomm was also involved in concentration control proceedings for its proposed acquisition of NXP. In october 2016, Qualcomm entered into a purchase agreement with NXP to acquire the entirety of NXP for US$47 billion, which would combine two patent portfolios of respectively more than 28,000 and 9,000 patent families.

against antitrust charges. In the seminal Japanese, European and South Korean cases, it reached either complete court wins overturning administrative sanctions or case dismissals. In the mid cases of China, Taiwan and again South Korea, it either settled or achieved mixed results. The most recent European and American cases have adverse first-instance outcomes for Qualcomm, yet appeals are ongoing. So far, Qualcomm's cumulative direct expenditure from the decisions, either in the form of fines or investment commitments, amounts to over €3.5 billion.

The Japanese Fair Trade Commission ('JFTC') was the first national competition authority to sanction Qualcomm. On 28 September 2009, establishing a violation of Art. 19 of the Japanese Antimonopoly Act, prohibiting unfair trade practices, the JFTC ordered Qualcomm to stop-imposing royalty-free cross-licenses and non-assertion provisions to Japanese manufacturers and to amend existing licenses accordingly. The Japanese cease-and-desist order did not affect Qualcomm as the Tokyo High Court stayed it pending the appeal, which Qualcomm ultimately won in March 2019.[94]

Concomitantly with the JFTC case, Qualcomm faced investigations for abuse of market dominance by the European Commission ('EC') and by the South Korean Fair Trade Commission ('KFTC'). The European proceedings began in August 2007, two years after Ericsson, Nokia, Texas Instruments, Broadcom, NEC and Panasonic had complained to the EC about Qualcomm's excessive and supra-FRAND 3G SEPs royalty rates. Allegedly, Qualcomm charged the same royalty rate for its CDMA2000 SEPs and W-CDMA SEPs, despite less of its patents read on the second standard and offered royalty rate discounts to OEMs agreeing to source their modem chips from Qualcomm exclusively. In late 2009, the Commission closed the investigation after the complaints' withdrawal. Exclusivity rebates were also at the heart of the 2009 KFTC decision. The KFTC fined Qualcomm about US$243 million, having established that it abused its market dominance in violation of Art. 3-2 of the South Korea Monopoly Regulation and Fair Trade Act by paying since 2000 exclusivity rebates to Samsung and LG. On 11 February 2019, the South Korean Supreme Court vacated the KFTC's decision and sent the case back to a lower court for reconsideration.[95]

In November 2013, the Chinese NDRC took action, too. On 2 March 2015, after less than two years of investigation, started with a dawn raid, the NDRC sanctioned Qualcomm under Article 47 of the China Antimonopoly Law for abuse of market dominance based on its SEPs licensing and baseband chips supplying conducts. The NDRC ordered Qualcomm to rectify its licensing conducts and to pay a fine of 8% of its 2013 Chinese sales, approximately US$975 million. Reflecting the importance of the Chinese market, Qualcomm did not challenge such decision but instead committed to a rectification plan that

However, the parties aborted the transaction, although it was cleared by the EC with commitments and not opposed by US antitrust authorities within the statutory terms since the Chinese Ministry of Commerce did not approve it; see Commission Decision of 18 January 2018 Case COMP/M.8306 Qualcomm/NXP Semiconductors OJ/2018/C113/77.

[94] See Japan Fair Trade Commission, Cease and Desist Order against QUALCOMM Incorporated (Tentative Translation) 30 September 2009, <https://www.jftc.go.jp/en/pressreleases/yearly-2009/sep/individual-000038_files/2009-Sep-30.pdf> ; Sachiko Sakamaki and Leah Nylen, 'How Qualcomm Won in Japan' (Mlex, 21 March 2019), <https://mlexmarketinsight.com/insights-center/editors-picks/antitrust/asia/how-qualcomm-won-in-japan>.

[95] See European Commission, 'Antitrust: Commission Initiates Formal Proceedings Against Qualcomm', (MEMO/07/389, 1 October 2007), <https://europa.eu/rapid/press-release_MEMO-07-389_en.htm?locale=en> ; European Commission, 'Antitrust: Commission Closes Formal Proceedings Against Qualcomm', (MEMO/09/516, 24 November 2009), <https://europa.eu/rapid/press-release_MEMO-09-516_en.htm?locale=en> ; Florian Müller, 'South Korea's Supreme Court vacates 2009 antitrust fine imposed on Qualcomm by the Korea Fair Trade Commission: Unrelated to 2016 Ruling' (Foss Patents, 11 February 2019), <http://www.fosspatents.com/2019/02/south-koreas-supreme-court-vacates-2009.html>.

includes several behavioural remedies, explicitly applicable only to Chinese licensees, and a planned investment of US$150 million in Chinese mobile and semiconductor technologies.[96]

At the beginning of 2017, the KFTC struck back, sanctioning Qualcomm again for abuse of market dominance this time because of its modem chips supply and patent licensing practices. The second South Korean decision fined Qualcomm approximately US$865 million and imposed behavioural remedies. In December 2019, the Seoul High Court upheld on appeal the fine but reversed parts of the KFTC remedies that to date remain unenforced.[97]

In 2017, it was also Taiwan's turn. On 11 October 2017, the Taiwan Fair Trade Commission ('TFTC') fined Qualcomm US$774 million under Article 9 of the Taiwanese Fair Trade Act for abusing its monopolistic position in the market of modem chips compliant with CDMA, WCDMA and LTE standards. On 9 August 2018, a settlement followed Qualcomm's appeal, which reduced the fine to approximately US$93 million. Qualcomm agreed to behavioural commitments regarding its SEPs licenses to Taiwanese OEMs and chipmakers as well as to a compliance reporting obligations to the TFTC. As part of the settlement, Qualcomm also promised to the TFTC to invest US$700 million over five years on Taiwan's mobile and semiconductor ecosystem.[98]

The EC had two bites at Qualcomm between 2018 and 2019. One proceeding concerned certain payments made between 2011 and 2016 to Apple on condition of exclusive use of Qualcomm 3G and 4G modem chips in its smartphones and tablets. The other one related to predatory pricing conduct against Icera between 2009 and 2011 over 3G modem chips. Both cases, initiated in sync on 16 July 2015, established Article 102 TFEU violations, the exclusivity payment case leading to a €997million fine (4.9% of Qualcomm's 2017 turnover) at the beginning of 2018, while the predatory pricing case to €242 million (1.27% of Qualcomm's 2018 turnover) on 18 July 2019. As of January 2020, no public versions of the decisions are available but only their summaries and EC's press releases. Appeals against both decisions are pending before the General Court. Qualcomm also revealed in its last financial report that, since December 2019, it is facing new antitrust scrutiny from the EC regarding its 5G radio frequency front-end chips supplies.[99]

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[96] See NDRC, 'NDRC Ordered Qualcomm to Rectify Its Anti-Competitive Behavior and Imposed a Fine of RMB 6 Billion' (Feb. 10, 2015) <http://www.ndrc.gov.cn/xwzx/xwfb/201502/t20150210_663822.html> ; Qualcomm, 'Qualcomm and China's National Development and Reform Commission Reach Resolution' (Press Release, 9 February 2015), <https://investor.qualcomm.com/static-files/2a33b6bd-66bd-4977-8486-808386aac482>.

[97] See Hyung-jo Choi, 'Qualcomm's South Korean Antitrust Appeal Enters End-Game as Final Court Clashes Loom', (Mlex, 9 August 2019), <https://mlexmarketinsight.com/insights-center/editors-picks/antitrust/asia/qualcomms-south-korean-antitrust-appeal-enters-end-game-as-final-court-clashes-loom> ; Hyung-jo Choi and Wooyoung Lee, 'Qualcomm's Loss in Seoul Set To Reverberate Across Company's Global Modem-Chip Business' (Mlex, 4 December 2019), <https://mlexmarketinsight.com/insights-center/editors-picks/antitrust/asia/qualcomms-loss-in-seoul-set-to-reverberate-across-companys-global-modem-chip-business>.

[98] See Taiwan Fair Trade Commission, News Release 11 October 2017 <https://www.ftc.gov.tw/internet/english/doc/docDetail.aspx?uid=179&docid=15247> ; Christal Chen, 'Anti-Trust Violation: Qualcomm Commits to Direct Investments in Lieu of Fines', (Tsai Lee & Chen Patent Attorneys, January 2019 Newsletter), <http://www.tsailee.com/about_periodical_show_en.aspx?p=3&cid=1111> ; Jon Russel, 'Qualcomm Settles Antitrust Case in Tawain' (TechCruch, 10 August 2018), <https://techcrunch.com/2018/08/10/qualcomm-settles-antitrust-case-in-taiwan/?guccounter=1&guce_referrer_us=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_cs=FoKUFkGy4_kv3YfZqzZRWA>.

[99] See European Commission, 'Antitrust: Commission Opens Two Formal Investigations Against Chipset Supplier Qualcomm', (Press release, IP/15/5383, 16 July 2015), <https://europa.eu/rapid/press-release_IP-15-5383_en.htm> ; European Commission, 'Antitrust: Commission Sends Two Statements of Objections on

Last but not least, in January 2017, the US Federal Trade Commission (FTC) filed a complaint in the Northern District of California against Qualcomm under Section 13 of the FTC Act for unfair methods of competition in violation of Section 5 of the FTC Act, which also includes violations of the two main federal antitrust statutes, namely, the Sherman Act and the Clayton Act. The FTC sought a permanent injunction to undo and prevent Qualcomm's 'no license, no chip' policy, its refusal to license rival chipmakers and exclusive dealing with Apple alleging violations of both Section 1 and 2 of the Sherman Act. The court, in the person of Judge Lucy Koh, ruled in favour of the FTC and granted injunctive relief. Yet on 23 August 2019, the US Courts of Appeal for the Ninth Circuit stayed the injunction pending appeal.[100]

4.4.2. Qualcomm Relevant Markets and Market Power

The national competition law violation decisions defined two types of relevant markets where Qualcomm operates, namely the wireless SEPs portfolio licensing market and the standard-compliant baseband chips market. In particular, both the SEPs licensing and chips markets comprise each three related product markets corresponding to the CDMA-, WCDMA- and LTE-compliant SEPs and modem chipsets. Furthermore, worldwide standardisation of cellular technologies makes both the SEPs licensing and baseband chips markets geographically global, albeit the NDRC more precisely recognised that the wireless SEPs portfolio licensing market is composed of the collection of individual national SEPs licensing markets where each patent is granted.[101]

In the EC and US FTC cases, Qualcomm allegedly had market power in the relevant global markets, either as European market dominance or American monopoly power. The antitrust agencies concluded so based on four main factors. First, because of Qualcomm's substantial market shares, corresponding for the EC to approximately 60% in the 3G chipset market, or three times the share of the largest rival, between 2009-2011 and 90% in the 4G premium tier chip market between 2011-2016. Naturally, regarding the licensing markets for its own wireless SEPs, Qualcomm directly has a 100% market share. Second, the markets presented very high entry barriers consisting of Qualcomm's substantial IPRs, onerous front-end sunk R&D investments needed to design modem chips and first-mover advantages in the winner-takes-most market for the latest baseband chips. Third, OEMs lacked countervailing buyer power to discipline Qualcomm's monopoly price. Finally, also existing competing chipmakers,

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Exclusivity Payments and Predatory Pricing to Qualcomm', (Press release, IP/15/6271, 8 December 2015), <https://europa.eu/rapid/press-release_IP-15-6271_en.htm>.

[100] The Northern District of California ruling in *FTC v Qualcomm* separately analyses Qualcomm's relations with key telecommunication market participants using sensitive business evidence otherwise confidential. The decision discusses Qualcomm's relations with the following OEMs: LG, Sony, Samsung, Huawei, Motorola, Lenovo, BlackBerry, Curitel, BenQ, Apple, Vivo, Winstron, Pegatron, ZTE, Nokia, smaller Chinese OEMs. The decision also discusses the relations with competing chipmakers, namely, MediaTek, Project Dragonfly, Samsung LSI, Via Telecom, Intel, HiSilicon, Broadcom, and Texas Instruments. See *Federal Trade Commission v Qualcomm Inc.*, FTC's Complaint for Equitable Relief, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019); *Federal Trade Commission v Qualcomm Inc.*, No. 17-CV-00220-LHK Judgment (N.D.Cal. 21 May 2019), 7; *Qualcomm v Federal Trade Commission*, US Court of Appeals for the Ninth Circuit No. 19-16122, Order 23 August 2019, <http://cdn.ca9.uscourts.gov/datastore/opinions/2019/08/23/19-16122.pdf>.

[101] See Stephen Harris, 'An Overview of the NDRC Decision in the Qualcomm Investigation' (July 2015) Competition Policy International 2, 3; Taiwan Fair Trade Commission, News Release 11 October 2017 <https://www.ftc.gov.tw/internet/english/doc/docDetail.aspx?uid=179&docid=15247> ; KFTC, Case No. 2015SiGam2118, In re Alleged Abuse of Market Dominance of Qualcomm Inc., Decision No. 2017-0-25 (20 January 2017), unofficial translation available at <www.theamericanconsumer.org/wp-content/uploads/2017/03/2017-01-20_KFTC-Decision_2017-0-25.pdf>, 57-61.

such as Via Telecom and MediaTek, could not respond to Qualcomm's higher chips prices by increasing output due to Qualcomm' foreclosure and predatory pricing tactics.[102]

Based on the defined markets and assessed market power, the national competition agencies recurred to both exclusionary (i.e. refusal to license, exclusivity rebates and predatory pricing) and exploitative (i.e. unfair trade practices, bundling and excessive pricing) theories of harm affecting rival chipmakers and OEMs customers, respectively.

4.4.3. Exclusionary Theories of Harm: Refusal to License Rivals, Exclusivity Rebates to OEMs and Predatory Pricing Against ICERA

The TFTC, KFTC and US FTC found Qualcomm's refusal to license its SEPs exhaustively to competing chipmakers in breach of both the antitrust duty to license and the applicable FRAND commitments to SSOs. The US FTC presented evidence to the District Court covering all conditions under the three-factor test from the relevant *Aspen Skiing* refusal to deal precedent. First, Qualcomm stopped to license SEPs to rivals in 2008 after a profitable course of licensing across all telecommunication value chain, sacrificing short-term benefits for long-run higher profits. Before 2008, competing modem chipmakers used to pay royalties of 3% on chipset sales (e.g. US$0,30 on a US$10 modem chip), thereafter Qualcomm usually charges 5% on handset price (e.g. US$20 on a US$400 handset).[103] Furthermore, except for the patent right license grant, Qualcomm did not change most of its contractual conditions with chipmakers pre- and post-2008. Indeed, both licenses and not-to-sue or to-sue-last contracts impose rival chipmakers not to sell their chips to non-Qualcomm licensees and, in any case, to report to Qualcomm business information, including supplied customers, number, types and price of products sold and time of purchase. Second, the refusal to license had the only intent to drive competitors out of the market, as many of them in the meanwhile did, to protect Qualcomm's chips business and keep patent royalties to OEMs artificially high.[104] Last, Qualcomm's refusal occurred despite a market existed where other chipmakers licensed SEPs to each other.

Qualcomm justified its refusal to license rivals and instead licensing only OEMs stating that doing so reduces transaction costs, allows rival chipmakers to freely practice its patents, aligns royalties with patent value and generates more efficiencies than multi-level licensing since some SEPs read on handset devices but not on modem chips. The US district court dismissed the pro-competitive

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[102] LTE premium tier chips being a distinct product from other LTE tier chips with lower performances; see Federal Trade Commission v Qualcomm Inc., Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019), 22-41; For example, Intel, one of the largest semiconductor firms in the world, entered the modem chips market only after costly acquiring two other semiconductor firms, namely, Infineon in 2010 and Via Telecom in 2015. Despite its efforts, investment and a brief success between 2016 and 2018 when it supplied even Apple, Intel exited the market in 2019 after Qualcomm won back Apple as a customer. Soon thereafter, Intel sold its modem chip business unit, comprising more than 2,200 employees and 8,500 patents to Apple for US$1 billion; see Apple, 'Apple To Acquire The Majority of Intel's Smartphone Modem Business', (Press Release, 25 July 2019), <https://www.apple.com/newsroom/2019/07/apple-to-acquire-the-majority-of-intels-smartphone-modem-business/> ; European Commission, 'Antitrust: Commission Fines US chipmaker Qualcomm €242 Million for Engaging in Predatory Pricing', (Press release, IP/19/4350, 18 July 2019), <https://europa.eu/rapid/press-release_IP-19-4350_en.htm> ; Summary of Commission Decision of 18 July 2019, Case AT.39711 *Qualcomm (Predation)* OJ/2019/C375/25.

[103] See Federal Trade Commission v Qualcomm Inc, Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D.Cal. 21 May 2019), 7.

[104] Semiconductor companies that exited the modem chips businesses since 2008 are: Freescale, Ericsson ST, Texas Instruments, Broadcom, Icera/Nvidia and Intel; see Florian Müller, 'Macabre Qualcomm-Internal Presentation Used Tombstones to Illustrate Competitors' Exits From Mobile Chipset Market' (Foss Patents, 26 July 2019), <http://www.fosspatents.com/2019/07/macabre-qualcomm-internal-presentation.html?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+fosspatents%2FzboT+%28FOSS+Patents%29>.

justifications as pretextual. Instead, it found that the refusal to license, besides preventing or delaying modem chips market entry, also limited supply options of OEMs helping to sustain Qualcomm's high patent royalties, prevented chipmakers from expanding output and reinvesting the increased revenue in further R&D ultimately depriving consumers of innovation.[105]

In the same sense, the KFTC also established that Qualcomm's practice of refusing to license rival modem chipmakers was abusive, first, because it was contrary to semiconductor industry customs, where rival chipmakers cross-license each other. Second, Via Licensing LTE patent pool, composed of 35 patentees, licenses at all level of the supply chain. Lastly, Qualcomm licenses its own non-cellular SEPs at the component level for Wi-Fi chip, application processor, memory and camera technologies. The KFTC concluded that the refusal to license obliged Qualcomm's competing chipmakers to ask their clients to conclude a separate license with Qualcomm before selling modem chips. Furthermore, the business information reported by chipmakers and their royalty-free grant back license to Qualcomm under the not-to-sue or to-sue-last agreements enabled the San Diegan firm to approach its rivals' customers undercutting these latter ones' offers.[106]

The exclusivity rebates theory of harm claimed that Qualcomm provided financial benefits to key OEMs as long as they sourced the vast majority of their modem chips from it. Such exclusivity payments, coupled with the 'no license, no chip' policy, made rival chipmakers' products more costly and reduced the incentives of the key OEMs to switch supplier and purchase from such rivals. Indeed, OEMs faced the choice of either buying rivals' chips and licensing Qualcomm's SEPs or buying Qualcomm's chips, benefitting of exclusivity rebates, and licensing its patent portfolio. Furthermore, lacking access to strategic customers, rival chipmakers could not enter or build scale and reputation in the chip markets necessary to finance R&D and compete.[107]

Qualcomm concluded exclusive modem chips supply agreements with several OEMs. Specifically, the 2009 KFTC decision found that Qualcomm anticompetitively granted exclusivity rebates to Samsung and LG since 2000, yet the South Korean Supreme Court vacated it and sent the case back for reassessment. Instead, both the EC and the FTC established the exclusivity rebates theory of harm for the same two 4G modem chips supply agreements concluded by Qualcomm with Apple in 2011 and 2013. As a result of the agreements, Qualcomm paid Apple between 2011 and 2016 over US$600 million on condition that Apple purchased substantial volumes of Qualcomm's modem chips. Apple sustained substantial penalties if it were to use rival modem chips, including termination of the incentive payments and return of the received payments (so-called 'clawback provision'). Exclusivity payments foreclosed not only rival chipmakers, foremost Intel, from having Apple as a customer but also precluded other benefits from them, such as significant revenue to fund R&D or acquire technology, exposure to Apple's leading engineering resources, business opportunities with other OEMs, enhanced reputation in SSOs, opportunities to conduct early field testing and prototyping with

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[105] See Federal Trade Commission v Qualcomm Inc., Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019), 114–141.

[106] See KFTC, Case No. 2015SiGam2118, In re Alleged Abuse of Market Dominance of Qualcomm Inc., Decision No. 2017-0-25 (20 January 2017), unofficial translation available at <www.theamericanconsumer.org/wp-content/uploads/2017/03/2017-01-20_KFTC-Decision_2017-0-25.pdf>, 57-61, 69-71 and 83. KFTC, 'KFTC Imposes Sanctions Against Qualcomm's Abuse of SEPs of Mobile Communications' (Press release, 28 December 2016), unofficial translation available at <https://www.qualcomm.com/media/documents/files/kftc-issued-press-release-dated-december-28-2016-unofficial-english-translation.pdf>.

[107] See See European Commission, 'Antitrust: Commission Fines Qualcomm €997 Million For abuse of Dominant Market Position', (Press release, IP/18/421, 24 January 2018), <https://europa.eu/rapid/press-release_IP-18-421_en.htm> ; Summary of Commission Decision of 24 January 2018, Case AT. 40220 Qualcomm (Exclusivity Payments) OJ/2018/C269/25; See Federal Trade Commission v Qualcomm Inc., Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019), 141–157.

telecom vendors and operators. Qualcomm did not demonstrate that its abuse had any objective justification or efficiency gains for consumers.[108]

The EC is the only agency that established Qualcomm engaged in predatory pricing by selling below cost three models of 3G chipsets to two targeted key customers, namely Huawei and ZTE, as part of a deliberate strategy to prevent Icera, a nascent rival, from building scale and reputation and expanding its presence in the premium modem chips market. Specifically, the EC found that Qualcomm sold given amounts of chipsets below long-run average incremental costs and average total costs, while a specific type of chipset below average variable costs. For the EC, the targeted nature of such predatory pricing conduct allowed Qualcomm to maximise injury to Icera while minimising the adverse effects on its own overall chipsets sales revenues. In 2011, NVIDIA acquired Icera but then closed the modem chips business partly in 2012 and totally in 2015. Qualcomm did not provide sufficient efficiency justifications to its anti-competitive practices, which instead for the EC stifled innovation, deprived OEM of a source of supply and reduced consumers' choice.[109]

4.4.4. Exploitative Theories of Harm: Unfair Trade Practices, Bundling and Excessive Pricing

Unfair trading claims focused on Qualcomm's 'no license, no chip' practice with OEMs, the mother of all Qualcomm's antitrust issues. As highlighted above, the 'no license, no chip' practice relies on avoiding patent exhaustion by excluding from chipset supply agreements the rights to the patents implemented by the chipsets. Because Qualcomm does not sell exhaustively, OEMs that wish to buy Qualcomm's modem chips must first take a license to Qualcomm's patent portfolio and then enter into modem chipset supply agreements (usually 3 to 6 months later). Without a license or not complying with such a license, Qualcomm cut-off, threatened to withhold or postponed chips supply (even of competitor MediaTek against Lenovo), withheld sample chips or technical support, delayed or threatened to require returning of software and imposed higher patent royalties to OEMs when using rivals' chips. To pursue the 'no license, no chip' policy, which effectively ties patent licenses to chips supplies, Qualcomm separated in 1998 its modem chipset business from the patent licensing one.[110]

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[108] Apple is particularly significant because it is the largest customer of premium modem chips. Moreover, consumers' recognition makes Apple one of the most sought-after customer by component suppliers. Other OEMs that received exclusivity incentives from Qualcomm include: Blackberry, LG for 85% modem chips exclusivity, Samsung for 100% premium modem chips exclusivity and an undisclosed percentage of exclusivity for medium and high tiers modem chips and Lenovo US$180 million in exchange of minimum orders of 80 million modem chips over two years. Instead of exclusivity payments, Motorola and Huawei received a discounted handset royalty rate, respectively 3.5% and 2.65%, conditioned on 100% modem chips exclusivity. See Federal Trade Commission v Qualcomm Inc., Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019), 141-157; Florian Müller, 'South Korea's Supreme Court vacates 2009 antitrust fine imposed on Qualcomm by the Korea Fair Trade Commission: Unrelated to 2016 Ruling' (Foss Patents, 11 February 2019), <http://www.fosspatents.com/2019/02/south-koreas-supreme-court-vacates-2009.html>.

[109] See Maurits Dolmans, David Little and Wanje Lin, 'European Commission Fines Qualcomm €242M for Predatory Pricing' (Cleary Gottlieb Alert Memorandum, 18 July 2019), <https://client.clearygottlieb.com/63/1303/uploads/2019-07-18-european-commission-fines-qualcomm-242m-for-predatory-pricing.pdf>.

[110] Allegedly, the business agreement between Qualcomm and Samsung also makes them business partners, as Qualcomm committed using Samsung's semiconductor foundries to manufacture its chips. See Federal Trade Commission v Qualcomm Inc, Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D.Cal. 21 May 2019), 45-112; Florian Müller, 'South Korea's Supreme Court Vacates 2009 Antitrust Fine Imposed on Qualcomm by the Korea Fair Trade Commission: Unrelated to 2016 Ruling' (Foss Patents, 11 February 2019), <http://www.fosspatents.com/2019/02/south-koreas-supreme-court-vacates-2009.html> ; KFTC, Case No. 2015SiGam2118, In re Alleged Abuse of Market Dominance of Qualcomm Inc., Decision No. 2017-0-25 (20 January 2017), unofficial translation available at <www.theamericanconsumer.org/wp-

To enforce the 'no license, no chip' policy, Qualcomm also unilaterally obliged customers to agree not to challenge its patent licenses and to grant-back for free their IPRs not only to Qualcomm but also to its other customers and licensees. The free grant-backs, which explicitly survived even after termination of the patent license, consisted of either an exhaustive patent license or a two-stage covenant not-to-sue Qualcomm and its customers. Qualcomm called 'patent umbrella' the cumulative effect of all grant-backs, namely, the preclusion to, back then, Qualcomm's almost 200-licensees from initiating patent infringement actions against Qualcomm and its customers. In favour of the patent umbrella, Qualcomm advocated that it shielded Qualcomm's chipset customers from royalty stacking.[111]

Bundling related to forcing the license of SEPs reading on different standards together, as well as tying such SEPs with non-SEPs (so-called package licenses) while keeping the entire wholesale handset price as the royalty base although licensees might not need non-SEPs and the end-user device price indicates more than just cellular technology. Furthermore, Qualcomm unilaterally imposed royalty rates that kept constant for the entire contract terms, often perpetual or longer than ten years, regardless of both the cross-licenses received and the fluctuating number, importance or value of its patents.[112]

Concerning excessive pricing, the NDRC determined that Qualcomm's licensing fees were unreasonably high since the patentee did not provide patent lists or claim charts, charged license fees for expired wireless SEPs, imposed on licensees a free reverse license of their non-SEPs to both Qualcomm and its clients and set the whole device as the royalty base. Regarding the licensing of expired SEPs, the NDRC recognised that while Qualcomm continued to add new patents to its portfolio, it failed to provide evidence that the value of the new patents was equivalent to that one of the expired patents since patent counts do not necessarily reflect patent portfolio value. Further, the license fee was constant during either the long-term (i.e. ten years) or the perpetual term of the licenses despite the fluctuation of Qualcomm's patent portfolio.[113]

The Californian district court too, in the FTC case, discussed many reasons why Qualcomm's patent license royalties are unreasonably high, the highest of all patentees as OEMs unanimously testified. Above all, Qualcomm's internal documents recognise that the high royalty rates are due to its power in the modem chipsets market, that Qualcomm is not the top contributor to latest cellular standards and that so-called user experience drives cellular handsets' value rather than cellular technology. Second, Qualcomm pursued its 'no license, no chip' policy coupled with the refusal to provide patent lists or claim charts contrary to what Qualcomm's other lines of business and entire semiconductor

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content/uploads/2017/03/2017-01-20_KFTC-Decision_2017-0-25.pdf>, 46 and 69; Federal Trade Commission v Qualcomm Inc., Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019), 72-76.

[111] See KFTC, Case No. 2015SiGam2118, In re Alleged Abuse of Market Dominance of Qualcomm Inc., Decision No. 2017-0-25 (20 January 2017), unofficial translation available at <www.theamericanconsumer.org/wp-content/uploads/2017/03/2017-01-20_KFTC-Decision_2017-0-25.pdf>, 94; Allen & Overy, 'Antitrust in China: NDRC v. Qualcomm – One All' (Client Alerts, 12 February 2015), <http://www.allenovery.com/publications/en-gb/Pages/Antitrust-in-China-NDRC-v--Qualcomm-—One-All.aspx>.

[112] See Allen & Overy, 'Antitrust in China: NDRC v. Qualcomm – One All' (Client Alerts, 12 February 2015), <http://www.allenovery.com/publications/en-gb/Pages/Antitrust-in-China-NDRC-v--Qualcomm-—One-All.aspx> ; KFTC, Case No. 2015SiGam2118, In re Alleged Abuse of Market Dominance of Qualcomm Inc., Decision No. 2017-0-25 (20 January 2017), unofficial translation available at <www.theamericanconsumer.org/wp-content/uploads/2017/03/2017-01-20_KFTC-Decision_2017-0-25.pdf>, 57-61 and 130-132; KFTC, 'KFTC Imposes Sanctions Against Qualcomm's Abuse of SEPs of Mobile Communications' (Press release, 28 December 2016), unofficial translation available at <https://www.qualcomm.com/media/documents/files/kftc-issued-press-release-dated-december-28-2016-unofficial-english-translation.pdf>.

[113] The argument against constant long-term royalty rates is not so sound when considering that contractual royalty rates can account for long-term technology depreciation.

industry do, both selling components exhaustively. Third, Qualcomm kept royalty rates constant for 30 years irrespective of cross-licenses received or its declining share of SEPs. It also used the entire market value of devices as royalty base contrary to case law endorsing the SSPPU rule of royalty apportionment.[114] Finally, thanks to its market power in the modem chip market and descending ability to withhold chips supply, Qualcomm precludes OEMs from challenging its licensing terms in court or arbitration.

4.4.5. Antitrust Prohibitions and Behavioural Remedies

As a result of the competition law infringement decisions or settlements, several prohibitions and behavioural remedies affect Qualcomm's patent licensing and chipset supplying businesses on top of administrative fines. The degree of intrusiveness of the decisions varies, from a European low, American medium, Asian-general high, to sky-high Chinese price-control.

Remaining at a quite general level, the EC decisions, recognising the infringements had already come to an end, only prohibit Qualcomm from repeating the proscribed conducts (i.e. predation and exclusivity payments) or any other activity that would have the same or an equivalent object or effect as the proscribed conducts. Thus, the EC has not impacted Qualcomm's licenses so far.

The US judgement goes further, prohibiting Qualcomm to pursue the 'no license, no chip' policy, any exclusive dealing rebates scheme and to interfere with customers' ability to interact with public authorities. The court also obliges Qualcomm to negotiate or re-negotiate in good-faith its contracts without threats of retaliation, to grant FRAND licenses for its SEPs to all and to submit to arbitral or judicial dispute resolutions if negotiations fail. An annual monitoring reporting obligation to the FTC for seven years would ensure compliance with the injunction, yet the appeal court stayed the enforcement of the judgment.

The NDRC was the first antitrust authority to condition much more into details Qualcomm's behaviour under an accepted rectification plan self-proposed by the firm. According to the rectification plan, explicitly applicable only to Chinese licensees, Qualcomm must provide lists of its Chinese patents, which it publicly does on its website and it must not charge license fees for expired patents to Chinese OEMs. It cannot require grant-backs of non-SEPs from its Chinese licensees without paying reasonable consideration, nor can it impose no-challenge clauses in its patent licenses. It must not arbitrarily bundle cellular SEPs and its other patents in its Chinese licenses. It must always adopt 65% of wholesale device price as the royalty base and charge royalties of 5% on 3G devices (including multi-mode 3G/4G devices) and 3.5% on 4G-only devices. Last, it cannot refuse modem chips supply to Chinese OEMs willing to take a license under the approved plan. Such remedies are explicitly binding on eventual Qualcomm's cellular SEPs successors in interest, neutralising patent divestitures and privateering concerns. More than 100 Chinese OEMs, such as Oppo, Lenovo, Xiaomi or Haier concluded new NDRC-compliant licenses or amended old licenses, which Qualcomm calls Chinese Patent Licensing Agreements. In practice, Qualcomm's 'no license, no chip' policy remains for OEMs who refuse the NDRC's approved license or do not comply with it.[115]

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[114] See Federal Trade Commission v Qualcomm Inc., Finding of Fact and Conclusions of Law, No. 17-CV-00220-LHK (N.D. Cal. 21 May 2019), 168.

[115] See Stephen Harris, 'An Overview of the NDRC Decision in the Qualcomm Investigation' (July 2015) Competition Policy International 2, 3; NDRC Administrative Sanction Decision No. 1 [2015] (Mar. 2, 2015) <http://www.ndrc.gov.cn/gzdt/201503/t20150302_666209.html> ; Qualcomm, 'Qualcomm and China's National Development and Reform Commission Reach Resolution' (Executive Presentation 9 February 2015), <https://investor.qualcomm.com/static-files/bee634be-71b5-4716-b8cf-a0a8078e4169> ; Cleary Gottlieb, 'China's NDRC Concludes Qualcomm Investigation, Imposes Changes in Licensing Practices' (Alert Memorandum

Qualcomm obeys to stringent requirements also under the settlement with the TFTC. In particular, Qualcomm agreed to renegotiate its SEPs licenses with Taiwanese OEMs, allowing for neutral dispute resolution procedures, not to withhold modem chips supply during license negotiations, to treat Taiwanese OEMs in a non-discriminatory manner vis-à-vis its other SEPs licensees, to offer a FRAND license to Taiwanese chipmakers, to sue for infringement only unwilling Taiwanese licensees and to stop its exclusive dealing incentives to OEMs. Qualcomm must report the implementation of all commitments to the TFTC plus the amended or new contracts with Taiwanese OEMs and chipmakers bi-annually for five years.[116]

Last but not least, the KFTC corrective order imposes Qualcomm the following licensing negotiation framework applying beyond just South Korean chipmakers and OEMs. Both competing chipmakers and OEMs must obtain from Qualcomm a draft patent license within 60 days from their licensing request. The draft must not contain the restrictive trading conditions Qualcomm previously imposed, such as the prohibition to supply chips only to Qualcomm's already licensees, chips supply monitoring reporting obligations and royalty-free cross-grant. Explicitly, the draft contract must include patent lists, claim charts and royalty calculation methods. Licenses must be separately available for both SEPs and non-SEPs, as well as groups of SEPs reading on different standards. Qualcomm must compensate any patent grant-back from its licensees. Prospective licensees can offer alternative terms and if good-faith negotiations fail, either party can notify the counterparty the end of negotiations. Within 60 days from such notification, Qualcomm must request the decision of an independent third party, such as the ICC or WIPO. Prospective licensees' compliance with the licensing framework precludes Qualcomm from seeking injunctive relief. Furthermore, Qualcomm shall not impose its patent licenses on OEMs by withholding, threating to withhold or delaying chips supply, unless OEMs do not comply with the licensing framework. In practice, OEMs' compliance with the KFTC's negotiation framework precludes Qualcomm's 'no license, no chip' policy. Qualcomm had to notify modem chipmakers and OEMs about the KFTC's corrective order and had to report to the KFTC every patent license or modem chip supply

16 March 2015) <https://www.clearygottlieb.com/-/media/organize-archive/cgsh/files/publication-pdfs/chinas-ndrc-concludes-qualcomm-investigation-imposes-changes-in-licensing-practices.pdf> ; Qualcomm, 'Qualcomm and China's National Development and Reform Commission Reach Resolution' (Press Release, 9 February 2015), <https://investor.qualcomm.com/static-files/2a33b6bd-66bd-4977-8486-808386aac482>.

[116] See Taiwan Fair Trade Commission, News Release 10 August 2018, <*https://www.ftc.gov.tw/internet/english/doc/docDetail.aspx?uid=179&docid=15565*> ; Christal Chen, Anti-Trust Violation: Qualcomm Commits to Direct Investments in Lieu of Fines, (Tsai Lee & Chen Patent Attorneys, January 2019 Newsletter), <http://www.tsailee.com/about_periodical_show_en.aspx?p=3&cid=1111> ; Jon Russel, 'Qualcomm Settles Antitrust Case in Tawain' (TechCruch, 10 August 2018), <https://techcrunch.com/2018/08/10/qualcomm-settles-antitrust-case-in-taiwan/?guccounter=1&guce_referrer_us=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_cs=FoKUFkGy4_kv3YfZqzZRWA>.

contract concluded afterwards within 14 days from execution or amendment.[117] Table 8. below compares the antitrust licensing prohibitions affecting Qualcomm.

Table 8. Antitrust Licensing Prohibitions on Qualcomm

	No 'no license, no chip'	Provide patent lists	No RF grant-backs	No no-challange clause	No patent package bundling	Price control	License to all (rival chipmakers too)	Dispute resolution if negotiations fail
China NDRC 2015	Unless licensees do not comply with licensing framework	✔	Limited to non-SEPs	✔	Cellular SEPs with other patents	Royalty-base 65% of wholesale device price, 5% rate on multi-mode/ 3.5% on 4G-only, no fees on expired patents		
South Korea FTC 2017 (unenforced)	Unless licensees do not comply with licensing framework	+ Claim charts, royalty calculations	✔		SEPs and non-SEPs, different standards together		+No chips supply monitoring obligations	
Taiwan FTC 2017	✔						✔	✔
US FTC 2019 (stayed pending appeal)	✔			+ No interference with customers-authorities interactions			✔	✔

Table edited by the author.

5. Case Study Findings

The case-study highlights several features of patent aggregators' licensing business that transcend the distinction between NPEs and PEs (see the comparative table of all features in Annex C). Above all, their patent licensing activities emerged out of diverse necessities (like inventions do). Sisvel, the oldest patent aggregator among the studied ones, started for defending its Italian member companies against cost-cutting Asian knock-offs competitors. Fractus shares a similar defensive patent licensing origin as it began to out-license former clients infringing the antennas they previously sourced from it. Qualcomm's licensing parallels the emergence of open innovation business opportunities whereby raising patent licensing revenue is essential to fuel further R&D investments. Annual revenue figures show that Qualcomm' licenses had two major leaps. The first one occurred in 1998 after Qualcomm separated the chips supply business from patent licensing, while the second in 2008 after it stopped licensing to rival modem chips manufacturers. Thanks to its outstanding patent revenue, Qualcomm keeps a strong leadership in semiconductors innovation. France Brevets distances it-self from the other patent aggregators being a French government initiative to spur liquidity and invest in the patent market, admittedly inspired by Intellectual Ventures and Asian counterparts.

Besides patent aggregators' origins also their ownership structures vary. Sisvel and Fractus are private companies, while France Brevets and Qualcomm are state-owned and public NASDAQ-listed firms, respectively. The kind of ownership affects patent aggregators' accountability, transparency of operations, investment-term commitment and geographical reach. For example, France Brevets, in

[117] In fact, the corrective order explicitly applied to South Korean modem chipmakers and their South Korean and foreign affiliates, to foreign modem chipmakers supplying South Korean OEMs or other OEMs selling in South Korea, to South Korean OEMs and their affiliates, to OEMs selling in South Korea and to component suppliers of OEMs selling in South Korea. See KFTC, Case No. 2015SiGam2118, In re Alleged Abuse of Market Dominance of Qualcomm Inc., Decision No. 2017-0-25 (20 January 2017), unofficial translation available at <www.theamericanconsumer.org/wp-content/uploads/2017/03/2017-01-20_KFTC-Decision_2017-0-25.pdf>, 4-5; OECD, 'Licensing of IP rights and competition law – Note by Korea' (6 June 2019) <https://one.oecd.org/document/DAF/COMP/WD(2019)23/en/pdf>.

light of its public-interested mission, licenses its GNSS portfolio for free to firms with less than €2 million of total turnover. The other patent aggregators could hardly justify RF licensing to private shareholders or investors.

Furthermore, patent aggregators concentrate on pervasive general-purpose patented technologies, such as ICT standards, that many downstream sectors implement and therefore must in-license. Sisvel and Qualcomm mostly license FRAND-encumbered SEPs, such as those of wireless communication standards. France Brevets licenses both SEPs (e.g. NFC) and non-SEPs (GNSS), whilst Fractus' antenna patents are not standard-essential. Patent aggregators' licenses scores, in the double-digit figures for France Brevets and Fractus and triple-digit figures for Sisvel and Qualcomm, reflect the wide-adoption of their patented technologies. Unanimously, the four patent aggregators license their patents as packages. Only France Brevets offers licenses for individual or subsets of patents out of its portfolios. Having SEPs for subsequent generations of standards, Sisvel and Qualcomm license their SEPs-portfolios relating to different standards either individually or together. Sisvel is the only company out of the sample that manages patent pools, whereas both Qualcomm and Sisvel participate with their cellular SEPS in the Avanci IoT patent pool.

None of the studied patentees computes royalty rates using the SSPPU instead all use the EMVR, namely a royalty base equal to the price of end-user devices implementing the relevant patents. Sisvel and Fractus formally offer their licenses to all comers. However, the use of the EMVR practically turns license-to-all offers into the out-right access to all approach of France Brevets and Qualcomm, whereby only OEMs or end-products distributors bear licensing costs.

Focusing on the licensing consideration parameter, Sisvel grants part paid-up licenses, coupling a lump sum upon closing and a fixed royalty rate, and reduces license fees for well-performing licensees. Fractus too uses fixed per-unit royalty rates, differentiated between US and non-US products, plus it discounts the fees for licensees that ask for a license spontaneously. France Brevets imposes a fixed per-unit royalty rate proportional to units licensed for its NFC patents, whereas a percentage per-unit royalty rate for the GNSS patents. Qualcomm applies percentage per-unit royalty rates, which it rarely discounts for grant-backs of prominent patent portfolios (i.e. Sony and Samsung).

Moreover, patent portfolios sizes range among the four patent aggregators from the relatively small and antenna-centred one of Fractus (over 60 patent families alive, validated on average in more than three countries) to the vast 'patent wall' of Qualcomm (>24,000 patent families alive, validated in a mean of over six countries). France Brevets' and Sisvel's technology-diversified patent portfolios (over 120 and 200 patent families alive, validated in a mean of about three and eight countries, respectively) lie in the middle. However, the two NPEs' third-party licensing activity implies the control and management of much more patents without actual ownership.

The four firms engage in more patent aggregation activities than just licensing. For the means of building patent portfolios, both PEs prosecute their patents though just Qualcomm has also engaged in acquisitions of patent portfolios or patent-rich companies. Instead, the two NPEs recur to patent purchases and exclusive in-licenses with sub-licensing rights, Sisvel having over thirty patent suppliers and France Brevets four main ones. For the non-manufacturing patent exploitation options, the four patent aggregators enforced their patents as part of licensing efforts. Their lawsuits reached several countries. All litigated in the US (e.g. Fractus and France Brevets in the Eastern District of Texas) and all but Fractus litigated in Germany (e.g. Qualcomm's preference for Munich, Sisvel's recurrent choice for Mannheim and France Brevets' predilection for Dusseldorf). So far, only Qualcomm and Fractus sued in China, respectively in Beijing and Shanghai. Reflecting proximity to operations, the Europe-

based patent aggregators used a variety of prominent European patent courts, yet only Sisvel ventured the notoriously expensive British ones.

Specific lawsuits by Sisvel and Fractus correspond to their shared strategy of suing implementers during consumer electronics fairs, such as the Barcelona Mobile World Congress, to leverage bad publicity reputation concerns as well as prospects of criminal infringement proceedings. In the past, Sisvel also recurred to border detention procedures against infringing products imported into the EU. Quite uniquely, Qualcomm, given its vertically integrated position, ties chipset supplies to patent licenses which brought it the abundant antitrust troubles analysed above.

6. Conclusion

This chapter shows that patent licensing is a legitimate and profitable path to monetise patents. Within limited patent and competition law bounds, parties have ample scope to design the patent license that best fits their opposing rent-seeking and technology-sourcing needs. The increase of patent licenses over the years, revealed by the empirical data and reinforced by the advent of the IoT, confirms the mutually beneficial results such contracts achieve, namely the remuneration and diffusion of patented inventions. The patent licensing market, though, still misses transparency. Neither recordation obligations into patent offices' official registers or positive economic effects (i.e. technological-quality-signalling and easier access to capital) overcome the parties' business secrecy concerns over licensing details. In turn, the lack of transparency raises transaction costs, in terms of screening markets, negotiating, monitoring and enforcing licenses, which further hamper patent licensing markets.

The multiple case-study finds that patent aggregators have a decisive role to play in patent licensing markets, establishing themselves as intermediaries between inventors and implementers. They change patents' use from exclusion to diffusion because their business is not to retain patent-related competitive and technological edges for themselves but rather to spread such edges as much as they can maximise licensing revenue. Patent aggregators are market references for anyone willing to either cash-out of obtained patents or access patented technology, albeit in the limited general-purpose technologies and ICT standards areas where aggregators elicit to operate. Their vast patent portfolios are more attractive propositions than separate individual patent licenses. In addition, patent portfolio size defuses implementers' spotted threats of patent revocation or declaration of non-infringement actions. Their expertise and networks off-set the lack of transparency over licensing terms, clear licensing transaction costs and open up commercialisation opportunities into discrete industries, too.

The qualitative analysis confirms significant differences among patent aggregators' types. PEs (i.e. vertically integrated patentees) and NPEs (i.e. patentees not competing downstream) have type-specific effects on the economics of licensing. PEs can leverage their patent licensing stance on product markets and vice-versa, something that already costed Qualcomm over €3.5 billion in antitrust fines and remedial investment commitments since 2015. Considering both patent licensing confidentiality and horizontal-collusion concerns, NPEs are more attractive vertical licensors for implementers than PEs licensors with whom the implementers may compete. However, NPEs, without a product-market foothold, are also immune to patent infringement counterthreats and cross-licensing needs. Thus, NPEs miss important countervailing bargaining forces that keep PEs' licensing activities under competitive check. Subsequent research on the interplay between patent aggregation activities and innovation should not lose sight of the peculiarities of the different types of patent aggregators.

Annexes

A. Sisvel's Audio-Video, Television and Broadband Licensing Programs

A.1. Audio-video Compression/Decompression

Sisvel's audio-video licensing programs cover MPEG Audio (MPEG-1 Audio and MPEG-2 Audio) and video coding VP9/AV1 technologies.[118] MPEG Audio is a standard adopted by the International Organisation for Standardisation (ISO) at the base of MP3 technology. VP9 and AV1 are video coding formats, respectively supported by Google and by the Alliance for Open Media, a consortium among Apple, ARM, Cisco, Facebook, Google, IBM, Intel, Microsoft, Mozilla and Netflix. The actual contracts for the audio-video compression and decompression licensing programs are not publicly available.

Sisvel's audio-video portfolio licenses are worldwide, non-transferable, non-assignable, non-exclusive and without sub-licensing rights. Furthermore, only end-products can be licensed, not components or subassemblies.

MPEG Audio SEPs licensed by Sisvel belong to Philips, TDF, IRT and BRW (Bayerische Rundfunkwerbung GmbH). Sisvel directly licenses about 200 SEPs granted in European countries, while the subsidiary MPEG Audio Inc. licenses 18 US SEPs. More than one thousand companies are listed as licensees under the MPEG Audio licensing program. Two types of licenses are granted, one for consumer hardware MPEG Audio enabled devices and the other license for professional hardware MPEG Audio enabled devices. The actual licenses on, yet they comprise a lump-sum upon closing and they are paid-up.[119]

Sisvel also has two separate joint patent licensing programs for consumer products implementing VP9 and AV1 technologies under the patents of JVC Kenwood, Philips, Nippon Telegraph and Telephone and Toshiba. The licenses provide for either per-unit running royalties or a yearly advanced lump-sum proportional to a committed volume of VP9 or AV1 enabled products. Rates for devices with a screen, such as smartphones, cameras, video projectors, TVs and augmented reality glasses are higher than

[118] See <https://web.archive.org/web/20190406090650/http://www.sisvel.com/licensing-programs/audio-and-video-coding-decoding>.

[119] See <https://www.sisvel.com/licensing-programs/audio-and-video-coding-decoding/mpeg-audio/introduction>.

for products without display, such as video-game consoles, decoders, home theatres and graphic cards. Moreover, fully compliant licensees pay reduced rates (see Table A.1.1.).

Table A.1.1.. VP9 and AV1 Running Royalties and Committed Volumes Rates

Running Royalties				
Device type	VP9		AV1	
	Standard rate	Compliant rate	Standard rate	Compliant rate
Device with screen	€0.24	€0.18	€0.32	€0.24
Device without screen	€0.08	€0.06	€0.11	€0.08
Committed Volumes Rates				
Devices with screen				
Minimum units committed	Maximum units committed	Applicable royalty rate		
		VP9	AV1	
1	100,000	€0.126	€0.168	
100,001	1,000,000	€0.117	€0.156	
1,000,001	25,000,000	€0.108	€0.144	
25,000,001	75,000,000	€0.099	€0.132	
75,000,001	Above	€0.090	€0.120	
Devices without screen				
1	20,000	€0.042	€0.056	
20,001	200,000	€0.039	€0.052	
200,001	5,000,000	€0.036	€0.047	
5,000,001	14,000,000	€0.033	€0.044	
14,000,001	Above	€0.030	€0.040	

Source <https://sisvel.com/licensing-programs/audio-and-video-coding-decoding/video-coding-platform/license-terms>.

A.2. Television Technologies

Sisvel manages seven licensing programs for digital video and display technologies, its original core expertise. The licenses concern Digital Video Broadcasting – Terrestrial 2 (DVB-T2), DVB-S2X, DVD-SIS, Recommendation engine and JPEG-XT.[120] DVB is a series of standards adopted by ETSI that allow for digital television broadcasting prevalently on terrestrial networks but also on satellite ones. Sisvel licenses DVB technologies through patent pools, which can be joined by any relevant patentee after essentiality assessment of the submitted patents by an independent expert retained by Sisvel. Recommendation engine technologies suggest content to be watched by users relying on the historical preferences of the individual user and of similar users. Sisvel does not disclose any detail of its recommendation engine licensing program. JPEG-XT is an improved and backwards-compatible extension of the Joint Photographic Experts Group (JPEG) image compression standard adopted by the International Communication Union, International Organisation for Standardisation and International Electrotechnical Commission.

As for the audio-video compression and decompression licensing programs, the television technologies are licensed under non-transferable, non-assignable, non-exclusive licenses without sub-licensing rights and only to end-products ready-to-use, not components or subcomponents.

For DVB-T2, Sisvel manages a patent pool where any patentee can submit his relevant patents and applications for an evaluation of essentiality by independent experts. So far, the pool comprises over 25 SEPs families owned by BBC, DTVG Licensing, ETRI, Fraunhofer, IMT Atlantique, LG, RAI, Samsung, Sony and TDF. More than 130 companies took a FRAND license. The term of the license is 31 December 2022 plus automatic renewal of five years unless a party gives written termination notice six months

[120] Sisvel is still organising a patent pool for DVB Single Illumination System (DVB-SIS), a standard published by ETSI in August 2018. See <https://www.sisvel.com/licensing-programs/digital-video-display-technology>.

before the renewal date. Consideration for the DVB-T2 license comprises an entrance lump-sum fee of €10,000.00 and a running royalty varied among consumer and professional DVB-T2-enabled products. The rates for consumer products are also applied to professional products with a sales price inferior to €1,000. Initially, DVB-T2 licenses did not vary among consumer and professional products and their royalty rates were higher yet proportional to volumes of licensed units manufactured or disposed of (see Table A.2.1.).

Table. A.2.1. DVB-T2 Royalty Rates: Current and Initial

Current Rates		
Type of licensed product	Standard per-unit rate	Compliant per-unit rate
Consumer product (either encoder or decoder)	€0.75	€0.60
Consumer product (both encoder and decoder)	€1.00	€0.80
Professional product (either encoder or decoder) sold for more than €1,000 or equivalent foreign currency	€18.00	€15.00
Professional product (both encoder and decoder) sold for more than €1,000 or equivalent foreign currency	€24.00	€20.00
Initial Rates		
Annual number of licensed consumer products manufactured or otherwise disposed	Standard per-unit rate	Compliant per-unit rate
1 – 2,000,000	€1.00	€0.75
2,000,001 – 4,000,000	€0.90	€0.67
4,000,001 – above	€0.80	€0.60

Source: <https://sisvel.com/licensing-programs/digital-video-display-technology/dvb-t2/license-terms> and <https://web.archive.org/web/20170720213028/https://sisvel.com/licensing-programs/digital-video-display-technology/dvb-t2/license-terms>.

To companies concluding a professional product DVB-T2 license before 31 December 2018, Sisvel granted early bird conditions, namely, a 50% discount on royalties due for unlicensed products sold or purchased in 2017, plus default application of the compliant rate for 2017 and 2018 instead of the standard one.

Turning to the DVB-S2X, Sisvel started a patent pool in 2017 and, as of July 2019, it comprises seven SEPs families owned by Fraunhofer, Hughes Network Systems, LLC Newtec, RAI, the European Space Agency (ESA) and Work Microwave. Consideration involves an entrance lump-sum of €3,000 combined with running royalties, which are differentiated for consumer and professional DVB-S2X-enabled devices. The consumer product rates are also applied to professional products with sales price lower than €800 (see Table A.2.2.).

Table A.2.2. DVB-S2X Royalty Rates

Type of licensed product	Standard per-unit rate	Compliant per-unit rate
Consumer product	€0.60	€0.50
Professional product	€18	€15

Source <https://sisvel.com/licensing-programs/digital-video-display-technology/dvb-s2x/license-terms>.

Regarding JPEG-XT, Dolby International and Trellis Europe granted Sisvel the right to license their SEPs to third parties under FRAND conditions for consumer products with image capturing capabilities. The royalty rate is higher for devices whose main function is to capture images, so-called camera-based devices, than for devices that implement such feature among many other technologies, so-called camera-enabled devices. Fully compliant licensees benefit of a reduced rate (see Table A.2.3.).

Table A.2.3. JPEG-XT Royalty Rates

Type of licensed product	Standard per-unit rate	Compliant per-unit rate
Camera-enabled devices	€0.06	€0.045
Camera-based devices	€0.12	€0.09

Source <https://sisvel.com/licensing-programs/digital-video-display-technology/jpeg-xt/license-terms>.

A.3. Broadband – DSL SEPs

Sisvel acquired from Panasonic a portfolio of SEPs relating to various digital subscriber line ('DSL') standards adopted by ITU and used to provide broadband access to the Internet or other data networks.[121] The DSL portfolio lists five widely validated SEPs families, corresponding to about 100 patents expiring between 2018 and 2025. Per-subscriber royalty rates cover DSL service providers, while per-unit royalty rates (see Table DUS) cover customer-premises equipment ('CPE', e.g. modems, router, gateways, transceivers) and telecommunication equipment (e.g. DSL Access Multiplier, 'DSLAM') as per Table A.3.1..

Table A.3.1. DSL SEPs Royalty Rates

DSL Service Providers Per-Subscriber Royalty Rates	
Annual Subscribers	Per-Subscriber Royalty Rate
1 to 1,000,000	US$0.40
1,000,001 to 5,000,000	US$0.30
5,000,001 and above	US$0.20
CPEs Per-Unit Royalty Rates	
1 to 1,000,000	US$0.50
1,000,001 to 5,000,000	US$0.375
5,000,001 to 10,000,000	US$0.25
10,000,001 and above	US$0.20
DSL Telecommunication Equipment Per-Unit Royalty Rates	
1 to 1,000,000	US$1.40
1,000,001 to 5,000,000	US$1.05
5,000,001 to 10,000,000	US$0.70
10,000,001 and above	US$0.56

Source <https://sisvel.com/licensing-programs/broadband/dsl/introduction>.

In its royalty calculation statement, Sisvel benchmarks TQ Delta's DSL patent portfolio license, which requires between US$0.60 to US$3.10 per CPE unit and between US$1.25 to US$2.60 per DSL telecommunication equipment unit.

B. Questel's Qualcomm Assignee Query

Qualcomm or "QUALCOMM GLOBAL TRADING" or "SOLLINK" or "QUALCOMM TELECOMMUNICATIONS" or "QUALCOMM" or "BLACK SAND TECHNOLOGIES" or "CORPORACION NACIONAL DE RADIODETERMINACION" or "DESIGNART NETWORKS" or "DIGITAL FOUNTAIN"or"ELATA" or "EUVISION TECHNOLOGIES" or "FIRETHORN HOLDINGS" or "FLAHERTY & CRUMRINE INCO" or "HALOIPT" or "IKANOS" or "INVESCO" or "MANGO TECHNOLOGIES" or "MCCORMICK & COMPANY" or "MEDIA FLO" or "NAVTEK" or "NIGEL POWER" or "NOW SOFTWARE" or "NPHASE" or "NUJIRA" or "ORB NETWORKS" or "OUTLIER" or "PIXTRONIX" or "QUALCOMM ASIA PACIFIC PTE" or "QUALCOMM ATHEROS TECHNOLOGY" or "QUALCOMM ATHEROS" or "QUALCOMM CAMBRIDGE" or "QUALCOMM CDMA TECHNOLOGIES" or "QUALCOMM CDMA TECHNOLOGIES ASIA PACIFIC PTE" or "QUALCOMM CONNECTED EXPERIENCES" or "QUALCOMM EUROPE HOLDINGS" or "QUALCOMM EUROPE" or "QUALKOMM FLARION TECHNOLOGIES" or "QUALCOMM GLOBAL TRADING PTE" or "QUALCOMM GREATER CHINA" or "QUALCOMM INDIA PVT" or "QUALCOMM INNOVATION CENTER" or "QUALCOMM INTELLIGENT SOLUTIONS" or "QUALCOMM INTERNATIONAL" or "QUALCOMM INTERNET SERVICES" or "QUALCOMM ITALIA" or "QUALCOMM KOREA" or "QUALCOMM LABS" or "QUALCOMM LATIN AMERICA" or "QUALCOMM MEMS TECHNOLOGIES" or "QUALCOMM PERSONAL ELECTRONICS" or "QUALCOMM POOLE" or "QUALCOMM RIVER HOLDINGS" or

[121] The relevant DSL standards are ADSL, ADSL2, ADSL2+, VDSL, VDSL2, SHDSL, SDSL and G.fast, ITU G.994.1

"QUALCOMM S DE RL" or "QUALCOMM SPINCO" or "QUALCOMM TECHNOLOGIES FINLAND" or "QUALCOMM TECHNOLOGIES INTERNATIONAL" or "QUALCOMM TECHNOLOGIES NETHERLANDS" or "QUALCOMM TECHNOLOGIES" or "QUALCOMM VENTURES" or "QUALCOMM WIRELESS BUSINESS SOLUTIONS" or "QUALCOMM WIRELESS BUSINESS SOLUTIONS EUROPE" or "QUALPHONE" or "RAPID BRIDGE" or "RF360 EUROPE" or "RF360 TECHNOLOGY" or "SANDBRIDGE TECHNOLOGIES" or "SIMAC MOBILE SOLUTIONS" or "SIMAC TECHNIQ" or "SOFTMAX" or "SPIKE TECHNOLOGIES" or "STATE STREET" or "SUMMIT MICROELECTRONICS" or "TAPIOCA MOBILE" or "TECHNOLOGY DEVELOPMENT" or "TRANSCELLA" or "VESUVIUS" or "WIDEFI NETWORKS" or "WILOCITY" or "WIRELESS SERVICES PVT" or "WITHIN TECHNOLOGY" or "XIAM TECHNOLOGIES" or "QUALCOMM FURNITURE" or "QUALCOMM INSTITUTE" or "QUALCOMM INVESTMENTS" or "QUALCOMM PANEL MANUFACTURING" or "QUALCOMM STADIUM" or "EMPOWERED CAREERS" or "EPOS DEVELOPMENT" or "KMEL ROBOTICS" or "QUALCOMM GERMANY RFFE" or "SCYFER" or "QUALCOMM WIRELESS COMMUNICATION TECHNOLOGIES" or "QUALCOMM WIRELESS COMMUNICATION TECHNOLOGY CHINA" or "QUALCOMM WIRELESS SEMI CONDUCTOR TECHNOLOGIES" or "SPECTRUM ASSET MANAGEMENT" or "HABITEX ROMANIA" or "ATTANSIC TECHNOLOGY" or "BIGFOOT NETWORKS" or "IKANOS COMMUNICATIONS" or "DORADUS TECHNOLOGIES" or "IKANOS COMMUNICATIONS PTE" or "IKANOS COMMUNICATIONS PVT" or "OPULAN TECHNOLOGIES" or "ZYDAS TECHNOLOGY" or "GPSNET TECHNOLOGIES" or "CSR" or "AUDIO PROCESSING TECHNOLOGY" or "CAMBRIDGE SILICON RADIO" or "CLARITY TECHNOLOGIES" or "UBINETICS" or "UBINETICS HOLDINGS" or "UBINETICS VPT" or "ZORAN" or "QUALCOMM COMMUNICATIONS" or "ISKOOT TECHNOLOGIES" or "QUALCOMM LIFE FUND" or "QUALCOMM VENTURES AI FUND" or "QUALCOMM VENTURES FUND" or "EUCLID VISION TECHNOLOGIES" or "ALCATEL MOBICOM EUROPE" or "INTEGRITY BROADBAND NETWORKS" or "QUANTUMTHINK' or 'GSB FINANCIAL'.

C. Comparative Table of Sisvel, France Brevets, Fractus and Qualcomm

	Sisvel	**France Brevets**	**Fractus**	**Qualcomm**
Origin	1982 Response to cost-cutting Asian knock-offs	2010 French policy for the patent market	2008 Response to hold-out by former customers	1985 Open innovation business opportunity
Ownership	Private	French State	Private	Public (NASDAQ)
Tech focus	Wireless communications and audio-video standards	Patent thickets	Antennas	Semiconductor, wireless communications, audio-video, software…
Standards licensed	2G/3G/4G, Wi-Fi, DVB, MPEG, VP9, AV1, DSL	NFC, GNSS		3G/4G/5G, Wi-Fi, GPS…
Patent portfolio size (alive patent families/avg. size of patent family)	>200/>8 countries	>120/3 countries	>60/>3 countries	>24,000>6 countries
Means to aggregate patents	Purchase, exclusive in-licensing with sublicensing rights	Purchase, exclusive in-licensing with sublicensing rights	Prosecution	Prosecution, patent purchase, M&As
Non-practising patent exploitations	Out-licensing (pools included), enforcement	Out-licensing, enforcement	Out-licensing, enforcement	Out-licensing (pools included), enforcement
No. of licensees	E.g. >1,000 for MPEG audio	>10 for NFC	>10	>400 for subscriber unit products

No. of patent suppliers	>30	4		Numerous M&As
Preferred litigation for a	DE (Mannheim), NL, IT, ES, US	DE (Dusseldorf), TGI Paris, US (ED Texas)	US (ED/ND Texas), ES (Barcelona), CH (Shanghai)	US, DE (Munich), China (Beijing)
Licensing tactics	Customs patent enforcement, lawsuits during industry fairs (IBC, IFA, CeBIT, MWC)		US litigation, lawsuits during industry fairs (MWC)	Tying chips supplies to patent licenses
Package licensing level	Individual standards alone and combined	Portfolio-level or subset of patents	Single portfolio	Individual standards alone and combined
Consideration required	Part paid-up, lump sum upon closing, fixed royalty rate on ASP of licensed end-device (EMVR)	Fixed per-unit royalty rate proportional to units licensed (NFC), percentage royalty rate per unit (GNSS)	Fixed per-unit royalty rate different for US/non-US products, discount to spontaneous licensees	Percentage per-unit royalty rate (rare grant-backs discount)
Access to all vs license to all	License to all but EMVR	Access to all (EMVR)	License to all but EMVR	Access to all (EMVR)

Table edited by the author.

Patent Aggregation in Patent and Competition Law

Niccolò Galli
Project: ESR3

Research Question

Does patent aggregation harm innovation and does, therefore, competition law provide a remedy to respond to the problem?

Methodology

To disentangle the complexity of patent aggregation the enquiry follows a mixed methodology. It employs traditional black-letter analysis together with quantitative and qualitative empirical legal methods.

Societal impact

The implementation of patents into end-products is but one way of profiting from patents. Indeed, many electronics firms, besides selling end-products, raise revenue by licensing or selling their patents (so-called Practicing Entities). Other firms with little or no research and development activities, disregard manufacturing activities completely and, instead, specialize in monetizing patents (so-called Non-Practising Entities). These patents-only transactions are enabled by the transferability of patent rights and correspond to some of the patent aggregation practices recently spurring in electrical engineering industries. Since patent aggregation does not directly result in new products being brought to markets, its effects on innovation are ambiguous and depend on the specific activity considered. Posing as a hypothesis that certain patent aggregation activities might stifle innovation, for example exacerbating patent hold-up scenarios, the study assesses the compatibility of the phenomenon of interest with European competition law. As a result, the research provides, first, recommendations for policy-makers to ensure that patent aggregation and innovation are positively related. Second, legal certainty and lower transaction costs for market-players, clarifying how their patent aggregation practices are regulated under EU competition law. Indirectly, society experiences more innovation, since lower transaction costs and pro-active recommendations enable more investment in research and development.

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