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Patent Law and Environmental Sustainability:

The Challenge of Green Innovation

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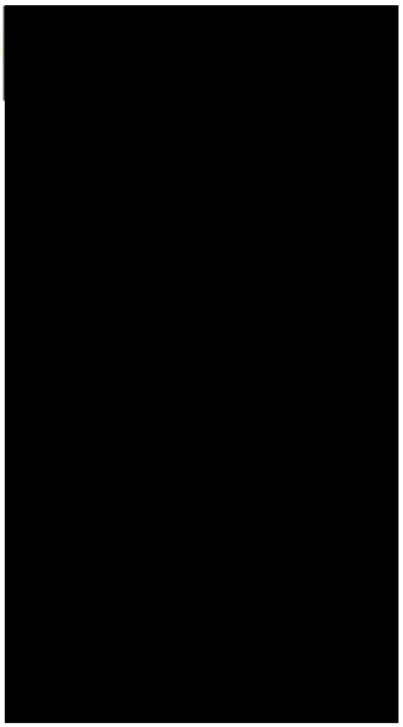

Abstract

This thesis is part of the studies on the relationship between private law and the environment. In particular, it aims to analyze how patent collaborations – such as patent pools, cross licensing agreements, patent commons and potent pledges – limit patent exclusivity, creating contractual claims. Patent exclusivity potentially hinders the global adoption of crucial green technologies by limiting access through high licensing fees or market lock-in due to large corporations. However, patent collaborations are increasingly frequent as a result of the complexity of green patents, revealing new scenarios.

The thesis consists of two parts. The first part is a critical reflection on the transformation of private law and patent law in the face of environmental emergencies. The second part has an application value, taking as reference the models of the United States and Germany. Specifically, the thesis evaluates how private law in these two legal systems disciplines some critical phenomena in patent collaborations.

In this way, the thesis intends to demonstrate how private law has specific consequences on the enforcement of patent collaborations and therefore on the possibility that the latter concretely promotes innovation.

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Introduction

The thesis, in the field of comparative private law, starts from the following question: How can private law overcome the barriers that the patent monopoly poses to eco-innovation?

Technological innovation related to green patents is emerging as an essential solution to address the environmental challenge. In legal literature, the relevance of these patents has grown considerably over time, becoming increasingly indispensable to reduce the environmental impact of human action. This has happened especially as a result of the fact that in 2020 the World Intellectual Property Organization (WIPO) chose the theme “Innovate for a Green Future” for the “World Intellectual Property Day”, highlighting the importance of revolutionary technologies to address the environmental challenge and respond to the need for energy and natural resources on a global scale, without jeopardizing future generations. Furthermore, this line of study is particularly interesting because it is congenial to achieving the objectives of numerous international treaties, as can be deduced from Article 16 (5) of the UN Biodiversity Treaty of 1993 or SDG 12 and SDG 17 of the UN 2030 Agenda.

Green patents protect technologies or industrial processes that contribute to reducing the environmental impact of human action. These inventions cover various sectors such as renewable energy, energy efficiency, waste and resource management, sustainable mobility, CO_2 capture and storage. Consequently, compared to classic patents, green patents have the primary characteristic

of achieving environmental benefits through their application. As patents, they are subject to the usual rules: products or processes in any technical field that are new, original, and industrially applicable are patentable, excluding scientific discoveries, theories, mathematical methods, and therapeutic methods. The patent gives its holder a temporary and limited monopoly right over the invention, preventing third parties from producing, using, marketing or importing the patented product without authorization. This exclusive right aims to encourage innovation.

However, patent monopoly represents a significant obstacle to eco-innovation, which, progressing through complementary patents and fragmented ownership, requires synergies among patent holders. Therefore, it is necessary to understand how to promote the sharing of green patents, with the aim of achieving the Sustainable Development Goals.

Government intervention can facilitate the sharing of green patents through compulsory licensing or public funding. These interventions balance intellectual property rights with the public good, promoting broader access to innovations that might otherwise be limited by private ownership.

Conversely, in the context of private law relations, there are examples of green patent collaboration that denote the overcoming of the traditional idea of exclusive exploitation of patents. By sharing patents, patent holders can leverage the knowledge of competitors, leading to the consolidation of innovation and minimizing the likelihood of patent infringement litigation.

There are various ways in which patents can be shared, including patent pool-agreements through which multiple patent holders pool their patents to make them accessible to members or third parties – and patent pledges – voluntary commitments by patent holders to limit the exploitation of their patents, thus allowing them generalized access by third parties.

Clearly, patent collaborations are desirable if they do not substantially limit competition or lead to an abuse of a dominant position, as they are otherwise collusive means aimed solely at pursuing the parties' opportunistic interests.

Beyond this, patent collaborations appear particularly attractive because they disseminate green technologies useful for addressing environmental challenges and advance innovation by combining the knowledge of multiple parties. In this sense, compared to public interventions, patent-sharing agreements have broader potential and transnational applicability.

Considering these reasons, the initial question is included in the broader reflection that brings private law into dialogue with the interests of the community. First, the thesis identifies how patent monopolies can be overcome to promote the sharing of green patents especially through patent collaboration. Second, the thesis includes an applied section on the relationship between private law and patent collaboration in the legal systems of the United States and Germany.

This choice is due to the fact that in both legal systems, representing the common law and civil law traditions respectively, in commenting on certain legislative provisions and innovative case law, legal literature has initiated an intense reflection aimed at overcoming the barriers that the patent monopoly poses to green innovation. For example, in March 2019, the international conference entitled "Enforcing Patents Smoothly: From Automatic Injunctions to Proportionate Remedies" was held at the Friedrich-Alexander-Universität Erlangen in Nuremberg. Then, in April 2019, the international conference entitled "Injunction and Flexibility in Patent Law. Civil Law and Common Law Perspectives" was held at the Ludwig-Maximilian University of Munich.

In both cases, the interventions demonstrated a reduction in automatic injunctions for patent infringement that involved Germany, the United Kingdom, and the United States. The title of the conference presentations highlighted multiple areas of investigation, from the treatment of not

worked patents to the role of the public interest in the granting of injunctions. Specifically, the proceedings of the Nuremberg conference were published in Volume 11, Number 3, of 2019 of the Intellectual Property Journal. Furthermore, meetings between intellectual property scholars were held at the University of Tilburg in 2018, and at the University of Vienna in 2019. In 2022, Cambridge University Press published the proceedings in "Injunctions in Patent Law. Trans-Atlantic Dialogues on Flexibility and Tailoring", edited by J. L. Contreras and M. Husovec. This book focuses on new trends in multiple legal systems regarding injunctive relief in patent law.

In this context, the thesis compares some legal solutions adopted by the two systems to encourage green patent sharing, thus preparing a fertile ground for implementing the primary goal of eco-innovation: the establishment of products and industrial processes that promote efficient use of resources and the reduction of CO_2 emissions.

Along this line, the first two chapters adopt a general perspective aimed at understanding the critical aspects of the relationship between patent law and green innovation.

The first chapter initially reconstructs the evolution of the relationship between private law and environmental interests in the world of civil law and common law.

In civil law countries, the opening of private law to environmental interests takes place as a result of the constitutionalizing of the principle of legal solidarity. With reference to the continental legal systems, the thesis highlights how solidarity, both at national and European Union level, is nowadays a legal principle that promotes social cohesion, cooperation and mutual assistance between individuals, Member States, and the European Union. Consequently, the regulation of some legal phenomena relating to property reveals an instrumental function in the pursuit not only of individual interests, but also of those of collective importance.

In common law countries, courts have reinterpreted tort law and property law to give greater prominence to the interests of the community, including environmental interests. Indeed, nuisance, trespass and negligence have been used by the courts to consider the environmental issue. At the same time, especially in the United States, courts sometimes have developed an ecological interpretation of property.

Subsequently, the first chapter highlights the opening of intellectual property to green innovation and the prospects of overcoming the exclusive right to promote its dissemination. This has happened especially in the field of trademark law and copyright law. In the first case, some eco-sustainable practices, i.e. those relating to upcycling, have led scholars to question the current opportunity to keep the owner's exclusive rights unchanged. In the second case, the usefulness of software to the environmental challenge has led scholars to test open innovation in this field.

Finally, the last section of the first chapter provides a theoretical framework for eco-innovation and its relationship with patent law.

The second chapter traces the steps taken in patent systems to improve inventions that address environmental challenges by promoting a sustainable future. Green patents refer to two categories:

- Climate Change Mitigation Technologies (CCMTs), include technologies useful for combating global warming, such as technologies to produce renewable energy, the promotion of energy efficiency, and the capture and storage of CO_2.
- Environmentally Sound Technologies (ESTs), concern technologies capable of reducing environmental damage deriving from human action, i.e. technologies for water treatment, sustainable waste management, sustainable agriculture.

In this regard, there are fast-track procedures for green technology, aimed at accelerating patent examination – through prioritization, reduced processing times, and streamlined processes – without affecting the patent monopoly as a prerogative of the inventor. Given the complexity and fragmentation of patent ownership related to green technologies, monopoly rights hinder their diffusion and development.

On this topic, there have been discussions about compulsory licensing to address the environmental issue. However, nowadays compulsory licenses only concern the pharmaceutical and healthcare sectors, not explicitly that of green technologies. At the same time, to promote green innovation, scientific literature discusses the opportunity to extend the fair use doctrine from copyright to patent law.

On the other hand, because of the complementarity and fragmentation of patent ownership in the green field, there are some interesting patents sharing experiences, including:

- The Eco-Patent Commons, a non-profit form of collaboration born in the United States. Through this model, companies voluntarily pledge their patents to make them available to anyone without royalties.
- COSIA, which stands for Canada's Oil Sands Innovation Alliance, is a collaborative initiative born in Canada that facilitates the sharing of patents related to tar sands treatment to address environmental challenges.

The third and fourth chapters follow a comparative perspective. The U.S. and German systems are examined to understand the positive effects that specific property rules and peculiar remedies for patent infringement produce on green patent collaborations. In other words, a critical comparison is made between specific legal profiles to achieve two objectives: comparing the

solutions adopted by the two legal systems for the same problems and evaluating their strengths and weaknesses.

The third chapter essentially concerns two thematic areas of patent ownership:

- Ownership of shared patents. Green innovation, which passes through complementary patents that belong to different subjects, requires joint action between companies. The most successful result is joint patenting. From a private law perspective, a joint patent is co-owned by several inventors who contributed to the result. The rights and obligations of joint patent co-owners are often governed by private ordering agreements. In the absence of a specific agreement, the default rules of each jurisdiction in which the relevant patent is registered are applied. From a green perspective, it is necessary to pay attention to how the default rules define the right to grant a non-exclusive license of the patent, because this tool is useful for making the most of its environmental benefits. For this purpose, this part of the thesis analyzes the default rules of the two legal systems. In the United States they are provided by Sections 261 and 262 of title 35 of the U.S. Code; in Germany they are contained in the German Civil Code on co-ownership (§§ 741-758 BGB).
- The binding nature of patent pledges using contract law. Patent pledges give rise to a fluid and multilateral set of relationships. In the United States, the contract is a bilateral agreement characterized by mutual assent and bargain; therefore, patent pledges are unlikely to qualify as contracts. Despite this, legal literature offers some solutions to make patent pledges binding, using specific tools provided by contract law. In Germany, the requirements for a binding contract are less stringent (§§145-157 BGB), as there is no requirement of consideration, nor that the acceptance is known to the offeror. These

two characteristics favor the configurability of patent pledges as contracts under German law.

In the light of this analysis, the configuration of the contract law of a legal system has significant consequences on the enforcement of patent pledges and therefore on the possibility that the latter concretely advantages innovation.

The fourth chapter concerns the evolution of permanent injunctions in the event of patent infringements relating to green innovation.

For the United States, the thesis considers Section 283 of title 35 of the U.S. Code, which provides that district courts may issue an injunction in accordance with principles of equity. Despite this, in *Richardson v. Suzuki Motor Co.* (1989), the Court of Appeals of the Federal Circuit, laid down a general rule. It entailed the automatic granting of a permanent injunction once the validity of the patent infringement was established. In *eBay v. MercExchange* (2006), the Supreme Court of the United States remarked on the equitable nature of the final injunction, excluding any form of automatic grant. Consequently, the district courts are called upon from time to time to carry out careful balancing in line with the equitable nature of the relief. In any case, the abuse of discretion of district courts can be enforced before the Court of Appeals of the Federal Circuit.

After *eBay v. MercExchange* (2006), in some cases related to green innovation, the infringed patent was evaluated by the district courts for its concrete function. Where the patent produced significant environmental benefits, the district courts saved its concrete application by imposing only royalties.

For Germany the thesis considers that in 2021 the legislator amended Section 139, paragraph 1, of the German Patent Act (Patentgesetz – PatG), adding three new sentences to the existing two. According to the third sentence, the court can, depending on the circumstances of the

individual case and the principle of good faith, exclude or limit the injunction requested by the owner of the infringed patent, if it causes disproportionate inconvenience to the infringer or third parties. This amendment serves to avoid the traditional automatic granting of injunctions, considering in exceptional cases the interests of the infringer or those of third parties.

Finally, the research results are collected in the conclusions. This section makes the point on the overcoming of patent monopoly through private collaborations, offering legal literature a new interpretation of the relationship between private law and green innovation.

Chapter 1

Private Law and Environmental Issues

1.1 Private Law and Environmental Interests in Civil Law Systems.

Private law in civil law countries, through some fundamental concepts, such as property, contract and private autonomy, provides useful tools for the environmental challenge. Nowadays, the attention of private law to the protection of environmental interests is considered at the level of legal literature, because of the new legal sensitivity of national legislators. For example, with reference to German contract law, Hellgard and Jouannaud write:

> Private law offers various possible solutions, even if the contracting parties agree not to comply with public environmental protection regulations or to circumvent them in other ways, especially to save costs […]. In particular, the nullity […] of the entire contract is taken into consideration due to the violation of the sustainability standards of public law – i.e. pursuant to Section 134 BGB in conjunction with the relevant public law provision [my translation].[1]

[1] A. Hellgardt; V. Jouannaud, *Nachhaltigkeitsziele und Privatrecht*, AcP, vol. 2 (2022), p. 196.

Many legal systems were formed in the 19th century around liberal principles and the protection of individual interests. After the Second World War, however, European constitutions gave space to solidarity, as a legal duty involving public bodies and individuals. This leads to a perception of law as an instrument at the service of supreme values, such as dignity and the full development of the human person. These principles have a collective aspect because individual fulfillment concerns all members of society.[2]

The term solidarity has a particularly broad semantic value and is structured through the integration of other concepts.[3] Its generalized legal value is a recent phenomenon, unlike other limited forms of social sharing such as medieval corporatism.[4] At the same time, it is necessary to distinguish legal solidarity from the *obligatio in solidum* proper to Roman law, since the latter is an expression of the sharing of liabilities because of a legal fact. More particularly, the legal application of solidarity is influenced by the Enlightenment reflections on the concept of fraternity.[5]

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[2] «Solidarity therefore becomes from time to time the cement of the human *consortium*, it operates as a mechanism of cohesion, as a dialectical element between the individual and the community» [my translation]. G. Alpa, *Solidarietà*, il Mulino, Bologna 2022, p. 276.

[3] «In fact, the components of solidarity cannot be reduced to a single matrix and do not reflect an exclusive model of humanity. Indeed, solidarity draws from the entire spectrum of the human condition and does not disdain, so to speak, any point of support. It is rooted in instincts, needs and interests as well as being guided by desires and ideals. It embraces the material and symbolic dimensions, the sense of possession and that of gift, the search for usefulness and the expression of gratuitousness. Solidarity also breaks the dividing bar between selfishness and altruism, since it arises from the intersection of individual identity and collective identity» [my translation]. F. Totaro, *Linee di ricerca sulla solidarietà*, in C. Vigna (edited by), *Libertà, giustizia e bene in una società plurale*, Vita e Pensiero, Milano 2003, p. 67.

[4] See P. Grossi, *L'Europa del diritto*, Laterza, Roma-Bari 2016, pp. 17 et seq.

[5] «The idea of fraternity, originally proposed as a philosophical concept capable of establishing necessary relationships between humans and the world, becomes the object of a particularistic use [...]. Rousseau contributed in a decisive way to "organizing" the idea of fraternity in the particularistic context of statehood […]. In this regard, the essence of his thought consists in theorizing a fraternity no longer destined to unite

From being the object of ethical-philosophical discussions aimed at orienting the conduct of individuals starting from the common human condition, after the Enlightenment fraternity began to be used in the process of normative construction, orienting the action of institutions with a view to supporting the most disadvantaged citizens.[6] The social changes of the late 19th century provided

all humans, but only those who are citizens of a *polis*» [my translation]. A. Mattioni, *Solidarietà giuridicizzazione della fraternità*, in A. Marzanati; A. Mattioni (edited by), *la fraternità come principio del diritto pubblico*, Città Nuova editore, Roma 2007, pp.16-17. «It is therefore possible to advance the idea that the principle of fraternity, where is inserted into the constitutional structure, explicitly or implicitly, operates as an instrument of public recognition of behaviours and connections which, although not fully legalized […], give consistency to the social relationship and, in this way, they attribute to the legal system an essential infrastructure» [my translation]. F. Pizzolato, *La fraternità come trama delle istituzioni*, Aggiornamenti sociali (2013), p. 201. «On a legal level, what remains with certainty after the revolutions are the principles of freedom and equality, descendants of the individualism of seventeenth – century rationalist natural law, which is at the origin of modern contractualism. These principles, unlike the principle of fraternity, are able to have legal efficacy through analogical recourse to concepts of the private legal tradition (first of all contracts, societas, mandate) which, being of private origin, are well suited to an individualistic vision of society» [my translation]. F. Pizzolato; P. Costa, *Principio di fraternità e modernità giuridica*, Costituzionalismo.it vol. 1 (2013).

[6] For example, in the Preamble of the French Constitution of 4th November 1848, Principle VIII, was written: «It is the duty of the republic to protect the citizen in his person, his family, his religion, his prosperity, and his labor, and to bring within the reach of all that education which is necessary to every man; it is also its duty, by fraternal assistance, to provide the means of existence to necessitous citizens, either by procuring employment for them, within the limits of its resources, or by giving relief to those who are unable to work and who have no relatives to help them» [translation by Bureau du New York: Courrier des États-Unis, 1848]. However, for some time this concept of fraternity, also taken up by Article 2 of the Constitution promulgated in 1958, was considered in France to have no legal value. Indeed, only with a decision of 6th July 2018 the Constitutional Council stated: «Like freedom and equality, which represent the other two symbolic terms of our Republic, the legislator has the duty to respect fraternity as a constitutional principle and it can be invoked in the courts» [my translation].

a great impetus for the affirmation of solidarity as a legal principle. In this regard, Comazzetto writes:

> During the nineteenth century, solidarity thus became one of the "idées-forces" for progressive movements, for workers' movements; it is then obviously a central category – expressed in a social-liberal key – for the current of French "solidarism", finding one of the most significant elaborations in the work of Léon Bourgeois (1851-1925); finally, it is important for Catholic social doctrine, in search of a "third way" with respect to liberal individualism and socialist collectivism [my translation].[7]

Between the 19th and 20th centuries, the legalization of the principle of solidarity initially concerned only administrative law, reversing the liberal tendency to interpret the functions of the State exclusively in terms of defense and public order.[8] More specifically, the State recognized some social rights and attributed to the public administrations the duty to protect the most disadvantaged segments of the population.[9]

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[7] G. Comazzetto*, La solidarietà nello spazio costituzionale europeo. Tracce per una ricerca*, Rivista AIC, vol. 3 (2021), p. 261.

[8] For example, Vittorio Emanuele Orlando wrote that when public administrations aim at economic protection, the physical care of individuals, their individual development, they carry out tasks that are not essential to the idea of the personality of the State. See V. E. Orlando, *Principi di diritto amministrativo*, Barbera, Firenze 1891, p. 266.

[9] «A solidarity reserved by the public administrations towards the needy, in order to protect the dignity and living conditions of the most disadvantaged and, therefore, guaranteed to the individual in a state of need, in order to seek ever greater social justice» [my translation]. A. G. Orofino, *La solidarietà in diritto amministrativo: da strumento di protezione dell'individuo a parametro di disciplina del rapporto*, Il diritto dell'economia, vol. 102 (2020), p. 577. «It was a notable attempt to offer a first legal qualification of the relationships between public administration and citizens, in the new sectors of public assistance and charity, education, postal and telegraph services, railway services and healthcare. That interference, until a moment before perceived as the unstoppable protagonist of the present times, but also isolated and kept away from

In the 20th century, the process of affirmation of solidarity in European legal systems came to a halt. Indeed, the antidemocratic government experiences of that period were based on corporatist ideologies aimed at exploiting the social dimension of humanity for political control.[10] As seen, however, the process was restarted in European constitutions after the Second World War.[11]

Thanks to legislators in civil law systems, today legal solidarity takes on importance in relationships between individuals, in relationships between public bodies and individuals and in

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the system, as a pre-juridical, eminently social dimension, was […] made an integral part of the State-citizen relationship» [my translation]. B. Sordi, *Dall'attività sociale ai pubblici servizi: alle radici ottocentesche dello Stato sociale*, Quaderni Fiorentini per la storia del pensiero giuridico moderno, vol. 46 (2017), p. 187.

[10] «Solidarity was [in the fascist regime] not between people, but between the interests of the participants in production. Here [in Republican Italy] social solidarity implies the intervention of the State, its action, to bring social classes closer together, to improve the living conditions of disadvantaged categories, to financially support the welfare state, to ensure equal opportunities for all. A very different meaning, much more demanding, and correctly placed in the dialectic of opposing interests» [my translation]. G. Alpa, *Solidarietà*, il Mulino, Bologna 2022, pp. 98-99. «Furthermore, the normativization of solidarity as belonging finds a particular expression with the corporate model in the Italian legislation of the twenty years of fascism. The corporate system promoted public solidarity imposed on professional categories, namely the corporations. The Article 1, paragraph 2, of Law 563/1926 required that corporations protect the economic and moral interests of their members [...]. This system of solidarity, which in some aspects could recall the ancient guilds of arts and crafts, was organic and subordinated to the regime, whose goals it had to achieve» [my translation]. R. Cippitani, *La solidarietà giuridica tra pubblico e privato*, Iseg Gioacchino Scaduto, Perugia 2010, pp. 16-17.

[11] In the older constitutions the call to solidarity is very concise, while in those promulgated after the 1970s it becomes more intense. Among the first, only the Italian Constitution (1948), through Article 2, is a *unicum*, however, there is no call to solidarity in the German Grundgesetz of 1949, while of the Preamble of the French Constitution of 1946 it is stated generically: «The Nation proclaims the solidarity and equality of all French people in bearing the burden resulting from national calamities» [translation by Conseil Constitutionnel]. Among the following, reference can be made to Article 25, paragraph 4, of the Greek Constitution (1975) and to Article 45, paragraph 2, of the Spanish Constitution (1978).

relationships between States.[12] This is possible because the introduction of solidarity into constitutions has brought private law into communication with the interests of the community. More specifically, since democratic constitutions call for the balancing of the interests of the owner and the interests of the community in the name of solidarity, the individualistic conception of private law has been tempered.[13] Nowadays, through solidarity in constitutions, private law not only aims at protecting individual interests, but also at achieving collective interests, including environmental ones.[14] This is a revolution because environmental protection, being primarily attributable to the category of general interests, has long been considered exclusively a public law matter.[15] The latter, however, due to the breadth of the subject, appeared insufficient, making it necessary, rather, to involve other branches of the legal system.[16] In this regard, the new Código

[12] « […] European solidarity […] can be specified, reductively, as inter-state solidarity or be understood, in a broader sense, as including solidarity between individuals, between groups (territorial communities, associations, unions, movements, etc.) and between states» [my translation]. G. Comazzetto, *La solidarietà nello spazio costituzionale europeo. Tracce per una ricerca*, Rivista AIC, vol. 3 (2021), p. 267. Also relevant is the reference to the Preamble of the Swiss Constitution of 1999 where it is written: « […] resolved to renew their alliance so as to strengthen liberty, democracy, independence and peace in a spirit of solidarity and openness towards the world» [translation by Fedlex – The publication platform for federal law].

[13] The precursors of this approach are evident in the Weimar Constitution (Article 153), later finding maximum expression in the post-war constitutions, such as the Italian one (Article 42), the Spanish one (Article 33) and the Portuguese one (Article 62).

[14] «The parable is complete today and its effects can be observed above all in the impact of solidarity on contractual relationships and in the progressive fading, in this context, of the public/private partition, increasingly replaced by the regulatory reliance on solidarity» [my translation]. M. Marchesiello, *La solidarietà come principio normativo. In margine a un libro di Guido Alpa*, Politica del diritto, vol. 2 (2023), p. 282.

[15] See S. Grossi, *La cultura dell'ambiente nell'evoluzione costituzionale*, AIC, vol. 3 (2023), pp. 216-254.

[16] «Sustainability, including environmental sustainability, has not traditionally been a major objective in private law and, as a consequence, it is insufficiently reflected in existing theories and practices». R. M. Ballardini; J. Kaisto; J. Similä, *Developing novel property concepts in private law to foster the circular*

Civil y Comercial de la Nación Argentina (CCyC), which came into force on 1 August 2015, is noteworthy. In this regard, Pennasilico writes:

> In accordance with the 1994 Constitution, which mainly regulates at articles 41 and 43 the *derechos de incidencia colectiva*, the Art. 14 CCyC prohibits the abusive exercise of individual rights when it could damage the environment and, in general, the rights of collective impact; the Art. 240 CCyC, in turn, expressly places environmental sustainability limits on the exercise of individual rights over assets [my translation].[17]

economy, Journal of Cleaner Production, vol. 279 (2021), p. 2. «The transversality that characterizes environmental protection (arising from the heterogeneity of interests that refer to the good synthesis "environment") makes it, indeed, necessary to pursue such protection through all branches of the legal system. This is also the warning addressed to the [Italian] Constitutional Court, first and foremost to the legislator who – by virtue of the principle of hierarchy of sources – is obliged to take this constitutionally protected value into consideration when preparing primary legislation. It is addressed to the same associates in light of the principle of social solidarity pursuant to Art. 2 of the [Italian] Constitution, and by virtue of the principle of horizontal subsidiarity pursuant to Art. 118, paragraph 2, of the [Italian] Constitution» [my translation]. A. Calogero, *Saggio su autonomia privata e ambiente*, Innovazione e diritto, vol. 2 (2020), p. 110. « […] It is above all in the last decade that there has been a considerable increase in writings on "ecological" and "sustainable" private law. In addition to the issue of environmental damage and responsibility, we also look at transactions and private consumption, responsible for a high percentage of greenhouse gas emissions, increasingly calling for the transition to "responsible" and "sustainable" consumption» [my translation]. M. Giorgianni, *Climate change e analisi ecologica del diritto. L'apporto del comparatista all'emergenza climatica*, BioLaw Journal – Rivista di BioDiritto, vol. 2 (2023), pp. 93-94. «While private law in the second half of the 20th century was viewed primarily as a "kingdom of freedom" characterized by private autonomy, there is now a growing recognition that this is only one (important and central) of its functions» [my translation]. A. Hellgardt; V. Jouannaud, *Nachhaltigkeitsziele und Privatrecht*, AcP, vol. 2 (2022), p. 181.

[17] M. Pennasilico, *Contratto ecologico e conformazione dell'autonomia negoziale*, Rivista Quadrimestrale di Diritto dell'Ambiente – Saggi, vol. 1 (2017), p. 8.

This sensitivity also characterizes the EU legislator, as demonstrated by article 37 of the EU Charter of Fundamental Rights (CFR), articles 11 and 191 of the TFEU. On the same wavelength, the Court of Justice of the European Union on several occasions has made environmental interests prevail over ownership rights. For example, in the ruling that closed cases C 234/20 and C 238/20, the Court of Justice of the European Union stated that the national legislator can prohibit carrying out an action on a private area if there are environmental reasons.[18]

Scholars highlight how ownership and contract have changed in order to consider environmental challenges.[19] This is due to the fact that legislators in civil law countries have reinterpreted the concept of private autonomy, especially: 1) through a limitation of private autonomy if it is capable of generating damage to the environment; 2) through an extension of private autonomy to the advantage of environmental interests.

From the first point of view, an act performed in violation of the limits to private autonomy imposed by law can be declared invalid or voidable, depending on the type of violation. In some

[18] « [...] the prohibition on establishing plantations of cranberries on property coming within the *Natura 2000* network does not constitute a deprivation of the right to property of that immovable property, but a restriction on its use, which may be regulated by law to the extent necessary in the public interest, in accordance with the provisions in the third sentence of Article 17(1) of the Charter». https://curia.europa.eu/jcms/upload/docs/application/pdf/2022-01/cp220017en.pdf.

[19] For the case of private property, see R. M. Ballardini; J. Kaisto; J. Similä, *Developing novel property concepts in private law to foster the circular economy*, Journal of Cleaner Production, vol. 279 (2021), pp. 1-10. For the case of contract, see N. Blanc, *Le contrat de droit privé à l'epreuve des questins environementales*, in M. Mekki (edited by), *Notions fondamentales des droit privé à l'éprouve des questions environnementales*, Bruylant, Bruxelles 2016, pp. 131-144; M. Pennasilico, *Contratto ecologico e conformazione dell'autonomia negoziale*, Rivista Quadrimestrale di Diritto dell'Ambiente – Saggi, vol. 1 (2017), pp. 4-31.

cases, the violation of the limits of private autonomy can also lead to the civil liability of the subject who acts illegitimately, obliging him or her to compensate for the damage caused.

More specifically, legislators often limit private autonomy for environmental reasons in contracts around tangible property. This happens because ownership has significant repercussions on the use of natural resources, and environmental protection is a necessary condition for the full development of the human person.[20]

French law is emblematic because it provides for heterogeneous limitations on private autonomy for environmental reasons. Firstly, article L. 125-9 of the Code de l'environnement, referred to in Article 145-34 of the Code de commerce, provides an obligation to draw up an environmental annex for rental contracts for premises exceeding 2000 sqm for office or commercial use. Therefore, this provision specifically affects the ability of the parties to a contract to choose which clauses to include in it. In particular, the lessor and the lessee have a mutual obligation to provide information relating to the energy consumption of the rented premises, with consequent evolution of energy performance based on the duration of the contract and the drafting of an action program aimed at improving these results.

Secondly, French law provides obligations to inform in relation to the risk of pollution in three cases:

a) pursuant to Article 514-20 of the Code de l'environnement, when the activity of an environmental protection system (Installation classée pour la protection de l'environnement – ICPE) on land being sold ceases, the seller must inform the buyer of this activity and if he was also

[20] See M. Hautereau-Boutonnet (edited by) *Le contrat et l'environnement, étude de droit interne, international et européen,* PUAM, Marseille 2014.

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the manager of the plant, he/she has the duty to account for any forms of manipulation or storage of chemical or radioactive substances. If the seller does not comply with these obligations, and if the pollution makes the land unsuitable for the purpose envisaged by the contract, within two years from the discovery of the pollution, the buyer may opt for the termination of the contract, the refund of part of the price or the restoration of the site at the expense of the seller if the cost is not disproportionate to the selling price.

b) Pursuant to Article L 125-7 of the Code de l'environnement, if the sale or rental concerns land registered in the SIS register (Secteur d'Information sur les Sols), governed by Article L. 125-6 of the Code de l'environnement, the seller or lessor must give written notice to the buyer or lessee, failing which, once pollution has been ascertained such as to make the land unsuitable for the purpose set out in the contract, within two years from the discovery of the pollution, the buyer or the tenant can request, respectively, the refund of part of the sale price or the reduction of the rent.

c) Pursuant to Article R512-69 of the Code de l'environnement, if any accident has occurred on land resulting from a plant subject to authorization, registration or declaration, operating on it, the user must send a report on the accident to the prefect and take measures necessary to mitigate its effects and to avoid the recurrence of similar incidents. In this case, the seller of the land must inform the buyer of the latest status of the site.

d) Finally, Article L. 271-4 of the Code de la construction et de l'habitation provides the Dossier de Diagnostic Technique (DDT) as a duty of attestation. It is attached to the promise of sale or to the rental contract and is aimed at making known to the future owner or tenant of a property elements concerning the building that may undermine the health or the safety of people.

Other significant limitations on private autonomy can be found in Germany in the

Lieferkettensorgfaltspflichtengesetz (2021), the law on due diligence in the supply chain.[21] This act limits private autonomy in the sense that companies must consider the ethical and environmental implications of their operations and those of their suppliers. More specifically, this act: a) requires companies to implement environmental and human rights due diligence measures (§ 3); b) establishes that lead companies ensure that their suppliers provide contractual guarantees of respect for human and environmental rights throughout the supply chain (§ 6.4. 2); c) imposes specific control mechanisms on lead companies towards their suppliers (§ 6.4.4).

At the European Union level, in 2023 the legislator defined the Corporate Sustainability Due Diligence Directive, aimed at imposing on European companies' responsible management of environmental and social impact throughout the entire supply chain, also the requirement to disclose information on the fulfillment of these obligations.[22]

From the second point of view, the extension of private autonomy means that the power of self-regulation of private individuals is expanded. In this sense, the Italian Civil Code is notable. Under Article 1135, final paragraph, the condominium assembly can authorize the administrator

> to participate and collaborate in territorial projects, programs and initiatives promoted by local institutions or private entities qualified [...] in order to promote the recovery of the existing building heritage, urban livability, safety and environmental sustainability of the area in which the condominium is located [my translation].[23]

[21] See https://www.gesetze-im-internet.de/lksg/LkSG.pdf.

[22] See F. Degl'Innocenti, *Nuove sfide regolatorie del diritto privato europeo nel prisma della sostenibilità. La proposta di direttiva sulla Corporate Sustainability Due Diligence*, Actualidad Juridica Iberoamericana, vol. 18 (2023), pp. 812-855.

[23] https://www.gazzettaufficiale.it/dettaglio/codici/codiceCivile.

As a matter of fact, legislators give to environmental interests a primary importance in private law. In other words, there is a progressive reconfiguration of public and private interests with respect to which environmental sustainability is no longer taken into consideration only in public decision-making processes but significantly affects also the discipline relating to private relationships.

1.2 Private Law and Environmental Interests in Common Law Systems.

Even if in common law countries environmental protection is a matter dominated by legislative measures and administrative procedures, the common law, particularly in tort and property, has undergone a transformation in order to address the protection of the environment. More specifically, over the years, courts have issued rulings capable of toning down the individualism of private common law in favor of environmental protection.

Starting from tort law, in chronological order, an interesting decision is the Alabama Supreme Court ruling in *Borland v. Sanders Lead Co.* (1979).[24] This case is pivotal in establishing a precedent regarding environmental pollution as an indirect form of trespass. Borland, a farm owner, sued Sanders Lead Co. for trespass, alleging that lead particles and sulphur dioxide gas emitted from the defendant's plant had polluted his land. The trial court sided with Sanders Lead Co., stating that compliance with the Alabama Air Pollution Control Act (1971) relieved the company of liability.

[24] *Borland v. Sanders Lead Co.*, 369 So. 2d 523 (1979).

Through a careful analysis of the Alabama Air Pollution Control Act, the Alabama Supreme Court, unlike the trial court, held that statutory compliance did not preclude common law remedies. Then, the Alabama Supreme Court qualified intangible violations of property interests as trespass. More specifically, the Court identified four foundational elements of the trespass tort: (a) a tangible or intangible intrusion; (b) the intentionality of the intrusion; (c) reasonable foreseeability; and (d) substantial damage.[25]

This case has defined a new conformation of the trespass tort: the intrusion of intangible particles can determine trespass if they cause damage to someone else's property.[26] Therefore, the evolution of the trespass to land tort appears to be conducive to the protection of the environment. In this regard, Grinlinton's words are noteworthy:

> Trespass to land is an area of great potential application to environmental pollution. An action lies where there is an intentional physical invasion of a person's property. The tort has been used in a number of jurisdictions to address a wide variety of environmental harms […].

Some modern cases of trespass have not required physical contact with the land, opening the way for the expansion of trespass to cases where airborne particulate or other toxic matter is carried across neighboring land, whether or not it settles on the land itself.[27]

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[25] *Id.* at 529.

[26] Other U.S. courts found some type of physical presence necessary for trespass to occur. For example, in *Stevenson v. E.I. DuPont de Nemours & Co*., 327 F.3d 400 (5th Cir, 2003), it is written: «Research shows no Texas cases adopting a "direct and tangible" requirement to prove trespass. Because the only showing necessary is entry over land by some "thing", Texas law would permit recovery for airborne particulates».

[27] D. Grinlinton, *The Continuing Relevance of Common Law Property Rights and Remedies in Addressing Environmental Challenges*, McGill Law Journal, vol. 62 n. 3 (2017), pp. 654-655.

On the same wavelength of innovation, the UK High Court ruling in *McKenna v. British Aluminium* (2002)[28] is noteworthy. Numerous individuals, including children, sued the owner of a noisy and polluting factory near which they lived for private nuisance, even though they had no property interest. Traditionally, the common law has qualified private nuisance as a property-based tort. Therefore, only those with a proprietary interest in the affected property can sue. Moreover, the court refused to strike out the claim for lack of proprietary interest: the case provided a strong argument that the common law should reconsider its position on this point to comply with Article 8 of the European Convention on Human Rights (ECHR). Article 8 of the ECHR, incorporated into UK law by the Human Rights Act (1998), guarantees the right to respect for private and family life. Justice Neuberger in obiter held that it was inconsistent with Article 8 of the ECHR to limit the standing to bring proceedings for private nuisance only to those who have a proprietary interest. He argued that such a rule could violate the right under Article 8 of those who do not claim proprietary rights.

This statement is interesting from an environmental point of view because Article 8 of the ECHR has been interpreted by the European Court of Human Rights as including the right to a healthy environment.[29] Indeed, this green reading of Article 8 recognizes that environmental degradation can significantly interfere with private and family life.

Among the most recent case law is the New Zealand Supreme Court decision in the tort law case *Michael Smith v. Fonterra Cooperative Group Limited*,[30] released on 7 February 2024. This

[28] *McKenna v. British Aluminium Ltd* [2002] Env LR 30.

[29] For example, see *Hatton and Others v. the United Kingdom* [GC] – 36022/97.

[30] *Michael Smith v. Fonterra Cooperative Group Limited* [2024] NZSC 5 https://www.courtsofnz.govt.nz/assets/cases/2024/2024-NZSC-5.pdf.

is a significant decision on the use of private common law remedies to challenge greenhouse gas emissions by private entities.[31]

The plaintiff was Mr. Smith, a descendant of a Māori community in the Northland region. In 2019, he sued seven companies, the New Zealand's largest climate polluters, over three causes of actions in tort:

1. Public nuisance: According to Mr. Smith, the defendant's acts and omissions substantially and unreasonably interfered with public rights such as the right to a healthy atmosphere.
2. Negligence: For the plaintiff there was a dangerous interference of the defendants' activities in the climate system.
3. A proposed new tort: Entailing the duty to cease materially contributing to dangerous anthropogenic interference with the climate system.

In March 2020, the High Court dismissed the claims of public nuisance and negligence, deeming them not reasonably arguable. However, the Court chose not to dismiss a third tort claim related to the emerging concept of climate duty. Mr. Smith appealed to the Court of Appeal, but in October 2021 it dismissed all three causes of action, public nuisance, negligence and a new climate duty. It held that environmental questions are the responsibility of other branches of the legal system.

The unanimous Supreme Court ruling overturned the Court of Appeal's decision. In particular, the Court rejected the argument that claims in tort relating to environmental issues are to be excluded because they are the preserve of public bodies and allowed Smith's claims of public

[31] See A. Ogunranti, *Private Law as a Tool for Climate Justice in Canada: Reflections on the New Zealand Court's Decision in Michael Smith v Fonterra Co-Operative Group Limited*, Manitoba Law Journal, vol. 47 n. 4 (2024), p. 2.

nuisance, negligence and new tort to proceed to trial. Indeed, according to the Supreme Court, New Zealand statutes such as the Climate Change Response Act (2002) and the Resource Management Act (1991) allow the common law to evolve in this area as well.[32] To sum up, the Supreme Court of New Zealand has challenged the idea that climate change cannot be addressed by common law tort claims. In doing so, the Supreme Court appears to be inviting lower court judges to develop new principles in tort law to address the environmental issue.

These rulings demonstrate a new configuration of tort law that is attentive to environmental issues. To do this, alongside the function of establishing liability in tort and defining compensation for damages, this new tort law focuses on the deterrence function, especially by trying to discourage behaviors that cause environmental damage. More specifically, the deterrence of behavior harmful to the environment derives from a reorganization of civil wrongs. Indeed, in *Borland v. Sanders Lead Co.* (1979) the integration of the trespass to land with environmental concerns was made easier by admitting intangible interference, while in *McKenna v. British Aluminium* (2002) the range of those entitled to proceed for private nuisance was extended. Furthermore, in *Michael Smith v. Fonterra Cooperative Group Limited* (2024) there was even a call for the provision of a new tort that imposes the duty to cease materially contributing to dangerous anthropogenic interference with the climate system.

The ability of tort law to change is not a new feature. Indeed, Murphy points out that tort law tends to respond to changes in society, evolving according to the needs of the latter. As such, the definition of a tort is inspired by values that change over time.[33] After all, environmental problems are expressed through alarming phenomena, such as climate change or the loss of

[32] *Michael Smith v. Fonterra Cooperative Group Limited* [2024] NZCS 5, para 101.

[33] J. Murphy, *Contemporary Tort Theory and Tort Law's Evolution*, Canadian Journal of Law & Jurisprudence, vol. 32 n. 2 (2019), p. 413.

biodiversity, which also cause negative effects on the activities of private individuals. Tort law is changing to properly handle such situations.

Common property rights, while traditionally focused on individual interests, are increasingly being modified by courts to address environmental concerns. This phenomenon has been evident in the United States since the 1960s and 1970s. In particular, in those years society became aware of the negative effects resulting from industrialization and the use of chemicals in production processes.[34] Since then, case law has rethought some of the connotations of private property.

From a diachronic perspective, the Wisconsin Supreme Court ruling in *Just v. Marinette County* (1972) is particularly interesting. Just purchased land along the shore of Lake Noquebay. In 1967, Marinette County issued an ordinance prohibiting the filling of wetlands along the shoreline of the lake without a conditional use permit. In accordance with this ordinance, the County sought the confiscation of the land because the plaintiff had filled it with a large quantity of sand. The plaintiff argued that the ordinance was unconstitutional under the Fifth Amendment to the U.S. Constitution, which states that private property cannot be used for public purposes without just compensation. In other words, the Wisconsin Supreme Court was asked whether the County's ordinance, which restricted the filling of areas adjacent to the lake without a permit, represented an unconstitutional taking of property without compensation. The Wisconsin Supreme Court explained that the ordinance was an expression of the State's police power to prevent harm to public interests, particularly the protection of navigable waters from pollution. In this regard, the Court distinguished between an expropriation for the public advantages, which requires compensation, and a regulation intended to prevent public harm, which does not. It is noteworthy

[34] See R. Carson, *Silent Spring*, Penguin Books, London 2000.

that the Court, before ruling on this issue, asked the following question: «Is the ownership of a parcel of land so absolute that man can change its nature to suit any of its purposes?».[35] Regarding this question the Court said:

> An owner of land has no absolute and unlimited right to change the essential natural character of his land so as to use it for a purpose for which it was unsuited in its natural state and which injures the rights of others. The exercise of the police power in zoning must be reasonable and we think it is not an unreasonable exercise of that power to prevent harm to public rights by limiting the use of private property to its natural uses.[36]

At the federal level, a similar case is at the basis of the U.S. Supreme Court ruling in *Lucas v. South Carolina Coastal Council* (1992).[37] In 1986, Lucas purchased two residential lots on a South Carolina island to build two single-family homes. In 1988, South Carolina enacted the Beachfront Management Act (1988), which prohibited the construction of permanent habitable structures on certain coastal lands, including the lots Lucas purchased. Lucas sued the state arguing that the Act deprived him of all economic use of his property, thereby affecting a taking under the Fourth and Fifth Amendments and requiring just compensation. The state trial court agreed, and Lucas won a large monetary judgment. The state appealed and the Supreme Court of South Carolina reversed the decision, holding that the Act was a valid exercise of the state's police power aimed at preventing harm to a valuable public resource. Consequently, no compensation was required under the Takings Clause. The case was remanded to the U.S. Supreme Court to determine

[35] *Just v. Marinette County*, 56 Wisconsin 2d 7 (1972), para 768.

[36] *Id*.

[37] *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992).

whether the Act constituted a taking. The Supreme Court concluded that this type of regulation did amount to taking.

Antonin Scalia, writing for the majority, specified that the Takings Clause applies when a property owner loses all the economic value of their land. Then, he affirmed that the government must demonstrate more than just public interest to justify regulations according to which property owners lose all economic value of their land. In other words, Scalia argued that the State may not force landowners to maintain their properties in their natural state, however for the first time land ownership was recognized as part of the ecosystem and no longer just as an expression of individual rights.[38] Moreover, Justice Kennedy's concurring opinion is significant because it demonstrates the need for common law to open up to new logics. Here are his words:

> In my view, reasonable expectations must be understood in light of the whole of our legal tradition. The common law of nuisance is too narrow a confine for the exercise of regulatory power in a complex and interdependent society. The State should not be prevented from enacting new regulatory initiatives in response to changing conditions, and courts must consider all reasonable expectations whatever their source. The Takings Clause does not require a static body of state property law; it protects private expectations to ensure private investment. I agree with the Court that nuisance prevention accords with the most common expectations of property owners who face regulation, but I do not believe this can be the sole source of state authority to impose severe restrictions. Coastal property may present such unique concerns for a fragile

[38] See J. L. Sax, *Property Rights and the Economy of Nature: Understanding Lucas v. South Carolina Coastal Council*, Stanford Law Review, vol. 45 n. 5 (1993), p. 1436.

land system that the State can go further in regulating its development and use than the common law of nuisance might otherwise permit[39].

Thus, Justice Kennedy invited judges to rethink the traditional connotations of private property rights in the light of environmental preservation.

Then, along these lines, in *Department of Community Affairs v. Charles Moorman* (1995),[40] the Florida Supreme Court recognized the broad scope of the state's regulatory powers for environmental reasons, in some cases holding that the latter prevailed over property interests.[41] Indeed, according to Article 2, § 7, of the Constitution of Florida, the Court affirmed:

> The clear policy underlying Florida environmental regulation is that our society is to be the steward of the natural world, not its unreasoning overlord.[42]

Thus, in Florida the constitutional provision regarding environmental protection was the basis for a decision to limit private property rights. This is a new sensibility, which breaks with previous case law that valorized private property interests over environmental interests. For example, the Pennsylvania Supreme Court, in *Commonwealth v. National Gettysburg Battlefield Tower* (1979), a dispute regarding the construction of a tower on private land, declared a constitutional provision aimed at protecting the environment unenforceable because it was not self-executing.[43]

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[39] *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1035 (1992)

[40] *Department of Community Affairs v. Moorman*, 664 So. 2d 930 (1995).

[41] In that dispute, Mr. Moorman fenced his property despite a state ordinance prohibiting the construction of fences to protect a species of deer living in that territory.

[42] *Department of Community Affairs v. Moorman*, 664 So. 2d 930, 932 (1995).

[43] *Commonwealth v. National Gettysburg Battlefield Tower, Inc.*, 311 A.2d 588, 594-595 (Pa. 1973).

In conclusion, although the dominant concept of property provides that the owner can exploit it and transform it according to her/his needs, U.S. case law sometimes adopts another configuration. More specifically, an ecological view of property is emerging in which it is not a passive entity, but capable of performing a function of supra-individual relevance.[44]

1.3 The Green Advantage of Intellectual Property

The functionalization of private law to social demands, and in particular environmental ones, essentially concerns dispositive acts with respect to tangibles. The discipline of intellectual property, on the other hand, remains mainly linked to the protection of the exclusive rights of the relative owner as an incentive to innovation. However, given the negative effects that human action has on the environment, nowadays there is an interaction between intellectual property and environmental protection. More specifically, the supporting role that intellectual property should have in the environmental challenge can be found in Article 16 (5) of the UN Biodiversity Treaty of 1993, which establishes:

> The Contracting Parties, recognizing that patents and other intellectual property rights may have an influence on the implementation of this Convention, shall cooperate in this regard subject to national legislation and international law in order to ensure that such rights are supportive of and do not run counter to its objectives.

[44] See J. L. Sax, *Property Rights and the Economy of Nature: Understanding Lucas v. South Carolina Coastal Council*, Stanford Law Review, vol. 45 n. 5 (1993), pp. 1142-1449.

Furthermore, the supporting role of intellectual property in addressing the environmental challenge is also evident in the goals of the UN 2030 Agenda. Specifically, intellectual property can help pursue the Sustainable Consumption (SDG 12) goals, through the dissemination of circular economy practices, and Research Cooperation (SDG 17), expanding the scope for collaboration between researchers.

On this wavelength, reflections on the relationship between intellectual property law and environmental sustainability have arisen in legal literature. At the heart of these reflections are concerns about the barriers that traditional intellectual property law places on some eco-sustainable practices, especially when these are not authorized by the owners of the intellectual property. The reason for these tensions is that intellectual property law still focuses on granting owners full control over their products. In this regard, Calboli writes:

> Of course, the relationship between IP and a circular economy is not inherently adversarial. IP rights can help incentivize environmentally friendly practices by promoting sustainable innovations and products. Nevertheless, the current system continues to be based on rules that foster sustainability and circularity, mostly when IP owners remain in full control. On the contrary, should unauthorized third parties try to repair, upcycle, or recycle IP-protected products, IP owners can generally block these activities by claiming IP infringement. While this control may be desirable for IP owners, it does not effectively support circular activities, as it decreases the number of companies engaging in a circular economy. Moreover, IP owners are not legally

obligated to implement sustainable and circular practices, at least from an IP standpoint.[45]

This has happened especially with reference to the relationship between upcycling and trademark law.

Upcycling is a sustainable phenomenon that transforms waste textile materials or used clothing into new products.[46] However, the transformation of existing products may conflict with the rights of the trademark owner, especially if the modified product retains the trademark. For example, a risk to the reputation of the trademark may arise if the transformed product is of low quality. Furthermore, in this specific case, the theory of exhaustion does not apply. According to this principle, once an authentic product enters the market, the protection of the trademark is exhausted, and the subsequent unauthorized sale of the product does not infringe the trademark. This principle does not apply if the quality of the product is altered, or if there are material differences between the goods purchased and the goods resold, even if they have the same brand.[47] Therefore, despite the propaedeutic nature of upcycling to promote sustainability and the circular

[45] I. Calboli, *Pushing a Square Pin into a Round Hole? Intellectual Property Challenges to a Sustainable and Circular Economy, and What to Do About It*, International Review of Intellectual Property and Competition Law, vol. 55 (2024), p. 238.

[46] See B. Calabrese, *Economia circolare e principio di esaurimento del marchio*, Orizzonti del diritto Commerciale, Fasc. 2 (2023), pp. 461-485; I. Antón Juárez, *Upcycling of textile products vs trademark right infringement. Material and cross-border litigation strategies*, Cuadernos de Derecho Transnacional, vol. 16 (2024), pp. 46-94; V. Lepesant, *Redressing Sustainable Fashion Practices: Upcycling as a Defense to Trademark Infringement*, Texas A&M Law Review, vol. 10 (2023), pp. 335-358; M. Senftleben, *The Unproductive "Overconstitutionalization" of EU Copyright and Trademark Law – Fundamental Rights Rhetoric and Reality in CJEU Jurisprudence*, International Review of Intellectual Property, vol. 55 (2024), pp. 1497-1498.

[47] See I. Calboli, *Market Integration and (the Limits of) the First Sale Rule in North American and European Trademark Law*, Santa Clara Law Review, vol. 51 (2011), p. 1241.

economy, the trademark owner has the right to prevent unauthorized use of her/his trademark on products that have not been manufactured or approved by them. This approach responds to a linear economy in which the product is created, sold and then disposed of. Circularity is only allowed if the intellectual property owners maintain control of the product. Otherwise, if third parties carry out unauthorized recycling activities, the intellectual property owner can claim infringement of intellectual property. In this regard, Calboli writes:

> We have been repeatedly told that IP rights benefit society by encouraging innovation and creativity on the one hand and market competition on the other […]. However, during the term of protection of IP rights, IP owners' right to control their products and processes extends to any use, including those related to circular and sustainable practices, unless a specific limitation or exception applies. In this way, IP owners can often prevent third parties from repairing, reselling, upcycling, and recycling their products when they can claim that these activities constitute an act of infringement of their IP rights.[48]

To make upcycling permissible, legal literature proposes the application of nominative fair use of the trademark,[49] a theory developed in the United States that allows persons not authorized by the owner to use a trademark to identify or refer to that brand's goods, provided that the reference does not reveal any form of affiliation.[50] In fashion, the use of the trademark on a product generated

[48] I. Calboli, *Pushing a Square Pin into a Round Hole? Intellectual Property Challenges to a Sustainable and Circular Economy, and What to Do About It*, International Review of Intellectual Property and Competition Law, vol. 55 (2024), p. 238.

[49] *Id* at 254.

[50] See C. J. Doellinger, *Nominative Fair Use: Jardine and the Demise of a Doctrine*, Northwestern Journal of Technology and Intellectual Property, vol. 1 (2003), pp. 66-69; W. McGeveran, *Rethinking Trademark Fair Use*, Iowa Law Review, vol. 94 (2008), pp. 88-97.

by upcycling is permitted under nominative fair use if it is clearly labelled as recycled and not an official product of the trademark.

Then, in the environmental field many works are protected by copyright, including software and databases used for weather forecasting, temperature analysis, flora and fauna changes, and drought and glacier monitoring. Data is essential for conducting comprehensive climate risk assessments, improving the quality of reporting, and promoting effective climate change mitigation strategies.[51] In this regard, some scholars have noted that the exclusivity connected to copyright could hinder the retrieval and access to data of environmental relevance,[52] without forgetting that the right of exclusivity is the incentive to create works covered by copyright.[53]

To reflect on this topic, it is appropriate to begin the analysis with the distinction between moral rights and patrimonial rights in copyright. Moral rights are non-economic rights that protect authors' personal connection to their work. Patrimonial rights relate to the economic exploitation of the work, such as reproduction or distribution, and can be transferred or licensed to third parties. They confer an exclusive power of economic exploitation of the work, but antitrust laws and compulsory licenses can intervene to guarantee access to protected works. Antitrust law restricts

[51] See S. M. Easterbrook, *Climate Change: A Grand Software Challenge*, Proceedings of the FSE/SDP Workshop on Future of Software Engineering Research (2010), pp. 99-104; S. M. Easterbook; T. C. Johns, *Engineering the Software for Understanding Climate Change*, Computing in Science & Engineering, vol. 11 n. 6 (2009), pp. 65-74.

[52] See E. Derclaye, *The role of copyright in the protection of the environment and the fight against climate change: is the current copyright system adequate?*, in J. Sarnoff (edited by), *Research Handbook on Intellectual Property and Climate Change*, Edward Elgar, Cheltenham (2018), p. 376.

[53] *Id* at 369-383. See also M. W. Carroll, *Intellectual property and related rights in climate data*, in J. Sarnoff (edited by), *Research Handbook on Intellectual Property and Climate Change*, Edward Elgar, Cheltenham (2018), pp. 384-398; H. Härkönen, *Copyright Moral Rights Protection and Environmental Sustainability: The Case of Upcycling*, VerfBlog, 2025/4/22.

the exercise of property rights when this leads to abuses of dominant positions.[54] Compulsory licenses allow the use of copyright-protected works to prevent the exclusivity of a work of collective importance from blocking access to it.[55] Then, to these statutory hypotheses of limitation of copyright are added the open source and fair use experiences.

More specifically, the phenomenon of open source is a way of operating in software technology that arose in the late 1990s as a result of the awareness that innovation requires global collaboration.[56] The intellectual property rights of open source software belong to the original creator but are licensed free of charge to third parties. More specifically, open source licenses provide that anyone can use, modify, and redistribute the software's source code, but in doing so, they must comply with the license terms, which often require the sharing of derivative works.

Fair use is a legal doctrine within U.S. copyright law that permits the use of copyrighted works without the permission of the right holder under specific circumstances. It is not a fixed rule, but rather a defense against copyright infringement claims.[57] Examples of fair use practices include

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[54] Abuses occur when dominant company uses its power to restrict competition. For example, this happens when a company controls the copyright of widely used software. If the company prevents access to such software, it limits competition and innovation. For a critical analysis on this topic, see D. S. Karjala, *Copyright Protection of Operating Software, Copyright Misuse and Antitrust*, Cornell Journal of Law and Public Policy, vol. 9 (1999), pp. 161-192.

[55] Compulsory license is not a general right to use copyrighted material. It only applies in specific situations and under the condition defined by law. On the complicated balance between copyright and compulsory licensing, see T. Gallagher, *Copyright compulsory licensing and incentives*, in R. Towse (edited by), *Copyright in the Cultural Industries*, Edward Elgar Publishing, Cheltenham 2002, pp. 85-98.

[56] For a general analysis, see J. Feller et al., *Perspectives on Free and Open Source Software*, MIT Press, Cambridge 2005; C. Tozzi, *For Fun and Profit: A History of the Free and Open Source Software Revolution*, MIT Press, Cambridge 2017.

[57] Unlike fair use, fair dealing is a collection of defined exceptions in many Commonwealth countries to the exclusive right of copyright. For critical readings on the intersections between these doctrines and environmental issues, see S. E. Cayton, *The "Green Patent Paradox" and Fair Use: The Intellectual*

the use of reverse engineering to promote the interoperability of software.[58] Reverse engineering can drive green innovation by allowing companies to analyze and improve upon existing technologies, such as developing new green software. This is a flexible approach to copyright protection that could also be taken as a model by other legal instruments to promote green innovation.

Discussions in the trademark and copyright fields highlight that the traditional idea of intellectual property rights often conflict with the effective management of environmental resources. The primary concern of debates among trademark scholars is how to promote the circular economy by reusing existing products without incurring infringement. In the area of copyright, however, scholars aim to improve the collection and sharing of environmental data, without copyright becoming an insurmountable obstacle. The following words of Senftleben are helpful to understand the basis for these original reflections:

> Moreover, it is important to recognize that there is no hierarchy between fundamental rights: as an exponent of the right to property, intellectual property protection has the status of a fundamental right. However, this does not imply that intellectual property is stronger or a priori more important than other fundamental rights positions, such as freedom of expression, the right to a healthy environment and the freedom to conduct a business.[59]

Property Solution to Fight Climate Change, Seattle Journal of Technology, Environmental & Innovation Law, vol. 11 n. 1 (2020), pp. 214-245. E. Derclaye, *Of Maps, Crown Copyright, Research and the Environment*, European Intellectual Propriety Review, vol. 30 n. 4 (2008), pp. 162-164.

[58] See *Splunk Inc. v. Cribl, Inc.*, No. 3:22-cv-07611 (N.D. Cal. 2024).

[59] M. Senftleben, *The Unproductive "Overconstitutionalization" of EU Copyright and Trademark Law – Fundamental Rights Rhetoric and Reality in CJEU Jurisprudence*, International Review of Intellectual Property, vol. 55 (2024), p. 1478.

A rethinking of the balance of values is evident, overcoming the traditional assumption in intellectual property that prioritizes the protection of individual interests, while treating the fundamental rights of others, such as the right to a healthy environment, as mere exceptions.

1.4 Eco-Innovation and Patent Law

While copyright and trademark law serve to address environmental issues, patent law holds the greatest potential for green innovation. Patent law protects technical inventions, granting the inventor an exclusive right to use and commercialize a technological invention for a limited period. This is where eco-sustainable innovation comes in, generating new industrial processes and products capable of reducing the impact of human action on the environment, the main source of climate change and environmental degradation.[60]

In a definitional perspective, eco-sustainable innovation falls within the broader idea of sustainability.[61] Specified by the Brundtland Report (1987),[62] the concept of sustainability includes environmental, social and economic aspects.[63] Consequently, sustainable development is not only

[60] For a general analysis of the relationship between human impact and the environment, see A. S. Goudie, *Human Impact on the Natural Environment: Past, Present and Future*, 8th edition, Wiley-Blackwell, Hoboken 2018.

[61] On the broad meaning of sustainability, see A. Pisani Tedesco, *Strumenti privatistici per la sostenibilità ambientale e sociale*, Giappichelli Editore, Torino 2024, pp. 8-10.

[62] G. Brundtland, *Report of the World Commission on Environment and Development: Our Common Future*, U.N. General Assembly document A/42/427, 1987.

[63] As a terminological premise, scholars tend to use the expressions "eco-sustainable innovation", "environmental innovation", "ecological innovation" as synonyms of "green innovation". See E. Gonçavales et al., *Green technology co-patenting networks: international dynamics*, Quality & Quantity:

a matter for governing bodies, but involves multiple entities, including firms and citizens. Furthermore, since innovation has significant consequences on natural, social and economic phenomena, the idea of sustainable development concerns also the interests of future generations. In this direction, the UN Agenda 2030[64] distinguishes economic sustainability, which repudiates the idea of constant growth based on the consumerist model, social sustainability, which imposes a perception of innovation in the name of equity and social justice, and environmental sustainability.[65] It is precisely the latter that constitutes the most important tool for effectively reconciling production with environmental protection and is mainly aimed at the industrial sector. In this regard, Stojčić writes:

> External eco-innovation incentives, whether public or private, motivate the search of firms for ways of achieving higher process efficiency and greater product value. Such actions yield an additional benefit by preventing socially undesirable

International Journal of Methodology, vol. 57 n. 2 (2023), p. 1604; D. Murzyn, P. Szyja, *European Union Efforts to Create Green Growth Through Green Innovation*, in C. Pintilescu; B. Wierzbiński; G. Zarotiadis (edited by), Proceedings of the 11th International Conference of AESCU "*Openness, Innovation, Efficiency and Democratization as Preconditions for Economic Development*", Foundation of the Cracow University of Economics, Cracow 2015, p. 38; T. Schiedering; F. Tietze; C. Herstatt, *What is green Innovation? A quantitative literature review*, working paper n. 63, Hamburg University of Technology, Institute for Technology and Innovation Management (TIM), Hamburg 2011, p. 2.

[64] U.N. General Assembly, *Transforming our world: the 2030 Agenda for Sustainable Development*, A/RES/70/1, 2015.

[65] For a general analysis, see M. Baise; K. Rennings, *Lead markets and regulation: a framework for analyzing the international diffusion of environmental innovations,* Ecological Economics, vol. 52 (2005), p. 6; P. Klemmer; U. Lehr; K. Löbbe, *Environmental innovation: Incentives and Barriers*, Analytica, Berlin 1999; J. Guinot; Z. Barghouti; R. Chiva, *Understanding Green Innovation: A Conceptual Framework*, Sustainability, vol. 14 (2022), p. 6; K. Rennings, *Redefining innovation – eco-innovation research and the contribution from ecological economics*, Ecological Economics, vol. 32 (2000), p. 322.

underinvestment in innovations and an excessive amount of negative environmental externalities.[66]

More specifically, green innovation, in addition to producing positive effects on the environment, can reconcile economic development with social sustainability, and is thus particularly attentive to promoting the well-being of people, human rights, access to essential services, employment and a dignified life. For example, green innovation reduces the dependence of industrial production on fossil fuels, whose supplies have a worrying social impact on local communities. On this matter, Kiptoo writes:

> The impact of green innovation extends beyond environmental sustainability; it also has significant social implications. By enabling the provision of affordable and clean energy, green innovation ensures communities' access to basic services such as healthcare, education, and clean water. It also fosters social equity by creating employment in green sectors and promoting sustainable livelihoods. Additionally, green innovation enhances resilience to climate-related disasters, protecting vulnerable populations and strengthening social cohesion.[67]

Given this, of particular interest is chapter 34 of Agenda 21, developed at the UN Conference on Environment and Development in 1992, which states:

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[66] N. Stojčić, *Social and private outcomes of green innovation incentives in European advancing economies*, Technovation, vol. 104 (2021), p. 3. On this topic, see also Z. Feng; W. Chen, *Environmental Regulation, Green Innovation, and Industrial Green Development: An Empirical Analysis Based on the Spatial Durbin Model*, Sustainability, vol. 10 (2018), p. 4; Y. Sun et al., *Green Innovation for resource efficiency and sustainability: Empirical analysis and policy*, Resources Policy, vol. 81 (2023), p. 2.

[67] B. S. Kiptoo, *Nexus of Green Innovation and Sustainable Development: A Systematic Review of Literature*, International Journal of Research and Innovation in Social Science, vol. 8 n. 14 (2024), p. 85. https://dx.doi.org/10.47772/IJRISS.2024.814MG008.

> New technologies are usually environmentally sound and help protect the environment, are less polluting, use resources such as energy efficiently, and recycle wastes. The transfer of these new technologies provides opportunities for human resource development, capacity building, and international cooperation. New and efficient technologies are essential to increase the capabilities of countries, in particular developing countries, to achieve sustainable development through economic advancement, environmental protection and conservation, and human development. This indicator also could be used to assess the role of incentives or regulations in influencing investor behaviour towards environmentally sound production.[68]

This document, in addition to recalling the varied prolificacy of green technologies, highlights the need for their diffusion. Technology transfer, however, is not always easy due to the presence of patents. Although patent exclusivity is traditionally aimed at stimulating innovation, it can create barriers to the spread of green technologies. The monopoly to use and to sell technology, that patent systems recognize as belonging to the patentee, allows the latter to recover the investments made to realize the invention and to make a profit. This perspective encourages research and innovation. In this regard Desh writes:

> The theory that patents incentivize innovation is based on the proposition that inventions are public goods that are expensive and difficult to make. Absent patent protection, inventors may not have sufficient motivation to invest in the development, production, and distribution of new products because they would not be able to recoup their investment nor protect it from appropriation by "free riders". Thus, patent law provides a market-based incentive to innovate by granting a temporary commercial

[68] https://www.un.org/esa/sustdev/natlinfo/indicators/indisd/english/chapt34e.htm

monopoly, allowing inventors to recoup their costs through "supracompetitive" pricing. The opportunity for supracompetitive pricing is particularly important for incentivizing industries with substantial research and development costs and where commercial scale-up is particularly intensive (e.g., the green technology sector).[69]

However, the competitive nature of patents can lead to reluctance to spread technologies. When green technology is patented, its full potential may not be realized if the patent holder chooses not to license it or license it at a prohibitive cost. To mitigate these scenarios, legal literature explores several strategies. In this regard, the next chapter reflects on the trasformation in a green sense of patent law, highlighting the steps taken and the prospects for progress

[69] B. Desch, *Fast-Tracks and Prizes: A Multi-Pronged Approach to Incentivizing Green Technology Innovation*, Washington Law Review, vol. 98 n. 2 (2023), p. 634.

Chapter 2
Greening Patent Law

2.1 Green Patents and Fast Track Programs: Critical Aspects.

"Green patent" is an informal term referring, among other patents, to legal titles that protect eco-sustainable technologies.

Like other patents, green patents give exclusive rights to inventors for a specific period of time based on the same criteria, namely novelty, inventive step and industrial applicability. However, green patents differ from traditional patents because they protect technologies aimed at reducing the negative impact of human activities on the environment. In other words, green patents are intended to generate environmental benefits, while traditional patents cover inventions in all other technical fields, so that eco-sustainability is not the main objective of the invention. According to Kemp and Pearson, the trait that distinguishes eco-innovation from traditional innovation is the following:

> The production, assimilation or exploitation of a product, production process, service or management or business method, that it is novel to the organization and which results,

throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resource use (including energy use) compared to relevant alternatives.[1]

The term "green patent" is broad because it encompasses a wide range of eco-sustainable technologies. They refer to two categories:

1. Climate Change Mitigation Technologies (CCMTs), including technologies useful for combating global warming (technologies for the production of renewable energy, for the promotion of energy efficiency, for the capture and storage of CO_2).
2. Environmentally Sound Technologies (ESTs), concerning technologies capable of reducing environmental damage deriving from human action (technologies for water treatment, sustainable waste management, sustainable agriculture).

In the official texts of International Organizations or in scientific texts these concepts are not considered in an organic way. This can also be deduced from the different classification systems developed at international level.[2] In this regard, Favot's words are interesting:

> Since 2010 three important organizations developed a strategy to facilitate the search for patents related to green technologies. The World Intellectual Property Organization (WIPO) in collaboration with United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC) made available the first "IPC

[1] R. Kemp; P. Pearson, *Final report MEI project about measuring eco-innovation*, UM Merit Maastricht (2007), p. 7.

[2] «The most important examples of this is classification schemes, such as "Climate Change Mitigation Technologies" (CCMT) and "Environmentally Sound Technologies" (EST), both of which were disseminated by the United Nations Framework Convention on Climate Change (UNFCCC) and used as base concept by several organizations (e.g. OECD, EPO), academics and policymakers. These definitions are frequently used as synonyms, although there are important conceptual differences among them». A. N. Tanner et al., *Regional Distribution of Green Growth Patents in four Nordic Countries: Denmark, Finland, Norway and Sweden*, Report for Technical University of Denmark, Kongens Lyngby 2019, pp. 16-17.

> Green Inventory" list which collects IPC codes related to Environmental Sound Technologies (ESTs). In 2012 the European Patent Office (EPO) developed a new classification scheme named "Y02/Y04S tagging scheme" to detect climate change mitigation technologies (CCMTs). Finally, in 2015 the OECD released the patent search strategies for the identification of selected environment-related technologies (from now on referred to as "ENV-TECH") thus providing a comprehensive methodology for measuring innovation in environmental related technologies.[3]

Despite these critical issues in terms of the classification of green patents, promoting green innovation has become a key priority for many governments. Given the urgency of the environmental crisis, the patenting process is generally too long to be able to exploit green technologies anytime soon. For this reason, following the example of the United Kingdom in 2009,[4] some systems have introduced accelerated procedures for patent applications related to green technologies.[5] They can reduce the time it takes to obtain a patent from a few years to a few months. In this regard, Dechezleprêtre writes:

> There are several advantages to a reduced examination process. It allows patent applicants to start licensing their technologies sooner, thereby reducing the time to reach the market. Possessing a granted patent may also help start-up companies to raise private capital.[6]

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[3] M. Favot et al., *Green patents and green codes: How different methodologies lead to different results*, Resources, Conservation & Recycling Advances, vol. 18 (2023), p. 2.

[4] See UK IPO Fast grant guide, available on the UKIPO website.

[5] In 2023, countries with fast-track programs for green technology patent applications were: Australia, Brazil, Canada, China, Israel, Japan, South Korea, Taiwan, the United Kingdom and the United States. For further information see P. A. Jackman; H. Ball, *Options for Accelerating Examination of Renewable Technology Patent Applications*, Pratt's Energy Law Report, vol. 23 n. 4 (2023), pp. 117-126.

[6] A. Dechezleprêtre, *Fast-tracking Green Patent Applications. An Empirical Analysis*, International Centre for Trade and Sustainable Development, Issue Paper n. 37, Geneva 2013, p. 1.

As evident, fast tracking aims to speed up the patenting process given the urgency of the environmental crisis but does not affect the recognition of exclusive rights to the patent holder. On the contrary, it actually extends its duration. Indeed, since the patent term runs from the date on which the patent application is filed with the patent office,[7] through a reduction in the application process, «inventors may enjoy the exclusivity benefits of patent protection for longer than through the normal process».[8]

This can have positive implications: longer-term patent monopolies provide more opportunities to recoup investment in research and development, encouraging companies to undertake expensive research for new green technologies. On the other hand, however, a longer monopoly may cause the monopolist to license the patented technology less in order to charge a higher royalty and increase its revenues, thus making the patented technology less accessible. In addition, in the absence of competition, patent holders may be less inclined to innovate, discouraging the ecological transition.

These problematic traits are even more marked in light of the structural characteristics of green technology. It is expressed through complex inventions that combine a heterogeneous variety of specialized elements.[9] While there are examples of green technology as simple as LED bulbs,

[7] For example, under 35 U.S.C. § 154(a)(2), the patent term begins on the date the patent is granted and ends twenty years from when the patent application was filed in the United States. If the patent application relates to one or more previously filed applications under section 120, 121, 365(c), or 386(c), the twenty years begin from the date the first application was filed.

[8] B. Desch, *Fast-Tracks and Prizes: A Multi-Pronged Approach to Incentivizing Green Technology Innovation*, Washington Law Review, vol. 98 n. 2 (2023), p. 628.

[9] «[...] green patents are more complex and more novel than non-green inventions, and are characterized by a larger and more pervasive impact on subsequent technological developments». N. Barbieri; A. Marzucchi; U. Rizzo, *Knowledge sources and impacts on subsequent inventions: Do green technologies differ from non-green ones?*, Research Policy, vol. 49 n. 2 (2020), p. 7.

many advanced innovations, such as carbon capture systems or hydrogen engines, involve technological apparatuses characterized by multiple patents. In such cases, therefore, a single innovation is covered by a series of patents potentially owned by different owners. Therefore, those who intend to use the invention or implement it must obtain licenses from different parties. Such negotiations can result in lengthy and costly processes, sometimes revealing obstacles that are difficult to overcome.

The first obstacle is the patent thicket. This term has become a synonym for anti-competitive behavior, with initial diffusion in the pharmaceutical field.[10] In the green field, there is a patent thicket where several companies hold patents on specific components of a single green technology, creating a complex network of exclusive rights. Sometimes this fragmentation in patent ownership is exploited by patent holders to profit from licensing important green technologies or to prevent competitors from entering the market. Specifically, patent thickets can slow down the diffusion of green technologies if patent holders define particularly high transaction costs. In addition, patent thickets can impede innovation where patent holders impose barriers to entry to fend off potential competitors.

[10] «Patent thickets contain patents that protect different parts of modular and complex technology. In this particular definition – often used in the pharmaceutical industry – modular refers to different sets of components that need to be assembled to produce a range of products. [...] Patent thicket measures the degree of overlapping patent rights, which makes it harder for a new innovator to develop new technologies due to the complexity of licensing deals for multiple patents from multiple sources». L. Cohen; U. G. Gurun; Q. Nguyen, *The ESG – Innovation Disconnect: Evidence from Green Patenting*, Finance working paper n. 744, European Corporate Governance Institute (2022), p. 18. For further information on the phenomenon of patent thickets in general, see C. Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in A. B. Jaffe; J. Lerner; S. Stern (edited by), *Innovation Policy and the Economy*, vol. 1, MIT Press, Cambridge 2001, pp. 119-150.

A second obstacle related to the previous one is patent trolling. It is a practice in which an entity owns or acquires a patent not to use its protected technology, but with the main objective of filing a lawsuit against users for patent infringement and obtaining compensation, often through settlement agreements. In other words, the purpose of these entities (non-practicing entity – NPEs) is not the use of a technology or its development, but the generation of profit through legal actions. Therefore, these entities exploit the exclusive rights of patents to make a profit in an opportunistic manner, without promoting innovation. These entities often target complex technology industries, such as green patents, where managing multiple specific patents is tricky for companies, especially startups, which can be crippled by costly legal battles, thus hindering innovation.[11]

In view of these difficulties, it is important to promote patent sharing, striking a balance that considers both inventors and users. This objective was also affirmed in the TRIPS framework. In particular:

> The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.[12]

Green patents, as complementary technologies, require joint applications, leading to complex dynamics where patent exclusivity can pose a problem. In a fragmented technology landscape, patent holders can demand high royalties for patent licensing, preventing others from

[11] See S. Cayton, *The "Green Patent Paradox" and Fair Use: The Intellectual Property Solution to Fight Climate Change*, Seattle Journal of Technology, Environmental & Innovation Law, vol. 11 (2020), pp. 224-225.

[12] Agreement on Trade-Related Aspects of Intellectual Property Rights, Art. 7, 33 I.L.M. 81 (1994).

using the technology or entering the market. Thus, patent fragmentation among different owners hinders innovation and reduces social welfare. Cayton writes in this regard:

> This tension between the rights of the patent holder and the need to use their green technology can be described as the Green Patent Paradox, whereby patented technologies geared toward mitigating the effects of climate change or substituting environmentally hazardous industries may not reach their full potential in part because patentees refrain from licensing their products.[13]

To promote patent sharing some scholars reflect on the opportunity to attenuate patent exclusivity through compulsory licenses for green patents and by extending the fair use doctrine from copyright to patent law. In any case, the initiative of patent holders reveals cases of spontaneous limitation of patent exclusivity, giving rise to patent collaborations. The following sections of Chapter two analyze these issues in depth.

2.2 Compulsory Licensing for Environmental Technologies

Some scholars consider compulsory licensing as a solution to the obstacles posed by the patent monopoly to the circulation of green patents. For example, Nanda writes:

> Technologies protected by IPR need to be licensed. The nature of IPR regime is an issue in so far as it can determine the terms of licensing. Therefore, there is more likelihood of production and usage costs going much higher because of payments made in order to obtain

[13] S. Cayton, *The "Green Patent Paradox" and Fair Use: Property Solution to Fight Climate Change*, Seattle Journal of Technology, Environmental & Innovation Law, vol. 11 (2020), p. 219.

> these licences. In some cases, the owner may just refuse to grant a licence altogether as such technologies are used as barriers to entry [...]. Given this context, it has been suggested that issuance of compulsory license can be a tool for faster diffusion of climate-friendly technologies.[14]

A compulsory patent license is imposed by a government authority and allows third parties to access the patent without the approval of the patent holder, granting the latter a mere right to remuneration. Unlike a voluntary license, a compulsory license arises from coercive action by the state and grants a non-exclusive and non-transferable right of use. Legal systems provide compulsory licensing in a variety of circumstances, such as the failure to implement a patent, the development of a dependent invention, antitrust reasons, or a national emergency. The TRIPS Agreement establishes provisions for the issuance of compulsory licensing. Specifically, Article 31(b) of the TRIPS Agreement requires negotiation with the patent holder before patents can be used without authorization. The provision permits exclusions from this requirement for «national emergency, other circumstances of extreme urgency, and in case of public non-commercial use». In these situations, the patent holder is informed as soon as possible. To ensure the impartiality of the decision, Article 31(i) TRIPS provides that «the legal validity of any decision relating to the authorization of such use shall be subject to judicial review or other independent review by a distinct higher authority in that Member».

Article 31(b) is silent on what constitutes a national emergency, leaving it up to States Parties to define its scope.[15] Consequently, compulsory licensing of green patents could be justified

[14] N. Nanda, *Diffusion of Climate Friendly Technologies: Can Compulsory Licensing Help?*, Journal of Intellectual Property Rights, vol. 14 (2009), p. 241.

[15] «There is nothing in TRIPS Article 31 to suggest that anyone other than the country considering a compulsory license should evaluate what constitutes a national emergency [...]. The Doha Public Health Declaration, as a subsequent agreement of the parties, confirms that assessing whether a national emergency

considering the national emergency resulting from climate change and environmental degradation.[16]

Compulsory licenses have been used for pharmaceutical products to combat health epidemics. For example, during the COVID-19 pandemic, several countries considered compulsory licenses for COVID-19 treatments.[17] Although compulsory licenses are theoretically permissible for green patents, some scholars argue that they are often ineffective.[18] Moreover, innovation presents different characteristics in the environmental and pharmaceutical fields. While in the pharmaceutical field, a single patent can constitute a drug, in green innovation, a single patent may not be sufficient for complex technology. As evidence of this, Consilvio writes:

> For example, a solar photovoltaic (PV) cell might be protected by multiple patents and trade secrets. The particular compositions of the layers of a p-n junction might be patented, but the method of obtaining the desired precision engineering of those layers might be a trade secret. Without the ability to precisely produce those layers, the true efficiency gain of the cell

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exists is solely within the discretion of each nation». C. M. Ho, *Patent Breaking of Balancing? Separating Strands of Fact from Fiction Under TRIPS*, North Carolina Journal of International Law and Commercial Regulation, vol. 34 (2009), p. 401.

[16] «Although environmental issues are not specifically mentioned in Article 31 of TRIPS, there are no subject matter restrictions to the Article that prevent its use for green technology, and environmental considerations are prevalent in other areas of the agreement». R. Fair, *Does Climate Change Justify Compulsory Licensing of Green Technology*, Brigham Young University International Law & Management Review, vol. 6 (2010), p. 30.

[17] See H. Wong, *The case for compulsory licensing during COVID-19*, Journal of Global Health, vol. 10 (2020).

[18] «[...] compulsory licenses are not the only ways to effectuate such transfer [...] and the compulsory licensing of green technology is not as straightforward as licensing in the pharmaceutical industry». B. Mercurio; R. Yu, *Compulsory licensing for environmental purposes*, in M. Faure (edited by) *Elgar Encyclopedia of Environmental Law* – Volume XI, Edward Elgar, Cheltenham 2023, p. 435.

might never be realized. Therefore, a compulsory license may be insufficient for actual transfer of the clean technology, since it would only disclose part of the technology.[19]

Consequently, according to other scholars, there are more effective government interventions to guarantee access to green technologies than compulsory licensing. One of these is reducing tariffs on eco-sustainable products. Fair writes in this regard:

> Rather than relaxing IPR on green technology through compulsory licensing, it would be more beneficial to relax tariff and non-tariff trade barriers in general, or at least specifically with regards to environmentally friendly industries.[20]

Tariffs aim to create a form of trade protectionism that can hinder green innovation. More specifically, high tariffs, by increasing the cost of products incorporating green patents, induce patent holders to demand higher royalties for licensing agreements, thus slowing the adoption of clean energy and the ecological transition.

Eliminating green tariffs was the goal of the joint proposal by the United States and the European Union at the UN Climate Conference in Bali in 2007. Specifically, the plan called for removing tariffs on 43 green technologies, including solar panels and wind turbines, to achieve the global ecological transition. The plan was not implemented because Brazil and India considered it incomplete since it did not address certain options, such as biofuel tariffs.[21]

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[19] M. Consilvio, *The Role of Patents in the International Framework of Clean Technology Transfer: A Discussion of Barriers and Solutions*, American University Intellectual Property Brief, vol. 7 n. 3 (2011), p. 13.

[20] R. Fair, *Does Climate Change Justify Compulsory Licensing of Green Technology*, Brigham Young University International Law & Management Review, vol. 6 (2010), p. 40.

[21] See R. Fair, *Does Climate Change Justify Compulsory Licensing of Green Technology*, Brigham Young University International Law & Management Review, vol. 6 (2010), pp. 40-41; T. Wilson, *Undermining*

Furthermore, governments can use public funds to finance research and development of green technologies. This support can take various forms, including tax incentives, grants, and public-private partnerships. For example, in the United States, the entity receiving federal funding – such as a nonprofit organization or a small business – retains ownership of patented inventions. To ensure that such inventions are developed and marketed in a reasonable manner, the Bayh-Dole Act (1980) grants the public agency providing the funding the so-called march-in rights.[22] They allow the public entity to enforce patent licensing in certain circumstances, such as when the contractor does not practice the invention. The public entity's decision to exercise trademark rights can be appealed to the U.S. Court of Federal Claims.

2.3 Fair Use and Green Patents

Section 107 of Title 17 of the U.S. Code provides a limitation on the copyright holder's exclusive right, represented by the fair use doctrine. Specifically, the provision lists various types of reproduction of the copyrighted work that are considered fair use.

Among the reasons justifying such reproductions are cited by way of example «criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research».[23] Subsequently, Section 107 identifies four factors that courts may consider in deciding whether a particular use is protected by the fair use doctrine. They are:

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mitigation technology: Compulsory licencing, patents and tariffs, Australian Institute of Public Affairs, vol. 21 n. 1 (2008), p. 9.

[22] See Section 203 of Title 35 U.S. Code.

[23] 17 U.S.C. § 107.

(1) The purpose and character of the use [...];

(2) the nature of the copyrighted work;

(3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and

(4) the effect of the use upon the potential market for or value of the copyrighted work[24].

In 2000, Professor Maureen O'Rourke proposed extending the fair use doctrine to patent law. She argued that this innovation was essential to avoid market failures in the field of patents, frequently complementary:

> It is therefore a particularly propitious time to re-examine the adequacy of existing law in addressing current conditions. The risk is that, in the absence of a doctrine that permits some privilege of unlicensed use while at the same time protecting patentees' incentives, the patent system may function to thwart the very innovation it is intended to foster.[25]

O'Rourke identified five points that courts should consider in patent infringement cases, namely:

1) The nature of the advance represented by the infringing work. If the infringing invention constitutes a significant advancement in technology, the fair use doctrine should be applied.

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[24] *Id*.

[25] M. A. O'Rourke, *Toward a Doctrine of Fair Use in Patent Law*, Columbia Law Review, vol. 100 n. 5 (2000), p. 1180.

2) The purpose of the infringing use. Here if the use is commercial the fair use doctrine should not apply.

3) The nature and strength of the market failure that frustrates licensing. In this regard, courts apply the fair use doctrine if they consider that the failure to license the patent is inefficient or motivated by opportunistic reasons on the part of the patent holder.

4) The impact of the use on incentives and social welfare. Here, in applying the fair use doctrine, the question is whether the courts consider the advantages to the community of the infringing invention to be more important than the damage to the patent owner.

5) The nature of the patented work. In general, fair use is more likely to protect an infringing invention that significantly improves the prior technology. This factor is very similar to the first, but while the first considers the incremental value of the infringement, the fifth focuses on the patented work.[26]

Although Professor O'Rourke's theory is applicable to green patents, there is one aspect that makes this theory unlikely to be successful in the green field. The theory does not, in principle, allow for commercial purposes in the fair use of the patent. Moreover, in every technological field, the incentive to innovate lies in the idea that the inventor can profit from the invention, for example by licensing the technology through the payment of royalties, or by producing and selling goods made with the patented technology. Therefore, this theory, failing to reconcile innovation with patent sharing, does not appear particularly advantageous in the green field.

[26] See J. I. Miller, *Towards a Doctrine of Fair Use in Some of Patent Law*, Intellectual Property Brief, vol. 2 n. 3 (2011), p. 62.

2.4 Patent Collaboration and Green Innovation

The limitations on patent exclusivity through compulsory licensing and fair use are exceptional and essentially not intended to commercialize the patent. Commercial purposes are generally the driving force behind patent collaborations, and some scholars are exploring the potential offered by patent collaborations to promote environmental sustainability.[27] Kingsbury writes in this regard:

> In the area of climate change there are also efforts to find appropriate collaborative structures to share technologies in order to develop and disseminate innovations that may assist in overcoming the challenges posed to the global community by climate change.[28]

Patent collaboration involves multiple inventors interacting to promote innovation in complex technologies through the sharing of essential technologies. More specifically, patent collaborations have the potential to replace exclusivity with contractual claims, since private autonomy defines the terms under which each party can access the other's patents. Ricolfi writes in this regard:

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[27] «Although patents give their owners the right to exclude others from practicing a patented technology or to charge them for the privilege of doing so, an increasing number of firms across different industries have begun to make voluntary pledges intended to limit their ability to enforce their patents to the fullest degree». L. Contreras; B. H. Hall; C. Helmers, *Pledging Patents for the Public Good: Rise and Fall of the Eco-Patent Commons*, Houston Law Review, vol. 57 (2019), p. 65. «There are several available frameworks to share patented technology. Reviewing these frameworks and understanding their advantages and disadvantages provides important insight to develop a program that diffuses green technology». J. Piana, *Diffusion of Green Technology: Patents, Licenses and Incentives*, Texas Environmental Law Journal, vol. 52 n. 1 (2022), p. 45.

[28] A. Kingsbury; J. Gamman, *Patent Collaboration: Licensing, Patent Pools, Patent Commons, Open Source and Communities of Innovation*, New Zealand Intellectual Property Journal (2013), p. 5.

> Property rules-based technological IP rights may be converted into liability rules not only by dint of legislative or judicial fiat but also by means of private contractual arrangements. The attention over the phenomenon of "contracting into liability", that is arrangements which transform property rights into contractual claims to a take part in pooled knowledge, technology or creativity or to share income streams derived by the same, is comparatively recent, even though the phenomenon as such has a quite long history behind it. It appears that resort to pooling arrangements of this kind is becoming particularly recurring in specific areas of technological innovation, such as climate change [...].[29]

In other words, due to the fragmentation of technological ownership, it is profiting reasons that induce patent owners to give up their exclusive rights. Indeed, profit comes from the commercialization of innovative technologies, which arise from the sharing of different patents. Ricolfi further writes:

> The explanation may be encapsulated in just a few words: in the current environment of creativity and innovation exclusivity tends to backfire.[30]

Therefore, collaborations enable commercialization of green patents, driving business growth and maximizing the potential of innovations.

The main forms of patent collaboration are: 1) patent pools; 2) cross-licensing agreements; 3) patent commons; 4) patent pledges. These models differ in that they provide a more or less formalized commitment to sharing patents.

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[29] M. Ricolfi, *The new paradigm of creativity and innovation and its corollaries for the law of obligations*, in P. Drahos; G. Ghidini; H. Ulrich (edited by), *Kritika: Essays on Intellectual Property* (vol. 1), Edward Elgar Publishing, Cheltenham 2015, p. 161.

[30] *Id*. at 164.

1. Patent pool is a form of collaboration originating in the United States.[31] It is based on a private ordering agreement between two or more patent holders to make patents for complex technology available for licensing to third parties. A central entity administers the patent pool, deciding on the admission of new members and managing licensing and the distribution of royalties on complex technology according to formal rules established by the parties. Through the agreements underlying the patent pool, patent holders waive their rights, and all pool members have access to them.[32] The most significant benefit of the patent pool is the reduction of transaction costs for exploiting the patents of pool members and the simplification of licensing complex technologies. An example of a patent pool in the green space is Canada's Oil Sands Innovation Alliance (COSIA). Founded in 2012, it brings together Canadian companies addressing environmental challenges within the oil and gas industry. In COSIA, each participant grants the other members of the pool royalty-free rights to use their patents, while remaining bound by a non-assertion clause that prevents them from enforcing their patents against another partner.[33]

2. Cross-licensing agreements involve two or more companies granting each other the right to use patented technologies. This allows each party to access and utilize the other's patented inventions, fostering a mutually beneficial exchange of patents. As consumer demand for

[31] For further information see F. L. Vaughan, *The United States Patent System: Legal and Economic Conflicts in American Patent History*, University of Oklahoma Press, Norman (1956), pp. 40 et seq.

[32] See R. P. Merges, *Institutions for Intellectual Property Transactions: The Case of Patent Pools*, working paper, University of California, Berkeley 1999, p. 17.

[33] For more information on COSIA see B. Awad, *Global patent pledges. A collaborative mechanism for climate change technology*, working paper n. 81, Centre for International Governance Innovation, Waterloo (CA) 2015, p. 7; M. Uddin, *Patent as a Tool for Facilitating Innovation: Lessons from Green Technology*, working paper, Centre for International Governance Innovation, Waterloo (CA) 2023, pp. 6-7.

environmentally sustainable products grows, companies are incentivized to offer increasingly cutting-edge green solutions that require the sharing of their resources and knowledge. Thus, cross-licensing agreements can accelerate innovation, reduce litigation, and form the basis for research and development (R&D) collaborations. An example of cross-licensing for green innovation is the 2023 solar panel dispute settlement between the Chinese company LONGi and the South Korean company Hanwha, where both global suppliers of solar panels entered into a patent cross-licensing agreement to resolve their multi-jurisdictional litigation, allowing them to share technology and avoid ongoing legal battles in the competitive renewable energy sector.[34]

3. In patent commons companies or individuals voluntarily pledge their patents for the benefit of the collectivity, often for a specific purpose like promoting environmental technology, without requiring royalties. The structure of a patent common is defined by the rules made by participating entities. Patent owners retain exclusive rights to their patents but waive the right to enforce them against users. They can withdraw their patents under certain conditions or defend themselves if others assert their patents against them. Eco-Patent Commons is an example of patent commons for environmental innovation.[35] It developed between 2008 and 2016, gathering thirteen companies, including IBM, Nokia, Sony and

[34] For a critical analysis of this type of agreement see A. Mocanu, *Portfolios, pools and public intervention – Ip strategies for a greener future?*, Journal of Intellectual Property Law and Practice, vol. 19 n. 12 (2024), pp. 896-907.

[35] For more information on Eco-Patent Commons see A. Boynton, *Eco-Patent Commons: a Donation Approach Encouraging Innovation Within the Patent System*, William & Mary Environmental Law and Policy Review, vol. 35 n. 2 (2011) p. 682; J. L. Contreras; B. H. Hall; C. Helmers, *Pledging Patents for the Public Good: Rise and Fall of the Eco-Patent Commons*, Houston Law Review, vol. 57 (2019), pp. 62-109.

HP. More specifically, the project was voluntarily accessible upon granting eco-sustainable technology, in a discretionary and non-onerous way, for the advantage of all. Moreover, a defensive termination clause was provided for patent holders involved in a lawsuit for infringement. Despite providing easy access to patented technologies, the initiative did not take root, definitively ceasing its activities in 2016. The main reasons for this failure are attributable to the lack of interrelation between the discretionary choice of patents donated by suppliers and the demand side, as well as the poor usability of the individual technologies made available, often requiring the use of additional patents not present in the database.

4. Patent pledge is a voluntary, public commitment by a patent holder to limit their rights to enforce their patents, often to encourage innovation and public advantage. By removing barriers to entry, patent pledges can speed up the adoption of technologies and foster innovation. Patent pledges are motivated by philanthropic reasons, such as the dissemination of socially beneficial patents, or by commercial interests. In the latter regard, while immediately renouncing exclusive rights, pledgors aspire to greater long-term gains by building robust ecosystems for their complementary technologies.

The formality of patent pledges varies, ranging from simple statements of intent to formal contract. The first paradigmatic example of patent pledges in the eco-sustainable context is the one that Tesla Motors made in June 2014 not to «initiate lawsuits against anyone who, in good faith, wants to use [their] technology» to produce electric cars.[36] In January 2015 Toyota announced that

[36] E. Musk, *All Our Patents Are Belong to You*, Tesla Blog (2014). https://www.teslamotors.com/blog/all-our-patent-are-belong-you.

it would grant royalty-free licenses to thousands of its patents covering automotive hydrogen fuel cells.[37] In May 2015, Ford Motor Company publicly offered to license hundreds of its patents related to electric vehicles. However, the Ford Motor Company's commitment did not expressly provide for the free licensing of its patents.[38] Therefore, Tesla and Toyota were pioneers in rethinking patent exclusivity in the field of eco-innovation, demonstrating «that business models based on tight control over intellectual property are not the only viable pathways to innovation and product development».[39]

Patent collaborations promise individual profits while simultaneously benefiting the community through technological innovation. Therefore, patent collaborations are desirable if they do not substantially restrict competition or lead to an abuse of a dominant position, since otherwise they are collusive means aimed exclusively at pursuing the opportunistic interests of the parties. While further exploration of the relationship between patent collaborations and antitrust law is a matter for other studies,[40] it is important here to explore the relationship between patent

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[37] Toyota Usa Newsroom, *Toyota Opens the Door and Invites the Industry to the Hydrogen Future* (2015). https://www.toyota-europe.com/news/2015/hydrogen-future.

[38] Ford Media Center, *Ford Opens Portfolio of Patented Technologies to Competitors to Accelerate Industry-Wide Electrified Vehicle Development* (2015). https://media.ford.com/content/fordmedia/fna/us/en/news/2015/05/28/ford-opens-portfolio-of-patented-technologies-to-competitors-to-.html.

[39] L. Contreras, *Patent Pledges*, Arizona State Law Journal, vol. 47 n. 3 (2013), p. 545.

[40] For a general analysis of the relationship between antitrust law and patent collaborations see T. M. Jorde; D. J. Teece, *Innovation and Cooperation: Implications for Competition and Antitrust*, Journal of Economic Perspectives, vol. 4 n. 3 (1990), pp. 75-96; B. Lundqvist, *Joint Research and Development under US Antitrust and EU Competition Law*, Edward Elgar, Cheltenham 2015. For a specific analysis of how antitrust law treats patent collaborations that address climate change see H. Burdette, *The Sustainability Paradox: A Competitive Case for Sustainability Agreements*, The George Washington Law Review, vol. 92 (2024), pp. 248-272; M. A. Carrier, *An Antitrust Framework for Climate Change*, Northwestern Journal of Technology and Intellectual Property, vol. 9 n. 8 (2011), pp. 513-532; D. C. Koga, *Teamwork or Collusion? Changing*

collaborations and private law. After all, private law, through its principles of contract law and property law, governs patent collaborations. At this point, a question arises: how can private law best accommodate patent collaborations?

To answer this question, the thesis's special part, consisting of Chapters three and four, explores the role of private law in enforcing patent collaborations, taking the legal systems of the United States and Germany as points of reference. Specifically, from a substantive perspective, Chapter three considers the role of default rules regarding patent co-ownership in R&D agreements and the applicability of contract law to patent pledges. From a procedural perspective, Chapter four analyses the relationship between public interest and permanent injunctions for green patent infringements. It will be argued that the possibility of a permanent injunction offers the patent owner a powerful tool to demand high royalties, thus discouraging patent collaborations.

Antitrust Law to Permit Corporate Action on Climate Change, Washington Law Review, vol. 95 n. 4 (2020), pp. 1989-2026.

Chapter 3

Private Patent Collaboration Tools and Prospects for Eco-Sustainable Development

3.1 Joint Developed Patents in Eco-Innovation

Given the modern technological landscape described above, individual action by companies is not enough to effectively promote green innovation. Indeed, green innovation, progressing through complementary patents that belong to different entities, requires common action between companies[1] and the signing of intricate patent pooling agreements. The latter enable multiple

[1] «The systemic […] and complex character of environmental innovations suggest that, to develop them, cooperation may be even more important than when it comes to introduce other types of innovations. […] Furthermore, to carry out a product that reduces environmental impacts is a rather complex task and often requires information and skills distant from the traditional knowledge base of the industry. Eco-innovations represent a technological frontier on which firms are still inexperienced and market and technological uncertainties increase as there are no widespread-accepted standards either in terms of specific technological solutions or of measures to evaluate the environmental performance of products and processes». V. De Marchi, *Environmental innovation and R&D cooperation: Empirical evidence from Spanish manufacturing firms*, Research Policy, vol. 41 n. 3 (2012), p. 615. «Complexity represents a fundamental issue of green innovations, being these the result of the integration and combination of several and heterogeneous technologies and knowledge resources». A. Messeni Petruzzelli et al., *Organizational factors and*

parties, without incurring huge transaction costs, to leverage each other's technologies for a common purpose,[2] as happens in research and development (R&D) collaborations.

In this regard, the study by Andomako et al. demonstrates that:

> […] providing support for R&D positively influences the transfer of green technology and the transfer of green technology acts as a mediator in the link between R&D support and sustainable innovation. Finally, […] the impact of green technology transfer on sustainable innovation is amplified when a firm is dedicated to upholding environmental ethics.[3]

The most successful outcome that an inter-firm R&D alliance should achieve is joint patenting. This is because joint patenting is the result of complex collaborations «wherein researchers from different firms interact face-to-face, exchange their ideas, and solve problems jointly»[4]. In many sectors, such as eco-sustainable innovation, empirical studies demonstrate a notable increase in joint patents resulting from collaborations between companies with varied

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technological features in the development of green innovations: evidence from patent analysis, Innovation, vol. 13 n. 3 (2011), p. 294.

[2] «Now, when exclusive IP rights are available over multiple, discrete complementary (and often minuscule) inputs, rather than over end products, exclusivity tends to "backfire". When the holders of IP rights over complementary items are more than two, the transaction costs required for their joint exploitations grow exponentially». M. Ricolfi, *The new paradigm of creativity and innovation and its corollaries for the law of obligations*, in P. Drahos; G. Ghidini; H. Ulrich (edited by), *Kritika: Essays on Intellectual property* (vol. 1), Edward Elgar Publishing, Cheltenham 2015, p. 165.

[3] S. Adomako et al., *Exploring the effect of R&D support, green technology transfer, sustainable innovation*, Sustainable Development, 2024, p. 9.

[4] C. Kim; J. Song, C*reating new technology through alliances: An empirical investigation of joint patents*, Technovation, vol. 27 n. 8 (2007), p. 469.

geographical locations. These data are explained by the need for complementary knowledge to innovate and by the fragmentation of patent ownership at a global level.[5]

From the above considerations it emerges that collaboration is the engine of green innovation. In this regard, the following critical reading is pertinent:

> Green collaborative innovation refers to a new organizational approach to green innovation in which green innovation entities cooperate and jointly develop. This approach can fully unleash the vitality of the "human resources, capital information, and technology" elements among innovation entities, promote the effective convergence of innovation resources and elements, achieve mutual benefit through innovation, and thereby enhance enterprise value and core competitiveness […]. Joint patent applications capture the output of enterprise collaborative innovation.[6]

From a private law perspective, a joint patent is co-owned by multiple inventors who contributed to the final invention. The rights and obligations of co-owners of joint patents are often governed by private ordering agreements. There are several key points to consider in an agreement governing joint developed patents, such as: the right of co-ownership on the joint patent, the right to exploit the invention by each co-owner, the ability of each party to grant licenses, the identification of the person entitled to bring infringement actions. Given their complexity, they can cause conflicts between the parties and are therefore often not feasible. In the absence of a specific agreement, the default rules of each jurisdiction in which the related patent is registered apply. If the parties do not initially contractually establish their own rules, they can do so at any time, even

[5] See E. Gonçavales et al., *Green technology co-patenting networks: international dynamics*, Quality & Quantity, vol. 57 (2023), pp. 1603-1627.

[6] J. Lian; X. Huang; X. Wu, *How green bonds promote firms' green collaborative innovation?*, Corporate Social Responsibility and Environmental Management, vol. 31 n. 6 (2023), pp. 6-7.

after the patent has been granted. Consequently, the default rules are applicable when the parties do not contractually establish rules that differ from the discipline provided by law to any case of patent co-ownership, including that of joint development, which characterizes eco-sustainable innovation. In such cases, the presence of jointly developed patents within a legal system is influenced by the default rules.[7]

From a green perspective, it is necessary to pay attention to how the default rules define the right to grant non-exclusive licenses of the shared green patent to third parties, because this tool is essential to best exploit its environmental benefits. Indeed, the importance of the non-exclusive license is in fact that it makes the invention potentially accessible to multiple licensees, creating a wide area of application. On the contrary, the exclusive license allows only one licensee to commercially exploit the technology. As evidence of this, the following critical reading is worthy of note:

> One may, however, mention a particular risk that comes with exclusively licensing a technology with potentially large social and environmental impact to a specific company. If the technology has potentially multiple applications to benefit society, but the exclusive licensee

[7] «Given the complexity and uncertainty surrounding joint patenting, it is rational for the companies to obtain co-owned patents in a situation where they will find effective patent protection». J. Hagedoorn, *Sharing intellectual property rights – an exploratory study of joint patenting amongst companies*, Industrial and Corporate Change, vol. 12 n. 5 (2003), p. 1046. «The difference in patent law of each country influences the activities of enterprises for the joint R&D in such countries and accordingly influences the number of the joint patent application of the enterprises». T. Hashimoto; Y. Tanaka; A. Adrian, *Managing joint R&D: an investigation into joint patent applications in Japan, US and Europe*, International Journal of Technology Transfer and Commercialisation, vol. 11 n. 3 (2012), p. 141. See also A. Fosfuri; C. Helmers; C. Roux, *Shared Ownership of Intangible Property Rights: The Case of Patent Coassignments*, Journal of Legal Studies, vol. 46 n. 2 (2017), pp. 339-369. A. Gorbatyuk, *The allocation of patent ownership in R&D partnerships: default rules v. contractual practices*, SCRIPTed, vol. 17 (2020), pp. 4-53.

uses only one or few of them, the technology is prevented from unfolding its full potential impact.[8]

In this regard, the following section aims to critically examine the default rules relating to the grant of non-exclusive licenses of joint patents in the United States and Germany, which adopt different approaches to this issue. The United States adopts the most flexible model compared to other national legal systems. Indeed, an *ad hoc* discipline attributes to each co-owner the full freedom to grant non-exclusive licenses, without affecting the other co-owners. Instead, in Germany the default rules on co-ownership of patents do not constitute an *ad hoc* discipline as in most national legal systems, but are regulated by civil law, i.e. the co-ownership of tangible and intangible propriety is regulated by the same provisions. This critical analysis of the distinctive features of the two default rules models, especially focused on the rules relating to the granting of non-exclusive licenses to third parties, is useful for understanding what effects they produce on the creation and circulation of green joint patents.

3.2 Patent Co-ownership in the United States and Germany

The U.S. provisions on joint patents are contained in Title 35 of the U.S. Code. Many of them have been implemented by case law over the years. For their critical analysis, the starting point is the concept of joint patent. This means that there are at least two different applicants who have jointly applied for the patent. In this regard, Section 116, paragraph a), states:

[8] P. Vimalnath et al., *Intellectual property strategies for green innovations – An analysis of European Inventor Awards*, Journal of Cleaner Production, vol. 377 (2022), p. 11.

> (a) Joint Inventions. When an invention is made by two or more persons jointly, they shall apply for patent jointly and each make the required oath, except as otherwise provided in this title. Inventors may apply for a patent jointly even though (1) they did not physically work together or at the same time, (2) each did not make the same type or amount of contribution, or (3) each did not make a contribution to the subject matter of every claim of the patent.

More specifically, the joint applicants are co-owners of the joint patent and each of them has undivided ownership of the entire patent. In this context, the U.S. legal system, particularly attentive to protecting private property, allows each joint owner to act independently from the others, unless there are agreements to the contrary. More specifically, Section 262 establishes that:

> In the absence of any agreement to the contrary, each of the joint owners of a patent may make, use, offer to sell, or sell the patented invention within the United States, or import the patented invention into the United States, without the consent of and without accounting to the other owners.

Thus, under Section 262 of Title 35 of the U.S. Code, each co-owner is permitted to exploit the patent independently. Case law makes it clear that there is a right to grant a non-exclusive license to third parties without having to obtain consent from the other co-owners[9] and without the

[9] « [A co-owner] may make use of and sell specimens of the patented invention and may license others to do so; and neither he nor his licensees can be enjoined from a continuance in so doing». *Talbot v. Quaker State Oil Ref. Co.*, 28 F. Supp. 544, 548 (W.D. Pa. 1938). « […] a co-owner of a patent can even grant a license to a third party without consent of the other owners». *Willingham v. Star Cutter Co.*, 555 F.2d 1340, 1344 (6th Cir.1977). « […] unless the co-owner has given up [its] rights through an "agreement to the contrary", the co-owner may not be prohibited from exploiting its rights in the patent, including the right to grant licenses to third parties on whatever conditions the co-owner chooses». *Schering Corp v. Roussel-UCLAF SA*, 104 F.3d 341, 344 (1997).

need to share the license income with them. This provision is unique in the world, both in the tradition and outside, as in Asian jurisdictions.

In the United Kingdom, for example, Section 36(3)(b) of the Patents Act (1977) states that a co-owner cannot grant a joint patent license without the consent of the other co-owners. The same is true in Australia, as provided by Section 16(1)(a) of the Patents Act (1990). In Canada, this issue is governed by case law. In *Forget v. Specialty Tools of Canada Inc.* (1995), the Court of Appeal of British Columbia stated that a co-owner cannot, without the consent of the other co-owners, grant a joint patent license to third parties because it would have the effect of diluting their rights.[10]

In this sense, civil law systems are in line with common law systems, as demonstrated, for example, by the Article XI 49 § 1-2 of the Belgian Code of Economic Law. This states that in the absence of a different agreement among co-owners; no one is authorized to grant any type of license to third parties without the consent of all the others.[11]

The same logic can be found in non-Western contexts, as demonstrated by Article 99, paragraph 4, of the South Korean Patent Act[12] and Article 73, paragraph 3, of the Japanese Patent Act.[13]

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[10] *Forget v. Specialty Tools of Canada Inc* (1995) 62 CPR (3d) 537, para 20.

[11] Similar *ad hoc* regulations can be found in other European systems. See, for example, Article 66, paragraph 2, of the Dutch Patent Act or Article 72, paragraph 3, of the Spanish Patent Act.

[12] «Where a patent right is jointly owned, an owner may not grant an exclusive license or a non-exclusive license of the patent right without the consent of the other owners». https://wipolex-res.wipo.int/edocs/lexdocs/laws/en/kr/kr041en.pdf.

[13] «If a patent right is jointly owned, no joint owner may establish an exclusive license or grant a non-exclusive license on the patent right to any third party without the consent of all the other joint owners». https://wipolex-resources-eu-central-1-358922420655.s3.amazonaws.com/edocs/lexdocs/laws/en/jp/jp262en_1.pdf.

In summary, the most common position among the different patent systems is to allow the granting of a joint patent license by the co-owner, exclusive or non-exclusive, only with the consent of all the co-owners. Therefore, such models provide veto power for each co-owner and are consequently called veto-power systems.

Some similarities with the U.S. model can be found in China and France, especially regarding the freedom of each co-owner to grant a non-exclusive license of the joint patent.

Article 14 of the Chinese Patent Law establishes:

> Where the co-owners of a patent application or patent have concluded an agreement on exercising of the right, the agreement shall apply. In the absence of such agreement, any co-owner may independently exploit the patent or license another party to exploit the patent through non-exclusive license; any fee for the exploitation obtained from licensing others to exploit the patent shall be distributed among the co-owners. Except for the circumstances as provided in the preceding paragraph, a jointly owned patent application or patent shall be exercised with the consent of all co-owners.[14]

Article L. 613-29, point (c), of the Code de la propriété intellectuelle in France provides:

> c) Each of the joint owners may grant to a third party a non-exclusive licence to exploit the invention for his own benefit, subject to equitable compensation of the other joint owners who do not personally exploit the invention or who have not granted a licence to exploit it. In the absence of an amicable agreement, such compensation shall be fixed by the court.[15]

[14] https://www.unitalen.com.cn/xhtml/report/16124419-1.htm.

[15] https://french-business-law.com/french-legislation-art/article-l613-29-of-the-french-intellectual-property-code/.

In both China and France, the freedom of each co-owner to grant a non-exclusive license to the joint patent is counterbalanced by the burden of attributing compensation to the others. This burden, however, is not found in the U.S. legal system.

The high level of freedom typical of the U.S. model is explained by the maximum valorization of the individual position of each co-owner of the joint patent, as traditionally supported by federal jurisprudence. In *Blackledge v. Weir & Craig Mfg. Co.* (1901), for example, the Court of Appeal for the 7th Circuit stated that:

> There can be no accountability on […] a part owner […] to other owners for profits made by the exercise of his individual right, whether it be by engaging in the manufacture and sale, or by granting to other licenses, or by assigning interests in the patent. His use of the invention in any lawful way is not an appropriation of anything which belongs to another. The separate rights of the other owners remain unaffected. They are equally free to use the invention in all legitimate ways for their individual profit.[16]

However, while U.S. courts recognize the co-owner's right to grant a non-exclusive license of the joint patent, «this right to license does not extend to the granting of an exclusive license by one of the co-owners without the consent of the other owner or owners».[17] Indeed,

> it is clear that one of the patentees can not grant what does not belong to him, and if he gives a license or makes a contract for the use of the thing patented, he can only grant that which he has himself […], namely, the right to sell or use thing patented.[18]

[16] *Blackledge v. Weir & Craig Mfg. Co.*, 108 F. 71 (7th Cir.1901), 76.

[17] L. Heng Gee, *The default rules relating to joint ownership of patents pitfalls for the unwary*, Pertanika Journal of Social Sciences & Humanities, vol. 22 (2014), p. 57.

[18] *Dunham v. Indianapolis & St. Louis R.R. CO.*, 8 F. Cas. 44 (C.C.C.N.D. III. 1876).

Moreover, this idea is in line with the original rationale founding the discipline of intellectual property in the United States. For example, James Madison, in 1788, two years before the promulgation of the Patent Act (1790), wrote about patents that «the public good fully coincides […] with the claims of individuals».[19]

In Germany, statutory rules regarding ownership of patents, trademarks and utility designs only provide for the possibility of joint ownership. For example, Section 6 of the German Patent Act (PatG) states that «if two or more persons have jointly made an invention, the right to the patent belongs to them jointly».[20] Instead, the joint ownership of a copyright is regulated by an *ad hoc* provision, namely Section 8 of the German Copyright Act (Urheberrechtsgesetz – UrhG).[21] Due to the lack of a specific intellectual property law, the principles of general civil law contained in German Civil Code (BGB) apply to the co-ownership of the patent, unless there are agreements between the parties. Since co-owners of joint intellectual property form a fractional community similar to condominium co-owners (Gemeinschaft nach Bruchteilen), Sections 741-758 BGB, which are dedicated to co-ownership in general (Gemeinschaft nach Bruchteilen),[22] do not only apply to joint ownership of tangible goods, but also to joint ownership of patents, trademarks and utility designs.

In this context, the granting of non-exclusive patent licenses to third parties is somewhat controversial. Section 743(2) BGB provides that, where there is joint ownership of things in general, each co-owner may use the property in such a way as not to impair the joint use of the other co-owners. However, given the intangible nature of the patent, it is difficult to identify which

[19] J. Madison, *The Federalist Papers*, n. 43, 1788.

[20] https://www.gesetze-im-internet.de/englisch_patg/englisch_patg.html.

[21] https://www.gesetze-im-internet.de/englisch_urhg/englisch_urhg.html.

[22] https://www.gesetze-im-internet.de/englisch_bgb/englisch_bgb.html.

forms of individual use can impair the rights of the others, thus making the consent of the latter necessary.[23] The prevailing doctrine includes licensing activity in this class of cases: since the granting of any kind of license can reduce the benefit of the patent for other co-owners, the license requires unanimous consent. In this regard, the following critical reading is interesting:

> Each part-owner is authorized to use the joint invention only to the extent that the use by other part-owners is not impaired. Notably, however, "use" of the invention does not encompass licensing of the invention, which would therefore require approval by the other part-owners in accordance with § 747 S. 2 BGB. In the case of a "community of joint owners" (Gesamt-handsgemeinschaft), all part-owners need to agree on the modus of exploitation of the joint invention.[24]

However, there are different opinions according to which the majority of co-owners can prevail over the minority in deciding on the grantability of the joint patent license.[25] In the absence of an agreement between the parties, § 745 (2) BGB allows each co-owner to request that the administration of the property be carried out in the interests of all parties according to their

[23] « […] it is difficult to establish when such an impairment is likely, in view of the non-material nature of the invention and because this means that the own use by a part owner does not per se exclude the use of the invention by other part members». M. Haedicke; H. Timmann, *Patent Law: A Handbook on European and German Patent Law*, C. H. Beck, Berlin 2014, p. 266.

[24] B. Banks et al., *Dealing with joint intellectual property ownership in the US and Germany*, DAIJV Newsletter, vol. 36 n. 2 (2011), p. 60. See also J. Feldges; B. Kramer, *Co-ownership of Patents under German Law*, Journal of Intellectual Property Law & Practice, vol. 2 n. 11 (2007), p. 748. R. Kraßer; W. Bernhardt, *Patentrecht: Ein Lehr – und Handbuch zum Deutschen Patent – und Gebrauchsmusterrecht, Europäischen und Internationalen Patentrecht*, §19, V. b) 9, C. H. Beck, Munich 2009.

[25] See P. K. Hess, M. Kobler, *Joint Intellectual Property Ownership in Germany*, Les Nouvelles, vol. 47 n. 4 (2012), p. 272.

reasonable discretion. Thus, each co-owner can ask the court to intervene if the refusal to authorize the granting of the license unreasonably affects the rights of all co-owners.

In comparison to the possibility of including the joint patent license among the acts requiring the consent of all co-owners, more significant doubts arise among scholars about the scope of the duty of compensation for the licensing of a joint patent. According to the jurisprudential interpretation of §743(1) BGB, each co-owner has the right to make her/his own return from the use of the property, without sharing the revenue with the others.[26] So, what happens to the proceeds of the joint patent license that, according to the prevailing legal literature, requires the unanimous consent of the co-owners? Most authors believe that a co-owner must account to the others for the licensing royalties in accordance with the license agreement. In the absence of the latter, the distribution of the shares will occur equally or in proportion to the shares of the joint patent.[27]

Considering this, legal literature constantly questions the adaptability of the general principles of civil law to the co-ownership of patents. For this reason, many authors express criticism for the lack of specific patent regulation in the German legal system that deals with the particularities of intangible property compared to tangible property. In addition, «the applicability of principles of general civil law gives a lot of leeway for the courts to apply the law on cases of joint ownership».[28] In light of this, the German default rules on co-ownership are characterized by

[26] See BGH X ZR 152/03 – *Gummielastische Masse II*.

[27] See A. Gorbatyuk, *The Allocation of Patent Ownership in R&D Partnerships: Default Rules v. Contractual Practices*, SCRIPTed, vol. 17 (2020), p. 25; P. K. Hess, M. Kobler, *Joint Intellectual Property Ownership in Germany*, Les Nouvelles, vol. 47 n. 4 (2012), p. 272.

[28] P. K. Hess, M. Kobler, *Joint Intellectual Property Ownership in Germany*, Les Nouvelles, vol. 47 n. 4 (2012), p. 272.

a lack of clarity, leading the parties to sign a private agreement. In this sense, Gorbatyuk's interpretation is enlightening:

> The German situation clearly shows that the fact that the co-ownership of tangible and intangible property is governed by the same provisions creates legal uncertainty. The existing provisions are not detailed and specific enough to govern the complex nature of intangible property. To increase legal certainty, similarly to other analysed jurisdictions, it would be desirable for Germany to adopt specialised default rules on patent co-ownership.[29]

As a result of this, most German commentators identify the system of patent co-ownership as falling within the category of veto-power systems. The American legal system, on the other hand, presents an undisputed originality at a global level, especially because it defines default rules that give each co-owner full freedom to grant a license of the joint patent. At this point, it is necessary to understand in which context there are default rules that are more likely to favor the creation of joint patents. As mentioned, the non-exclusive license enhances the potential of eco-sustainable technology because it encourages the diffusion of environmentally sound products and stimulates further progress in the field.

The U.S. system certainly gives greater freedom to each co-owner to grant non-exclusive licenses than veto-power systems. Veto-power systems lead to the so-called tragedy of the anti-commons because each co-owner can hinder the others from granting a license of the joint patent, causing its underuse.[30] In this sense, Heller appropriately writes:

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[29] A. Gorbatyuk, *The Allocation of Patent Ownership in R&D Partnerships: Default Rules v. Contractual Practices*, SCRIPTed, vol. 17 (2020), pp. 25-26.

[30] «As effective as these tactics may be, however, they also present ethical dilemmas because although it may protect a firm's current position in their industry, it does so at the possible expense of pursuing environmental innovations in more far-flung technological domains». D. I. Leyva-De La Hiz et al.,

> Usually, private ownership creates wealth. But too much ownership has the opposite effect – it leads to resource underuse […]. If too many owners control a single resource, cooperation breaks down, wealth disappears, and everybody loses.
>
> There has been an unnoticed revolution in how we create wealth. In the old economy, twenty or thirty years ago, you invented a product and got a patent […]. Today, the leading edge of wealth creation requires assembly.[31]

At the same time, however, the U.S. model raises questions. Since each co-owner is allowed to grant a license of the joint patent, each co-owner, to maximize her/his profit, tends to license the patent to more licensees than would be the case if all co-owners decided on the license.[32] In short, compared to veto-power systems, in the United States there is no risk of underuse of the joint patent, but rather the risk of overuse, as it happens in the tragedy of the commons. Thus, the competition in the market increases and the potential profits for each co-owner are reduced, leading to an inexorable reduction in joint patent development.[33] However, through empirical analysis, some studies demonstrate that in veto-power systems there is a propensity towards underuse of greater intensity compared to the inclination towards overuse in the tragedy of the commons. To understand the foundations of this assertion, the following critical reading is useful:

Innovating for good in opportunistic context: the case for firms' environmental divergence, Journal of Business Ethics, vol. 176 n. 4 (2022), p. 706.

[31] M. Heller, T*he Tragedy of the Anticommons: A Concise Introduction and Lexicon*, The Modern Law Review, vol. 6, 2013, p. 7. See also A. Fosfuri; C. Helmers; C. Roux, *Shared ownership of intangible property rights: the Case of Patent Coassignments*, Journal of Legal Studies, vol. 46 n. 2 (2017), p. 354.

[32] See R. P. Merges; L. A. Locke, *Co-ownership of Patents: A Comparative and Economic View*, Journal of the Patent and Trademark Office Society, vol. 72 n. 6 (1990), p. 592.

[33] See T. Hashimoto; Y. Tanaka; A. Adrian, *Managing joint R&D: an investigation into joint patent applications in Japan, US and Europe*, International Journal of Technology Transfer and Commercialisation, vol. 11 n. 3 (2012), p. 154.

> Clearly, there are important behavioral effects when anticommons property entitlements are created. Anticommons owners have a right to exclude others and a right to veto any transformation of the common resource. The prerogatives of an anticommons owner are perceived as something that they "own", and psychological attitudes are triggered for the protection of such entitlement. No sense of "harm" is associated with one's exercise of the property right, even though others may suffer a possible economic prejudice. Commons users instead do not perceive their opportunity to use the commons as something that they own. When overexploiting a common resource, they fully realize that they are imposing an economic prejudice to others and partially restrain from such abusive behavior.[34]

Nevertheless, the problem of the tragedy of the commons remains in the U.S. model of default rules and therefore it is worth imagining possible solutions. Legal literature is involved in an interesting reflection on this topic. The starting point is the thought of William Callyhan Robinson, the first to apply the concept of the tragedy of the commons to shared property. He was an American academic and judge who became famous for founding the Columbus School of Law in Washington, as well as for his three-volume work published in 1890 *Law of patents for useful inventions*. In the latter he noted that in co-ownership situations outside patent law there are mutual obligations that induce the co-owners to restrain each other from excessive use. In particular, he connected the joint patent issue with the common pasture rights, finding in the latter there are some jurisprudential limits to the exploitation that are inexplicably not foreseen in the joint-patent co-ownership. He explained this through the following words:

> Although no exact similitude exists between a patent privilege and any other property, yet the resemblance which it bears to a common of pasture is sufficient to suggest a possible solution of the present question. Both the patent privilege and the common of pasture are to be

[34] S. Vanneste et al., *From "tragedy" to "disaster": Welfare effects of commons and anticommons dilemmas*, International Review of Law and Economics, vol. 26 (2006), p. 117.

> exercised within definite territory by specified means of enjoyment, and with a limited and determinable amount of profit. In both, the appropriation to himself, by one owner of more than his just share of such profit is an unjust invasion of the rights of the others, whether, in the one case, by the introduction of an excessive number of commonable beasts, or, in the other, by distributing the patent privilege to an increased number of […] licensees […]. Now the law finds no difficulty in regulating the rights and duties of commoners of pasture.[35]

Copyright law is another important area in which the U.S. legal system provides mutual limits between co-owners, especially as regards non-exclusive licenses. In copyright law, under Section 101 of Title 17 of the U.S. Code, a joint work is the result of the inseparable contributions of two or more authors. In the absence of a contrary agreement, they share equal and undivided ownership of the joint work. Each co-owner cannot proceed unilaterally to grant an exclusive license to third parties, but is allowed to grant a non-exclusive license to use the entire work. However, unlike patent law, this possibility is subject to the duty to pay the other co-owners their pro-rata shares of the related profit.[36]

This rule on copyright law has a jurisprudential origin and demonstrates greater flexibility in the protection of private property than patent law. Moreover, copyright law is characterized by limitations and exclusions, such as those underpinning open innovation and fair use, which undermine the exclusive idea of property. Instead, patent law is still linked to strong protection of

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[35] W. C. Robinson, *The Law of Patents for Useful Inventions*, Little Brown & Co., Boston 1890, p. 571.

[36] «A co-owner of copyright must account to other co-owners for any profits he earns from licensing or use the copyright, […] but the duty to account does not derive from the copyright law's proscription of infringement. Rather, it comes from "equitable doctrines relating to unjust enrichment and general principles of law governing the rights of co-owners" (*Harrington v. Mure*, 186 F. Supp. 655, 657-658. S.D.N.Y. 1960)». *Oddo v. Reis*, 743 F. 2d 630, 633 (9th Cir. 1984). «Each hav[e] an independent right to use or license the copyright, subject only to a duty to account to the other co-owner for any profits earned thereby». *Community for Creative Non-Violence v. Reid* F.2d 1485, 1489 (D.C. Cir. 1988). See also *Goodman v. Lee*, 78 F.3d 1007, 1012 (5th Cir. 1996).

individual privileges. In this sense, the case of *Blackledge v. Weir & Craig Mfg. Co.* (1901)[37] is emblematic, since, for the first time expressly, the federal judges addressed the issue of sharing profits in matters of joint patents. In this case, the judges excluded the mandatory division of profits arising from the use of the joint patent, arguing that the exploitation of the same by a co-owner does not prejudice the rights of the others. This logic was also extended to profits from joint patent licensing. Indeed, the ruling states:

> Use of the invention in any lawful way is not an appropriation of anything which belongs to another. The separate rights of the other owners remain unaffected. They are equally free to use the invention in all legitimate ways for their individual profits. Each is entitled to the fruits of his endeavors, taking no risk and expecting no reward from enterprises in which he does not choose to join. There is, therefore, no ground for the distinction instead upon between profits derived directly from the manufacture, use and sale of the patented article by the owner and profit derived by him from the sales of licenses.[38]

However, in subsequent cases there were judges who were skeptical about the appropriateness of this system. For example, in the decision of *Talbot v. Quaker-State Oil Refining Co.* (1939) the court said:

> Each joint owner is in a very real sense at the mercy of any other. Each of them may use or license to others to use the invention without the consent of his fellows, and without responsibility to such fellows for the profit arising from such use or license. This unlimited right to license other may, for all practical purposes, destroy the monopoly and so amount to an appropriation of the whole value of the patent.[39]

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[37] *Blackledge v. Weir & Craig Mfg. Co.* (1901), 108 F. 71 (7th Circ.).

[38] *Id.* at 77.

[39] *Talbot v. Quaker-State Oil Refining Co.* (1939), 104 F. 2d 967 (3rd Circ.), p. 968.

Given this skepticism, the possibility that the judges intended to reconsider this issue, perhaps also making use of comparative law, cannot be excluded. In this regard, it should be noted that the provision of a duty to account to the other co-owners for the granting of a non-exclusive license, as seen above, exists in China and France. in In France, in particular, in the absence of an agreement among the parties, the judge determines the amount of compensation *équitablement* to other co-owners «who do not personally exploit the invention or who have not granted a licence to exploit it». This could be an interesting starting point for the U.S. common law, which is strongly permeated by case law solutions based on reasonableness and fairness. In this regard, the following analysis of the French model it is noteworthy:

> The determination of compensation will embarrass judges who, under the law, have no other instrument than "équité". It emerges, however, from the preparatory work that the notion of "indemnité équitable" will have to consider what is attributable to the efforts of the exploiter. Everything that he personally directed to facilitate and increase the yield of the patent should not benefit those who remained passive and who did not show any interest in exploitation […].
>
> It should be recognized that the compensation system risks threatening the objective of the law by blocking the exploitation of the patent: the co-owner who wishes to exploit the patent will perhaps hesitate in the face of an indemnity whose amount he cannot know in advance. But the legitimate interests of those who are not in a position to exploit cannot be totally sacrificed in the face of concerns for efficiency [my translation].[40]

In conclusion, the full freedom to grant non-exclusive licenses, provided by the U.S. default rules, certainly offers companies a reason to collaborate with each other to create joint patents,

[40] M. A. Perot Morel, *La réforme de la coproprieté des brevets d'invention par la loi du 13 juiliet 1978*, SJ/G-I-13, 1981, note 39, p. 10. For further information see also P. Lauzon, *Le partage des profits entre copropriétaires de brevets: Un survol international – Une réponse pour le Québec?*, in *Les Cahiers de propriété intellectuelle*, vol. 21, 2009, pp. 144-147.

even if the risk of the tragedy of the commons could subsequently harm them. In the future, to overcome this issue, the federal judges could find a valid solution in the provision of a duty of accountability towards the other co-owners, similar to copyright. This change would be useful not only to preserve monopoly right in patent collaborations, but also from a green perspective: all co-owners of the green joint patent would derive advantage from the licenses granted by the each co-owner, the reluctance to engage in joint patents would be reduced and the granting of licenses would favor the exploitation of the benefits of the green joint patent in a concrete and large scale manner.

3.3 The Role of Patent Pledges in Eco-Innovation

Patent matters, as previously considered, have traditionally been oriented by legislators towards protective strategies, considered more effective in promoting innovation. On the contrary, more flexible logics have found application in other sectors of intellectual property, as demonstrated by open innovation in the field of copyright. Precisely, following this example, some private companies, driven by the intent to advance innovation, whether for philanthropic or economic reasons, such as the diffusion of one's own innovative technology on the market,[41] have tried to mitigate the patent monopoly by resorting to patent pledges. Tandale's words are enlightening:

[41] «The most common form of patent pledge is made in order to induce other market participants to do something. The action that the pledgor seeks to induce in others can vary, but is generally related to third parties' adoption of certain technology choices that are favored by the pledgor». J. L. Contreras, *Patent Pledges*, Arizona State Law Journal, vol. 47 (2015), p. 573.

> A patent is a mechanism which allows an inventor to have exclusive rights over the patented invention for a fixed period of 20 years. However, technology is developing rapidly and the invention not being in the public domain for such long time is bound to slow down technological development […].
>
> Companies wish to promote innovation while also retaining the exclusivity over their patented inventions. This is achieved by issuing a patent pledge, which is a promise by the company that legal action shall not be instituted against any party which uses its patents in accordance with the conditions in the pledge.[42]

Patent pledges are voluntary commitments made by patent owners to grant licenses of one or more patents, for limited or no compensation.[43] More specifically, the owners of such patents promise not to sue for infringement third parties who exploit them for innovation. Thus, they do not address specific counterparties, but the public. Therefore, patent pledges differ both from the voluntary assignment of patents to the public domain, since they do not affect the ownership of the pledged patents which remains with the original owners, and from patent pools, since they are intended to benefit potentially all third parties and not only the members of the patent pool.

[42] S. Tandale, *Patent Pledges: A Bridge Between Exclusivity Over Patented Inventions and Promoting Innovation*, Supremo Amicus, vol. 18 (2020), p. 842.

[43] In legal literature, some scholars believe that the exclusion of compensation is a fundamental component of patent pledges. See J. F. Ehrnsperger; F. Tietze, *Patent pledges, open IP, or patent pools? Developing taxonomies in the thicket of terminologies*, Plos One, vol. 14 n. 8 (2019).

Although some scholars find anticipatory forms,[44] patent pledges have become frequent since the early years of the 21st century. Initially, patent pledges were common in the software[45] and biotechnology[46] sectors, followed by their use in the green sector. As Awad comments:

> For decades, private sector firms negotiated different types of partnerships, joint ventures, and licensing agreements to obtain technologies held by others to bring new products to the market. However, the urgent need for green technology diffusion and the complexity of some technologies that are critical to addressing climate change has led to new collaborative structures and sharing of technologies that benefit both innovators and society at large. The "own and protect" model for intellectual property rights that dominated global markets evolved, in this area, gradually towards a "sharing and collaboration" model. These collaborative models of green technology innovation have been inspired by their successful implementation in other sectors, such as information and communication technology (ICT) and telecommunication.[47]

The main benefit of patent pledges is to facilitate the adoption of patented technology, lowering the related barriers to entry and increasing use.[48] Therefore, in the fragmented and

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[44] See J. M. Burnett, *The Host's Dilemma: Strategic Forfeiture in Platform Markets for Informational Goods*, Harvard Law Review, vol. 124 n. 8 (2011), pp. 1861-1938.

[45] Between 2004 and 2005, for example, a group of companies including Nokia, Novell, Sun, publicly announced that they would not enforce their patents against the use of the Linux operating system.

[46] In 2010, for example, Monsanto, a corporation that operated in the agrochemical and agricultural biotechnology sector, stated it would not sue farmers for patent infringement if traces of its patented seeds were present in a farmer's field inadvertently.

[47] B. Awad, *Patent pledges in green technology*, in J. L. Contreras; M. Jacob (edited by), *Patent Pledges. Global Perspectives on Patent Law's Private Ordering Frontier*, Edward Elgar, Cheltenham 2017, p. 86.

[48] G. de Rassenfosse; A. Palangkaraya, *Do patent pledges accelerate innovation?*, Research Policy, vol. 52 n. 5 (2023), p. 2.

complementary context of environmental innovation, patent pledges are extremely relevant because they lead technology owners to grant their patents for use in green innovation.

Legal literature, however, raises critical issues regarding the binding nature of patent pledges.[49] More specifically, unlike licensing agreements, patent pledges often do not qualify as binding contracts, revealing the pledgor's mere intention to encourage the exploitation of the pledged patent to promote innovation. Indeed, since almost all patent pledges have a public purpose, addressing the market in general and not reflecting negotiations between two or more defined parties, they seem to fall outside contractual obligations.[50] In these cases, the sole basis of the pledge lies in the pledgor's goodwill. Therefore, there is a risk that the pledgor may retract the pledge and undermine innovation.[51]

Given the generalist nature of many patent pledges, the contract law of a legal system may not apply to them. In this context, the following section considers whether contract law in the United States and Germany can enforce patent pledges.[52]

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[49] See J. L. Contreras, *Patent pledge enforcement theories*, in J. L. Contreras; M. Jacob (edited by), *Patent Pledges. Global Perspectives on Patent Law's Private Ordering Frontier*, Edward Elgar, Cheltenham 2017, pp. 101-116.

[50] See C. Maracke; A. Metzger, *Playing Nice With Patents: Do Voluntary Non-Aggression Pledges Provide a Sound Basis for Innovation?*, North Carolina Journal of Law & Technology, vol. 17 n. 3 (2016), p. 496.

[51] In this regard, Contreras speaks of the impermanence of patent pledges, highlighting the absence of legal consequences if patent holders retract their promise. See J. L. Contreras, *Patent Pledges*, Arizona State Law Journal, vol. 47 (2015), pp. 597-598.

[52] In this way, the intention of the section is to expand research already started by some scholars. See C. Maracke; A. Metzger, *Playing Nice With Patents: Do Voluntary Non-Aggression Pledges Provide a Sound Basis for Innovation?*, North Carolina Journal of Law & Technology, vol. 17 n. 3 (2016), pp. 483-514. C. Maracke; A. Metzger, *Voluntary patent pledges: enforcement in Germany*, in J. L. Contreras; M. Jacob (edited by), *Patent Pledges. Global Perspectives on Patent Law's Private Ordering Frontier*, Edward Elgar, Cheltenham 2017, pp. 137-148.

3.4 Patent Pledges Contractual Enforcement between the United States and Germany

In the United States, the legal authority for contract enforcement comes from statutory and common law. Many commercial transactions have clearly defined contractual remedies in the provisions of the Uniform Commercial Code (UCC) or in case law. Patent pledges are not currently subject to specific contractual regulation, and it is unlikely that they would qualify as contracts even under general provisions. Indeed, since in the United States the contract is a bilateral agreement characterized by mutual assent and bargain,[53] an irreconcilable distance can be found between «the contractual transaction (a direct bargain between two parties) and the more fluid and multilateral set of relationships that characterize patent pledges».[54] A mere promise cannot even be considered an implicit license if not accompanied by a series of parties' interactions capable of demonstrating the mutual agreement.[55] This is exemplified by considering the formulation of Tesla Motors' pledge under U.S. contract law. In this regard, Tandale appropriately writes:

> This pledge is an inducement inviting prospective licensees. It should not be misconstrued as an announcement of patents being licensed unconditionally.

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[53] This assumption can be deduced from the following definition: «Except as stated in Subsection (2), the formation of a contract requires a bargain in which there is a manifestation of mutual assent to the exchange and a consideration. (2) Whether or not there is a bargain a contract may be formed under special rules applicable to formal contracts or under the rules stated in §§ 82-94». *Restatement (Second) of Contracts* §17(1) (1981).

[54] J. L. Contreras, *Patent pledge enforcement theories*, in J. L. Contreras; M. Jacob (edited by), *Patent Pledges. Global Perspectives on Patent Law's Private Ordering Frontier*, Edward Elgar, Cheltenham 2017, p. 102. The same idea was already expressed in J. L. Contreras, *A Market Reliance Theory for FRAND Commitments and Other Patent Pledges*, Utah Law Review, vol. 2 n. 5 (2015), p. 503.

[55] See *De Forest Radio Tel. Co. v. United States*, 273 U.S. 236, 241 (1927).

> Whether or not the pledge is legally enforceable is unclear. In this case, it is safest to presume that it is legally actionable.[56]

Although U.S. contract law is not capable of making patent pledges binding, legal literature offers three solutions for their enforcement using some tools provided by contract law. In particular, they are useful when the promiser modifies or withdraws his promise in a non-transparent way, perhaps by obscuring the website containing it.

Firstly, scholars suggest the theoretical applicability of promissory estoppel, through which patent pledges can be enforced under U.S. contract law even if they do not qualify as contracts.[57] Thus, U.S. contract law reconciles a strict notion of contract with the flexible doctrine of promissory estoppel. The precise definition of the latter is contained in Restatement Second of Contracts §90(1):

> A promise which the promisor should reasonably expect to induce action or forbearance on the part of the promisee or a third person and which does induce such action or forbearance is binding if injustice can be avoided only by enforcement of the promise. The remedy granted for breach may be limited as justice requires.[58]

This definition of the doctrine of promissory estoppel has its origins in equity and concerns promises which have given rise to the prejudicial reliance of a third party, even in the absence of the typical characteristics of a common law contract, namely mutual assent and bargain. More specifically, there are three constitutive elements of the doctrine: 1) the nature of the promise should

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[56] S. Tandale, *Patent Pledges: A Bridge Between Exclusivity Over Patented Inventions and Promoting Innovation*, Supremo Amicus, vol. 18 (2020), p. 845.

[57] For example, see C. Maracke; A. Metzger, *Playing Nice With Patents: Do Voluntary Non-Aggression Pledges Provide a Sound Basis for Innovation?*, North Carolina Journal of Law & Technology, vol. 17 n. 3 (2016), p. 505.

[58] Restatement (Second) of Contracts §90(1) (1981).

reasonably induce the party to act or to forbear; 2) the party acts or forbears; 3) from such action or forbearance the party suffers unfair detriment.

Promissory estoppel aims to prevents the promisor from denying the existence of a contract for lack of consideration. Scholars, extending this theory to patent pledges, emphasize its applicability in the absence of a contractual framework, but point out some practical difficulties. For example, Contreras observes:

> Promissory estoppel is an attractive theory because it emphasizes the patent holder's reliance-inducing promise rather than a hypothetical bargain between parties. Estoppel thus overcomes many of the difficulties that contract doctrine faces in its application to patent pledges. Nevertheless, a claim of promissory estoppel requires a showing that the promisee actually and justifiably relied on the patent holder's promise, a requirement that is difficult to make in complex technology markets characterized by thousands of patents and dozens of patent holders.[59]

Exploring this last consideration, Maracke and Metzger recall some critical hypotheses in a fragmented and complementary context such as that of green innovation. More specifically, they write:

> What if the user was not aware of the patent or did not relate his product or service to the relevant patent claims? What if the user has purchased products that contain protected technology without his knowledge? Proving actual reliance may be challenging in such cases.[60]

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[59] J. L. Contreras, *A Market Reliance Theory for FRAND Commitments and Other Patent Pledges*, Utah Law Review, vol. 2 n. 5 (2015), p. 484.

[60] C. Maracke; A. Metzger, *Playing Nice With Patents: Do Voluntary Non-Aggression Pledges Provide a Sound Basis for Innovation?*, North Carolina Journal of Law & Technology, vol. 17 n. 3 (2016), p. 506.

So, Contreras proposes a solution capable of adapting the doctrine of promissory estoppel to the practical difficulties of fragmented and complementary technological innovation. More specifically, he elaborates the "market reliance theory", which he describes as follows:

> Under the market reliance theory, it is unnecessary for a manufacturer who seeks to enforce a patent pledge to prove that it specifically relied on the pledge made by a specific patent holder. It is enough that the patent holder made such a commitment to the market, and that the manufacturer is or becomes a participant in that market by manufacturing or selling a product that uses a standard or other common technology that is subject to patent pledges. Thus, like the rebuttable presumption of reliance in securities fraud cases, the law should recognize a rebuttable presumption of reliance in the enforcement of patent pledges based on market reliance.[61]

According to the above description, the main feature of the theory is to provide a rebuttable presumption of reliance that protects the implementer of the promised patent against the patent holder. This solution would create a solid basis for defending patent pledges against opportunistic behaviors of the patent holder.

Secondly, Contreras proposes another solution starting from the contract law: the establishment of a registration regime for patent pledges. In this regard, it should be considered that the registers are all over the world «the most common means of conveying information about property rights»[62] and that in the United States they originate from the Massachusetts Bay Colony's Recording Act of 1640.[63] With specific reference to patents, the U.S. Patent and Trademark Office

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[61] J. L. Contreras, *A Market Reliance Theory for FRAND Commitments and Other Patent Pledges*, Utah Law Review, vol. 2 n. 5 (2015), pp. 542-543.

[62] A. Bell; G. Parchomovsky, *Of Property and Information*, Columbia Law Review, vol. 116 (2016), p. 245.

[63] P. H. Marshall, *A Historical Sketch of the American Recording Acts*, Cleveland State Law Review, vol. 4 (1955), p. 65.

provides a voluntary registration system for patent transfers and licensing. In the first case, registration of a patent transfer is not necessary for the transfer to be valid, but it protects the purchaser of a patent against a subsequent purchaser of the same patent.[64] Instead, in the second case «patent licenses need not be recorded in order to survive against subsequent competing licenses».[65] The registration of patent pledges, probably voluntary in analogy to the above, could make the knowledge of the rights attached to a patent more exhaustive. In this way, although a registration system would not transform patent pledges into binding contracts, the latter would be less precarious than they are now. In this sense, Contreras writes:

> Once a pledge is registered, it should be date-stamped and "frozen" to avoid ambiguity regarding its scope at the time made. Of course, if a patent holder later wishes to change or retract such a pledge, the registry should not prohibit it from doing so, provided that such changes and retractions are similarly date-stamped and recorded, and all prior versions of the pledge remain publicly accessible.[66]

Thus, recording the original versions of such pledges and any amendments thereto, the registry would aim to establish a reliable public archive of patent pledges for evidentiary and reference purposes and discourage opportunistic behavior by patent holders, such as removing the patent pledge from the website to pursue patent enforcement actions.

Thirdly, Vu critically evaluates the application of Creative Commons to patents as an alternative to patent pledges.[67] Following open source, Creative Commons use copyright law to flexibly protect the numerous works covered by copyright. The concept of open source concerns

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[64] See 35 U.S. Code § 261.

[65] J. L. Contreras, *Patent Pledges*, Arizona State Law Journal, vol. 47 (2015), p. 602.

[66] *Id.* at 607.

[67] See S. Vu, *Pledging Patents Effectively: Copyright and Open Source as a Framework for Patent Pledges*, Colorado Technology Law Journal, vol. 14 n. 2 (2016), pp. 449-452.

in general software or other digital products freely available to anyone for use, modification and distribution. The Creative Commons system is a specific set of predefined licenses that allow digital content creators to grant the right to use of their work under certain conditions. Of course, there are many reasons that militate against the extension of such instruments from copyright law to patent law. In this regard, Vu writes:

> The high fees and length of time to get a patent reduces the number of patent applicants. On the other hand, copyright automatically attaches, has no direct fees or lengthy waiting times, and thus the pool of copyright holders is much larger. Essentially, everyone has copyrighted material, whether it is an email or a poem haphazardly written on a napkin.[68]

Nevertheless, a creative commons system regarding patents would reduce the uncertainty of patent pledges and avoid their dependence on the good faith of patent holders. In this way, patent holders, losing full control over their patents, would concretely demonstrate their intention to promote innovation.

Compared to the United States, and common law systems in general, the requirements for a binding contract under German contract law are less stringent (Sections 145-157 BGB). As seen, common law contract law requires the mutual consent of the contracting parties and bargain for the formation of a contract. German contract law, on the other hand, does not provide for a rule of consideration,[69] nor that acceptance be known by the offeror. These last two characteristics favor the recognition of patent pledges as contracts under German law.

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[68] *Id*. at 449.

[69] «German law does not require consideration for an offer to become binding. There is no real equivalent to the Anglo-American doctrine of consideration». J. Zekoll; G. Wagner (edited by), *Introduction to German Law*, 3rd edition, Wolters Kluwer, Alphen aan den Rijn, 2019, p. 226.

More specifically, patent pledges are covered by German contract law if they have a wording that demonstrates a clear intention of the pledgor to be legally bound (Geschaeftswille). The latter does not exist if the pledgor provides only basic information on technology, thus encouraging interested parties to simply make an offer (Schaunfester-beispiele).[70] In the study by Maracke and Metzger, reflecting on the hypotheses according to which patent pledges can constitute contracts, two solutions are proposed: the covenant not to sue, which in the German legal system assumes the procedural value of *pactum de non petendo*,[71] and the implicit patent license. More specifically, a *pactum de non petendo* is a mere procedural contract. It is a promise in which the patent holder simply declares that it will refrain from taking legal action against those who use the patented technology to promote innovation. If the wording, on the other hand, clearly reveals the characteristics of a patent license, such as the licensee's substantial right to use the patented inventions, this will amount to an implied patent license. Different legal effects will occur depending on which hypothesis applies. Essentially, a license is potentially binding on subsequent owners of the patent, while a *pactum de non petendo* binds «the parties to the settlement agreement and not, after the patented was transferred, the transferee».[72]

If patent pledges do not qualify as a binding contract under German Civil Code, Maracke and Metzger propose three solutions for their enforcement. The most feasible solution is based on the idea of extending to patent pledges the theory of simple consent that the German Federal Court

[70] C. Maracke; A. Metzger, *Playing Nice With Patents: Do Voluntary Non-Aggression Pledges Provide a Sound Basis for Innovation?*, North Carolina Journal of Law & Technology, vol. 17 n. 3 (2016), p. 501.

[71] For a comparison of the different legal nature of covenant not to sue under German law and U.S. law, respectively qualified as *pactum de non petendo* and as a non-exclusive license, see R. Hauck, *Rechtsnatur und-wirkungen eines covenant-not-to-sue nach deutschem und US-Patentrecht*, Zeitschrift für Geistiges Eigentum, vol. 5 (2013), pp. 203-229.

[72] C. Maracke; A. Metzger, *Playing Nice With Patents: Do Voluntary Non-Aggression Pledges Provide a Sound Basis for Innovation?*, North Carolina Journal of Law & Technology, vol. 17 n. 3 (2016), p. 503.

applied in the *Vorschaubilder I* case (2010) on copyright.[73] The case concerned thumbnail previews in Google's image search function in Germany. The Court ruled that if the image rights holder does not want to allow thumbnail previews, he or she must provide opt-out solutions to prevent indexing. Thus, the Court found an implicit consent to the thumbnail preview in Google's image search function since the image rights holders did not provide opt-out solutions. Such implicit consent is admissible according to the Court when the thumbnail preview function attributes to the user only the use of the image. Otherwise, if it attributes to the user a right, a declaration to be bound by the relevant owner is necessary. Furthermore, simple consent is revocable at any time, but, even if revoked, any action for patent infringement committed in the past is precluded. In other words, it is an "accepted use" of intellectual property theoretically applicable also to non-binding patent pledges, «because it belongs to the very nature of simple consent to be without any binding effect for the future and to be revocable at any time».[74]

The other two solutions are more difficult to implement. They are the unilateral waiver and the theory of *venire contra factum proprium*. A unilateral waiver in the world of patents is possible, but it must be in written form and submitted to the Patent Office (Section 20 PatG). Since patent pledges are often found on websites, this solution raises some problems.[75] The use of the doctrine of unilateral waiver in this context has not yet been tested by German patent jurisprudence.[76]

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[73] See BGH I ZR 69/08 – *Vorschaubilder I*.

[74] C. Maracke; A. Metzger, *Playing Nice With Patents: Do Voluntary Non-Aggression Pledges Provide a Sound Basis for Innovation?*, North Carolina Journal of Law & Technology, vol. 17 n. 3 (2016), p. 510.

[75] See C. Maracke; A. Metzger, *Voluntary patent pledges: enforcement in Germany*, in J. L. Contreras; M. Jacob (edited by), *Patent Pledges. Global Perspectives on Patent Law's Private Ordering Frontier*, Edward Elgar, Cheltenham 2017, pp. 143-144.

[76] The idea of interpreting patent pledges as unilateral waivers of patents has gained ground in copyright law especially after the *Mauer-Bilder* case (1995). In this ruling, the German Federal Court denied the authors of works of art on the Berlin Wall a share of the proceeds from the subsequent commercialization

The doctrine of *venire contra factum proprium* is an application of the general principle of good faith (Section 242 BGB). It prohibits a subject from contradicting previous behavior, especially when such previous actions have generated expectation in the other party, causing damage or unfair benefit. More particularly, the user of the pledged patent sued by the patent holder who publicly declared the non-assertion of her/his patents can rely on this doctrine.[77]

In light of this analysis, a significant fact emerges: the configuration of the contract law of a legal system determines relevant consequences with respect to the enforcement of patent pledges and therefore in relation to the possibility that the patent pledges concretely benefit innovation. Understanding what tool is provided by legal systems to enforce patent pledges, where contract law is unable to do so, is a critical activity for innovation in sectors where technology is complementary and ownership is fragmented, such as the green sector. In conclusion, making patent pledges reliable for innovators reduces the risk of litigation brought by patent holders for opportunistic reasons[78] and accelerates the pace of technological progress.

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of pieces of the Wall. Indeed, the German Federal Court stated that, although the copyright cannot be waived completely, since it is not fully transferable under Section 29 UrhG, a unilateral waiver of certain economic rights, such as the right of distribution, is permissible.

[77] See C. Maracke; A. Metzger, *Voluntary patent pledges: enforcement in Germany*, in J. L. Contreras; M. Jacob (edited by), *Patent Pledges. Global Perspectives on Patent Law's Private Ordering Frontier*, Edward Elgar, Cheltenham 2017, pp. 146-147.

[78] For example, if the patent pledge is not binding, the patent holder can sue for patent infringement only those innovators who use the pledged patent to produce technologies that threatened its commercial power.

Chapter 4

The Environmental Concern in Patent Infringement Remedies

4.1 Permanent Injunction, Discretionary Power, Proportionality and Public Interest

From the mid-20th century, public interest gradually began to acquire space in private law. Public interest concerns the needs of the community and is also pursued by the state through a limitation of property rights.[1] Public interest aspires to the well-being of the public in general and expresses non-economic values. In this regard Bozeman writes:

> In a particular context, the public interest refers to the outcomes best serving the long-run survival and well-being of a social collective construed as a "public" […].
>
> While the definition may seem to have much in common with utilitarian ("greatest good for the greater number") theories of the public interest, it is not fundamentally utilitarian. The fact that survival is privileged in this definition undercuts some bases of utilitarianism.

[1] For further information on the concept of public interest in private law see L. Tichy; M. Potacs (edited by), *Public Interest in Law*, Intersentia, Cambridge 2021.

> Similarly, the focus on the long run and on the social collective as a whole (rather than majority) presents some departure from utilitarian theories.[2]

Patent matters are also starting to consider non-economic interests. In this context, much has been written about compulsory licenses that limit patent exclusivity for extraordinary reasons. However, little has been said about the strong protection that patent law, through the instrument of the injunction, provides for the patentee, even in the presence of significant non-economic reasons militating against enforcement. In this regard Hoyng writes:

> Patent law evolved from a specialism for a selected group of people to a domain which holds the attention of society at large. Consequently, it became more and more apparent that the automatic injunction was not a desirable solution in all circumstances and could, in certain circumstances, be an impediment instead of an incentive for further innovation and/or stifle competition in an unacceptable way.[3]

The patent injunction constitutes a remedy for patent infringement and can have a permanent or interlocutory or preliminary nature, depending on whether it is granted before or after the ascertainment of patent infringement. In Italy, for example, the two forms of injunction are reflected in Articles 124 and 131 of the Industrial Property Code. The grant of a permanent injunction occurs almost automatically upon ascertainment of a patent infringement. Instead, with reference to a preliminary injunction, the profile of the *periculum in mora* leads the judge to carefully examine the circumstances of the specific case. With regard to permanent injunctions, there is a widespread belief in jurisprudence that in this way it is possible to preserve patent

[2] B. Bozeman, *Public Values and Public Interest: Counterbalancing Economic Individualism*, Georgetown University Press, Washington 2007, p. 12.

[3] W. Hoyng, *Foreword*, in L. Dijkman, *The Proportionality Test in European Patent Law. Patent Injunctions Before EU Courts and the UPC*, Hart Publishing, Oxford 2023, p. VII.

exclusivity, which is fundamental from the utilitarian perspective of encouraging technological innovation. Moreover, the almost automatic granting of the injunction discourages infringement and induces those who intend to innovate through the use of technology subject to existing patent rights to conclude licensing agreements with the relevant patentees. In this sense Cogo writes:

> The general assumption seems to be that a court reaching a finding of infringement must also grant injunctive relief, if requested to do so, unless the patent has expired or infringement has definitively stopped. Intent or fault by the infringer and harm caused to the rights owner are not required, considering the preventive function of this remedy.[4]

However, the flexibility of the injunction is based on Article 7 of the TRIPS Agreement, which attributes to intellectual property the function of contributing to innovation and technological diffusion, creating a mutual advantage between inventors and users, in a perspective of overall social and economic benefit.[5] To achieve this aim, States are required to: a) guarantee a competitive environment that allows patent holders to recover their investments; b) avoid the unsustainable costs that fall on society. Indeed, through the right of exclusivity, functional to rewarding the inventor, and consequently to benefiting society from continuous technological progress, patent law imposes an artificial scarcity, making inventions accessible only after the conclusion of specific licensing agreements. When the monopoly right prevents the use of intellectual resources, however, the mutual advantage between inventors and users is undermined and careful balancing becomes necessary. Antitrust regulations recognize the need for this balance. More specifically, when due to

[4] A. Cogo; M. Ricolfi, *Italy*, in J. L. Contreras; M. Husovec (edited by), *Injunctions in Patent Law. Trans-Atlantic Dialogues with Flexibility and Tailoring*, Cambridge University Press, Cambridge 2022, p. 204.

[5] Article 7 of the TRIPS Agreement (Objectives): «The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations».

the structure of the market or the technical characteristics of the invention there are no alternative products accessible to consumers, the enforcement of the relevant patent can constitute an abuse of a dominant position. Dijkman writes in this regard:

> In theory at least, this incentive is provided by (the prospect of) market exclusivity, guaranteed by a property right to the underlying invention. Several consequences attach to fostering innovation through property rights and not, as has been done through history, through state-awarded prizes, privileges or other non-property systems. First, the patentee's reward in monetary terms is determined by the market. There are many examples where a patent on sought-after technology made its holder fabulously rich, but many more where, four various reasons, the technology could not be marketed successfully and the patent yielded its holder no benefits. Second, other wishing to use the patented technology may do so only with the patentee's consent. Conditions for use of patented technology are thus set by private actors through bargaining processes, and not by courts or government officials. Third, to enable these two mechanisms, patents enjoy protection as property rights under national constitutions as well as Article 17(2) in the EU's Charter of Fundamental Rights (CFR).[6]

Although commercial law protects free competition as the optimal market situation for the economic development of the patent system, it does not consider other interests such as those relating to the community. Thus, the social development that the patent system is supposed to pursue under Article 7 of the TRIPS Agreement is overlooked.

[6] L. Dijkman, *The Proportionality Test in European Patent Law. Patent Injunctions Before EU Courts and the UPC*, Hart Publishing, Oxford 2023, p. 16. Note that these considerations are included by the author in an in-depth analysis of the European system. However, they also are relevant beyond European borders.

The Italian trend also characterizes other legal systems, both civil law and common law.[7] The inclination to issue permanent injunctions for patent infringement leads to valorizing only the interests of the owner of the infringed patent,[8] unless an abuse of a dominant position can be established.[9] Instead, non-economic general interests possibly involved in patent infringement are considered sufficiently protected outside of patent infringement litigation, especially by compulsory licensing systems.[10] So, what role do non-economic of public interest factors play in the granting of final injunctions? Since most legal systems share a utilitarian perception of patent issues, they are not often taken into account. However, in this context further investigation is needed.

[7] «More generally, there is a tendency to exclude the need for a concrete balancing of interests. This applies to Italy and is assumed to also apply to civil law countries, but, if you look at the law practiced, it tends to apply to common law systems as well» [my translation]. P. Fabbio, *La proporzionalità dell'inibitoria per violazione di diritti di proprietà intellettuale*, Rivista di diritto industriale, vol. 70 (2021), p. 159.

[8] «To protect that exclusivity and to maintain patent system's ability to provide incentives for invention and innovation, patentees are equipped with a set of remedies, which among others include permanent injunctions. In most national patent laws, mere unlawful use of patent suffices for granting injunctive relief». R. Sikorski, *Permanent Injunctions in Patent Law – In Search of Flexibility*, in R. Sikorski (edited by) *Patent Law Injunctions*, Kluwer Law International, Amsterdam 2018, p. 374.

[9] See for example *Huawei v. ZTE*, decided by the Court of Justice of the European Union in 2015. The Court concluded that, to avoid the violation of Article 102 TFEU, the owner of a SEP patent, bound by a FRAND commitment, must confront the alleged infringer before carrying out an infringement action. If the latter expresses the desire to stipulate a FRAND licensing contract, it is up to the patent owner to formulate the contract proposal.

[10] See for example the ruling of the Dutch Supreme Court relating to the *Boehringer Mannheim/Kirin Amgen* case (HR 1995), where in paragraph 3.7 it is written that «the protection of the interests of third parties, such as patients, should not be achieved by permitting patent infringement» [my translation].

The legal systems present a formal difference depending on whether they belong to the civil law tradition or to the common law tradition.[11] In civil law systems, the automatic granting of the injunction is justifiable on the basis of the proprietary nature of the patent. Indeed, if the exclusivity of the patent is violated, the legal system must intervene to prevent the continuation of this violation, as there is no discretion for the judge. Instead, in common law systems the injunction constitutes an equitable remedy. For this reason, it should be granted according to the discretion of the judge in the case of the inadequacy of remedies in law, such as pecuniary damages. Moreover, in the Anglo-American tradition the judge has a significant balancing power. Through this activity, the principle of proportionality has also been established in private law, and performs a moderating function between opposing interests.[12] Desaunettes-Barbero writes in this regard:

> From a legal perspective, whereas proportionality is a conceptual tool that originated from German public law, the notion has a counterpart that emerged in US private law jurisprudence, referred to as balancing. As a result of their different origins, the two concepts present certain analytical differences.
>
> In its public law conception, the proportionality test was developed to systematize the courts' constitutionality assessment of government interference with interests protected by a fundamental right […].

[11] See J. L. Contreras; M. Husovec (edited by), *Injunctions in Patent Law. Trans-Atlantic Dialogues on Flexibility and Tailoring*, Cambridge University Press, Cambridge 2022.

[12] See F. Bauer; B. Khöhler (edited by), *Proportionality in Private Law*, Mohr Siebeck, Tübingen 2023; D. Kennedy, A *Transnational Genealogy of Proportionality in Private Law*, in R. Brownsword et al. (edited by), *The Foundations of European Private Law*, Hart Publishing, Oxford 2011, pp. 185-220.

> Balancing on the other side, because of its development within the context of private law, is primarily aimed at resolving conflicts that might emerge between rights or interests of distinct individuals, according to the ultimate aim of a given legal system.[13]

In U.S. common law, the Supreme Court ruling in *eBay v. MercExchange* (2006) is the starting point. It is «a case that questioned several basic principles in patent enforcement that were considered well established for quite some time».[14] The ruling rejected the pre-existing logic of federal courts to almost automatically grant final injunctions. Rather, it established that to obtain a permanent injunction the owner of the infringed patent must demonstrate that the so-called four-factor test is satisfied. Therefore, the judge is required to decide based on a balance of the circumstances involved. On the other hand, a categorical refusal of the injunction requested by the plaintiff is not permitted.[15]

To understand the *eBay v. MercExchange* revolution, it becomes necessary to delve deeper into one aspect. Considering that «the origin of the plaintiff's substantive right – be it constitution, statute, or common law – affects the judge's equitable discretion»,[16] district courts cannot refuse to issue an injunction for violation of a right if required by statute. Indeed, the doctrine of separation of powers prevents the court from prevailing over the statute.[17] Thus, given that the Patent Act,

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[13] L. Desaunettes-Barbero, *Proportionality and IP Law: Toward an Age of Balancing?*, in F. Bauer; B. Khöhler (edited by), *Proportionality in Private Law*, Mohr Siebeck, Tübingen 2023, pp. 137-138.

[14] L. Van Dongen, *Proportionality and Flexibilities in Final Injunction Relief*, in A. Strowel et al. (edited by), *The Unitary Patent Package and Unified Patent Court: problems, Possible Improvements and Alternatives*, Ledizioni, Milano 2023, p. 357.

[15] See *eBay, Inc. v. MercExchange*, L.L.C., 547 U.S. 388, 394 (2006).

[16] D. Rendleman, *The Triumph of Equity Revised: The Stages of Equitable Discretion*, Nevada Law Journal, vol. 15 (2015), p. 1426.

[17] See Z. J. B. Plater, *Statutory Violations and Equitable Discretion*, California Law Review, vol. 70 (1982), p. 546.

contained in Title 35 of the U.S. Code, in Section 261 states that «patents shall have the attributes of personal property», especially the *ius excludendi alios*, according to the Federal Circuit, «this statutory right to exclude alone justifies its general rule in favor of permanent injunctive relief».[18] However, «the Patent Act itself indicates that patents shall have the attributes of personal property "subject to the provisions of this title", 35 U.S.C. § 261, including, presumably, the provision that injunctive relief "may" issue only "in accordance with the principles of equity", § 283».[19]

On the exercise of equitable discretion, the U.S. Supreme Court in *Virginian Railway Co. v. Railway Employees* (1937) said:

> The extent to which equity will go to give relief where there is no adequate remedy at law is not a matter of fixed rule. It rests, rather, in the sound of discretion of the court.[20]

Thus, starting from *eBay v. MercExchange*, exploiting the discretion of the district courts, an innovative jurisprudence has developed especially regarding public interest, one of the four factors. Although for years it has been stated that the public has a strong interest in an effective and reliable patent system, American courts and scholars, after *eBay v. MercExchange*, are starting to move away from this idea. In particular, the courts have extended the original focus of the public interest limited to public health and safety.[21] In many cases, they have enhanced the public interest factor to deny permanent injunction in other contexts, highlighting the broad social vocation of the public

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[18] *eBay, Inc. v. MercExchange*, L.L.C., 547 U.S. 388, 392 (2006).

[19] *Id*.

[20] *Virginian Railway Co. v. Railway Employees*, 300 U.S. 515, 551 (1937).

[21] «The Federal Circuit […] established a historical precedent of essentially granting injunctions automatically after a finding of patent infringement […]. The few exceptions to this presumption appear in medicine or public sanitation cases». P. A. Riley; S. A. Allen, *The Public Interest Inquiry for Permanent Injunctions or Exclusion Orders: Shedding the Myopic Lens*, Vanderbilt Journal of Entertainment & Technology Law, vol. 17 (2015), pp. 755-756. For example, see *City of Milwaukee v. Activated Sludge, Inc.*, 69 F.2d 577 (7h Cir. 1934); *Hybritech Inc. v. Abbott Laboratories*, 849 F.2d 1446 (Fed. Cir. 1988).

interest.[22] For example, in *z4 Technologies, Inc. v. Microsoft Corp.* (2006),[23] the jury found that Microsoft's software products infringed z4's patents and that the infringement occurred willfully. Nonetheless, the Eastern District Court of Texas, after using the four-factor test, rejected the request for a permanent injunction. From the point of view of public interest, in particular, the court found possible negative consequences for users if the permanent injunction was issued. In this regard, Sandrik writes:

> The court was strongly swayed by the size and influence of the parties involved in the litigation. Unlike the remand court of eBay, this court gave little attention to the fact that Microsoft was a willful infringer or that z4 was a practicing entity. The z4 court instead focused on the pervasive use of Microsoft's products; and perhaps at a surface level this is warranted.[24]

The Eastern District Court of Texas in deciding this dispute took its starting point from *eBay v. MercExchange*. By virtue of this ruling, the court said:

> A violation of the right to exclude does not inevitably lead to the conclusion that a patent holder cannot be adequately compensated by remedies at law such as monetary damages without first applying the principles of equity […]. Accordingly, z4 is not excluded from the use of its intellectual property in a way that cannot be calculated with reasonable certainty in the form of monetary damages […].[25]

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[22] See K. E. Sandrik, *Reframing Patent Remedies*, University of Miami Law Review, vol. 67 (2012), pp. 115-116.

[23] *z4 Technologies, Inc. v. Microsoft Corp*., 434 F. Supp. 2d 437 (E.D. Tex. 2006).

[24] E. Sandrik, *Reframing Patent Remedies*, University of Miami Law Review, vol. 67 (2012), p. 118.

[25] *z4 Technologies, Inc. v. Microsoft Corp*., 434 F. Supp. 2d 437, 442 (E.D. Tex. 2006).

This case demonstrated that, despite the predominance of the exclusive conception of patent ownership in the United States,[26] patent exclusivity was attenuated by liability rules, in line with what Calabresi and Melamed proposed in the famous 1972 study.[27] In other words, given the circumstances of the case, the judge can opt for a balance in which:

> It is no longer for the rights owner to decide who can use the subject matter protected and the appropriate price is not subject to market mechanisms but is instead fixed by the courts.[28]

More specifically, through numerous jurisprudential tailoring techniques, district courts have found a balance between the interests of the owner and the public interest. An example of this is the decision to delay the legal effect of the permanent injunction. This delay is intended to avoid the sudden blocking of the distribution of products manufactured from the infringed patent, being of interest to third parties.[29] This is evidenced by the decision in *Broadcom Corp. v. Qualcomm Inc.* (2008)[30], where the public interest was considered delaying, rather than denying, the issuance

[26] In the ten years since *eBay v. MercExchange*, district courts denied injunctions one out of four times, despite meeting the four-factor test. See C. B. Seaman, *Permanent Injunctions in Patent Litigation After eBay: An Empirical Study*, Iowa Law Review, vol. 101 (2016), pp. 1982-1983. In this regard, some articles in legal literature have interpreted the *eBay v. MercExchange* ruling as an obstacle to innovation. See K. J. Osenga, *The Loss of Injunctions under eBay: Evidence of the Negative Impact on the Innovation Economy*, Hudson Institute, (2024), pp. 1-8.

[27] G. Calabresi; A. D. Melamed, *Property Rules, Liability Rules and Inalienability: One View of the Cathedral*, Harvard Law Review, vol. 85 n. 6 (1972), pp. 1089-1128.

[28] See L. Desaunettes-Barbero, *Proportionality and IP Law: Toward an Age of Balancing?*, in F. Bauer; B. Khöhler (edited by), *Proportionality in Private Law*, Mohr Siebeck, Tübingen 2023, p. 145.

[29] J. M. Golden, *United States*, in J. L. Contreras (edited by), *Injunctions in Patent Law. Trans-Atlantic Dialogues with Flexibility and Tailoring*, Cambridge University Press, Cambridge 2022, pp. 304-306.

[30] See *Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683, 704 (Fed. Cir. 2008).

of the injunction. This is a way to give the infringer time before being inhibited from using the infringed patent.[31]

In the European context, the Directive on the enforcement of intellectual property rights 2004/48/EC (so-called Enforcement Directive) is fundamental. This legal act requires in Article 11 that national judicial authorities have the power to grant injunctions. Despite this, various indications from the European legislature lead Member States to adopt a more flexible perspective on injunctions. Although less explicit than the *eBay* ruling, the European Directive also shows a distancing from the automatic granting of injunctions for patent infringements. Indeed, the European legislator often refers to the profile of proportionality as a guiding criterion for protecting intellectual property in the presence of different interests.

After the Enforcement Directive, a particular reflection on proportionality began in the United Kingdom. Today this principle is part of English common law in the regulation of the means of protection of intellectual property. This is demonstrated, for example, by *Edwards Lifesciences LLC v. Boston Scientific Scimed Inc.* (2018), the High Court of Wales and England imposed a balance between the interest in protecting the exclusivity of the patent holder and the public interest in guaranteeing healthcare provision for patients.[32] Similarly, in *Evalve v. Edwards Lifesciences* (2020), again the High Court of Wales and England declared the possibility of a refusal or modulation of the injunction for reasons of public interest.[33] On this wavelength, although not in a structured way as in the U.S. four-factor test, the English courts identified proportionality as the tool for considering reasons of public interest in granting the injunction.

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[31] See K. J. Osenga, *What Happened to the Public's Interest in Patent Law?*, The Federalist Society Review, vol. 19 (2018), p. 202.

[32] *Edwards Lifesciences LLC v. Boston Scientific Scimed Inc.* [2018] EWHC 1256 (Pat).

[33] *Evalve Inc. v. Edwards Lifesciences* [2020] EWHC 513.

In the context of civil law, to mitigate the automatism of injunctions in the presence of public interest, there were some rare cases in which jurisprudence exalted proportionality in intellectual property law. For example, the *Bundesgerichtshof*, the Federal Court of Justice in Germany, in its decision in the 2016 *Wätermetauscher* (Heat exchanger) case, explicitly recognized that injunctions may also be subject to proportionality considerations.[34] Similarly, in 2021, the Court of Turin recognized the possibility for the judge to modulate the injunction in a case of ascertained patent infringement, by virtue of the principle of proportionality and the presence of reasons of public interest.[35] The Turin judge, in stating this, recalled the English case *Edwards Lifesciences LLC v. Boston Scientific Scimed Inc.* (2018) and ruling 9828/2019 of the Court of Milan. In the latter, concerning a dispute of misappropriation of trade secrets, it is written that the principle of proportionality pursuant to Article 124, paragraph 6, of the Industrial Property Code, allows the injunction to be modulated, from a temporal point of view to safeguard interests external to the patent dispute. However, compensation is reserved, also in relation to the grace period.

Despite this, compared to the common law tradition, especially in the United States, the flexibility regarding the automatic granting of injunctions in civil law countries is less intense. Indeed, while in the post-*eBay* U.S. system there is no longer a general rule that leads to the granting of a permanent injunction for patent infringement in the absence of extraordinary circumstances, it does exist in civil law countries. Thus, U.S. district courts balance all the circumstances in granting an injunction. The civil law judge, on the other hand, grants a permanent injunction for infringement of patent right, unless there are exceptional circumstances that justify a more

[34] Federal Court of Justice, 10 May 2016 (X ZR 114/13) – *Heat exchanger* case.

[35] The above proceeding is G. 10009/2020.

proportionate measure. Beyond that, there is an important technical profile to consider. Dijkman writes in this regard:

> It is worth noting that in the US, the patentee's claim to injunctive relief is typically considered a post-trial motion: parties file a supplemental briefing after the court and jury decide on validity of the claim and the infringement, occasionally resulting in a hearing dedicated to this subject alone. By contrast, proportionality is a remedial-stage defense that I expect very few European courts further take account of their much more limited access to evidence as compared to US courts, it is clear that properly assessing the real-world effects of an injunctions grant or denial is a fraught and time-consuming task.[36]

In this panorama, however, the German legal system presents a peculiarity. Indeed, the new version of the Section 139 (1) of the German Patent Act (Patentgesetz – PatG), which came into force in 2021, codified, for the first time in the civil law tradition, the principle of proportionality in relation to the order of an injunction.[37] However, as can be seen from the explanatory report of the law, the new version of Section 139 (1) PatG codifies a proportionality test already existing in the legal system. Such a provision served to overcome the jurisprudence's reluctance in relation to this test, providing an operational guide for its application. Outside of exceptional cases, the

[36] L. Dijkman, *The Proportionality Test in European Patent Law. Patent Injunctions Before EU Courts and the UPC*, Hart Publishing, Oxford 2023, p. 140.

[37] Differently, pursuant to Article 124, paragraph 6, of the Italian Industrial Property Code, introduced in 2006, the legislator recalls the principle of proportionality only in the imposition of civil penalties resulting from the permanent injunction. In this case, the legislator «evidently wanted to indicate two guiding criteria that the judge is required to respect in the application of the sanctions in question: 1) the principle of necessary proportionality between the seriousness of the violations ascertained and the sanctions to be imposed; 2) violation of the interests of third parties» [my translation]. C. Mirto, *Commento all'art. 124 c.p.i.*, in G. Ghidini; F. De Benedetti (edited by) *Codice della proprietà industriale. Commento alla normativa sui diritti derivanti da brevettazione e registrazione*, Il Sole 24 ore, Milano 2006.

explanatory memorandum highlights that the permanent injunction is the regular corrective of the German patent system and that the burden of proof of the disproportionate nature of the injunction falls on the infringer.[38] In any case, among the hypotheses of exceptional cases suggested by the legislator there are the interests of third parties. Regarding the scope of the latter according to the perspective of the German legislator, Fabbio writes appropriately:

> The terms "third party interests" and "public interest" are sometimes used interchangeably in this context. In any case, they signify interests (of identified individuals, of an entire category or properly public) different from those of the parties, and not immediately attributable to the assessments of general interest typical of patent law, essentially "external" interests [my translation].[39]

Precisely these "external" interests could be jeopardized by the patent monopoly. Indeed, the complementarity of green technologies could generate numerous patent infringement disputes and reduce their diffusion. Thus, it may appear reasonable to balance the permanent injunction against the need to encourage the concrete application of eco-sustainable inventions.[40]

Now, having recognized the existence of margins for a certain flexibility with respect to the granting of permanent injunctions in situations involving public interest considerations in both the U.S. and German legal systems, it is necessary to understand what space there is in the concept of

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[38] See Begr. RegE Bt-Drs. 19/25821, p. 53; P. Fabbio, *La proporzionalità dell'inibitoria per violazione di diritti di proprietà intellettuale*, Rivista di diritto industriale, vol. 70 (2021), pp. 192-193.

[39] P. Fabbio, *La proporzionalità dell'inibitoria per violazione di diritti di proprietà intellettuale*, Rivista di diritto industriale, vol. 70 (2021), p. 176.

[40] «A system that fosters both innovation and widespread diffusion of technology will be essential to harness the environmental benefits of green technology. Such a system requires a well-functioning legal regime of intellectual property (IP) that incentivizes innovation without creating undue obstacles to technological uptake». A. S. Fowler, *No Need to Reinvent the Wheel: The Positive Relationship Between Green Technology and Patent Enforcement*, Villanova Environmental Law Journal, vol. 35 (2024), p. 127.

the public interest for the protection of the concrete application of eco-sustainable inventions that infringe pre-existing patents. A valid starting point is Kwon's thought. He writes:

> The concept of "public interests" has been with us much longer than that of "environmental protection". And as it has been with us for so long and also used for so many disparate purposes, it has now become almost a barren concept […]. Coming to the rescue of the concept of "public interests" that has become so barren and expedient, the environmental concern provides it not only with necessary contextuality but also meaningful content […]. And furthermore, since our environmental concern today is not merely to keep the wholeness intact but to preserve an adequate level of quality of life within it, it is in essence the concern for the good of collective life. Within such definition of environment are logically included all the members of the relevant community, and by this definition, the concept of "public" is given a tangible systemic boundary.[41]

The objective set here is therefore to carry out a comparative law analysis which has so far received little attention in the literature.[42]

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[41] T. Kwon, *Environmental Concern and the Concept of "Public Interest"*, Journal of Environmental Studies, vol. 4 (1977), pp. 57-59.

[42] Legal literature, indeed, essentially focused on the flexibility demonstrated by legal systems with a view to protecting anti-monopoly reasons. See M. Chapter, *Injunctive Relief in Patent Cases in the U.S., Germany and Japan: Recent Developments and Outlook*, in T. Takenaka, *Intellectual Property in Common Law and Civil Law*, Edward Elgar, Cheltenham 2013, pp. 325-346; J. L. Contreras; M. Husovec (edited by), *Injunctions in Patent Law. Trans-Atlantic Dialogues on Flexibility and Tailoring*, Cambridge University Press, Cambridge 2022; V. Semenov, *Between exclusivity and flexibility: proportionality and permanent injunctions in German, English and U.S. patent disputes*, Journal of Intellectual Property Law & Practice, vol. 14 n. 12 (2019), pp. 942-948; M. Stierle, *Patent Injunctions – Identifying Common Elements*, Intellectual Property Journal, vol. 11 (2019), pp. 334-361.

4.2 From eBay v. MercExchange (2006) to the Environmental Interpretation of public Interest in U.S. Federal Case Law on Permanent Injunctions

Beyond scientific literature that aims to reform patent law through compulsory licensing for eco-sustainable technology[43] or by extending fair use to green patents,[44] post-*eBay* district court case law offers examples of a cautious attenuation of patent monopoly, in some cases favoring the concrete enforcement of infringed green patents.

In the United States, patent law is contained in Title 35 of the U.S. Code. Pursuant to Section 154(a)(1),[45] the content of patent protection is based on the right of exclusion. Among remedies for infringement, Section 283 provides that district courts may grant an injunction in accordance with equitable principles.[46] Despite this, however, in *Richardson v. Suzuki Motor Co.* (1989),[47] the Court

[43] For more information see R. Fair, *Does Climate Change Justify Compulsory Licensing of Green Technology*?, Brigham Young University International Law & Management Review, vol. 6 (2010), pp. 21-41.

[44] See S. Cayton, *The "Green Patent Paradox" and Fair Use: The intellectual Property Solution to Fight Climate Change*, Seattle Journal of Technology, Environmental & Innovation Law, vol. 11 (2020), pp. 214-245. For more information on the extension of fair use to patents see J. L. Miller, *Towards a Doctrine of Fair Use in Some of Patent Law*, Intellectual Property Brief, vol. 2 n. 3 (2011), pp. 56-63; M. A. O'Rourke, *Toward a Doctrine of Fair Use in Patent Law*, Columbia Law Review, vol. 100 n. 5 (2000), pp. 1177-1250.

[45] 35 U.S.C. § 154 U.S. Code. Contents and term of patent; provisional rights – (a) In General. (1) Contents. Every patent shall contain a short title of the invention and a grant to the patentee, his heirs or assigns, of the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States, and, if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States, or importing into the United States, products made by that process, referring to the specification for the particulars thereof.

[46] 35 U.S.C. § 283 U.S. Code. Injunction – The several courts having jurisdiction of cases under this title may grant injunctions in accordance with the principles of equity to prevent the violation of any right secured by patent, on such terms as the court deems reasonable.

[47] *Richardson v. Suzuki Motor Co, LTD*, 868 F.2d 1226 (Fed. Cir. 1989).

of Appeals for the Federal Circuit, which has jurisdiction over all patent appeals laid down a general rule.[48] It entailed the automatic granting of a permanent injunction once the validity and infringement of the patent had been ascertained. Only extraordinary health and safety circumstances were an exception.[49] Thus, the Court of Appeals for the Federal Circuit in *MercExchange v. eBay* (2005), recognized precedents in which district courts denied permanent injunctions for reasons of public interest other than economic ones as exceptional.[50] However, the reasons of public interest take on an unprecedented role after the judgment of the U.S. Supreme Court relating to *eBay v. MercExchange* (2006). Today they constitute an essential filter suitable for enhancing environmental issues as well. In other words, in the *eBay v. MercExchange* no green profiles directly emerged, but the ruling of the U.S. Supreme Court created fertile ground to give green issues a potential value in patent litigation. The case concerned an online sales system disputed between MercExchange and eBay, both companies being active in e-commerce. In particular, the MercExchange had held a patent since 1998 on a method of online sale of goods between private individuals with a central authority that guaranteed its supervision. eBay, after several unsuccessful attempts to stipulate a licensing agreement to exploit that patent, was sued by

[48] See H. C. Sung, *An Analytic Study on Permanent Injunction in Patent Litigations*, NTUT Journal of Intellectual Property Law Management, vol. 4 (2015), p. 3. S. A. Mota, *eBay v. MercExchange: Traditional Four-Factor Test for Injunctive Relief Applies to Patent Cases, According to the Supreme Court*, Akron Law Review, vol. 40 n. 13 (2007), p. 538. Although the precise expression "general rule" appears written for the first time in the *Richardson v. Suzuki Motor Co.* ruling, federal courts had previously recognized a consequentiality between patent infringement and injunctive relief. See *Rumford Chem. Works v. Hecker*, 20 F. Cas 1347 (C.C.D.N.J. 1876); *Elect. Smelting & Aluminium Co. v. Carborundum Co.*, 189 F. 710 (C.C.C. W.D. Pa 1900).

[49] See, for example, *City of Milwaukee v. Activated Sludge* (1934), in which injunction was denied avoiding leaving an entire community without means of disposing of wastewater.

[50] *MercExchange, L.L.C. v. eBay Inc.,* 401 F.3d 1323 (Fed. Circ. 2005).

MercExchange for its online auction system which allowed private individuals to carry out commercial transactions.[51]

The District Court for the Eastern District of Virginia did not grant the permanent injunction and the Federal Circuit Court of Appeals, upon appeal by MercExchange, affirmed the rule stated in *Richardson v. Suzuki Motor Co.* Subsequently, eBay successfully presented the petition for a writ of certiorari to the U.S. Supreme Court, asking it to define the adequacy of the general rule pronounced in *Richardson v. Suzuki Motor Co.*

The U.S. Supreme Court in *eBay v. MercExchange*, annulled the ruling of the Court of Appeals for the Federal Circuit and, more generally, «harmonized the manner in which permanent injunctions issue across the various bodies of law».[52] In this regard, the Court qualified the permanent injunction, like any other form of injunction, as an act of «equitable discretion».[53] The Court therefore underlined that, in accordance with the consolidated principles of equity, Section

[51] For further information on the controversy, it should be underlined that: «Founded by Pierre Omidyar in 1995 as Auction Web, the Internet site eBay achieved great success through its online auction system that permits private individuals to sell goods to the highest bidder or at a fixed price. Additionally, eBay owned Half.com, a subsidiary that operated a Web site specializing in instant sales of fixed-price goods. At the time of eBay's inception, the Federal Circuit Court of Appeals had yet to decide State Street Bank & Trust Co. v. Signature Financial Group, in which it held that business methods were patentable subject matter. This helps explain why eBay did not patent its online business method at its inception, which later led to its conflict with MercExchange. In 1998, the year of the State Street Bank decision, MercExchange was granted several business method patent applications, including a patent for an electronic market that allowed private individuals to sell goods to other private individuals through use of an electronic market, monitored by a central figure that would engender trust among users». J. C. Lopez, *Weapon of Mass Coercion: How eBay Inc. v. MercExchange, L.L.C. Eliminated the Threat of Coercive Automatic Permanent Injunctive Relief and Restored Balance to the American Patent System*, Oklahoma Law Review, vol. 60 n. 3 (2007), p. 612.

[52] N. A. Skop, *Patent Law: Four Factors to Injunctions in the Wake of eBay, eBay, Inc. v. MercExchange, L.L.C.,* Journal of Technology Law & Policy, vol. 12 (2007), p. 139.

[53] *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 389 (2006).

283 of the U.S. Code imposes the applicability of the four-factor test also for the permanent injunction.[54] Specifically, the burden is on the plaintiff to demonstrate that (1) he or she has suffered irreparable harm; (2) remedies available by law, such as monetary damages, are inadequate to compensate for such harm; (3) denial of a permanent injunction would cause more hardship to the patentee than granting it would cause the infringer; (4) the public interest would not be prejudiced by a permanent injunction. The interested party must demonstrate all the factors in order to hope to obtain the injunction.[55] Thus, the U.S. Supreme Court rejected the general rule of the Court of Appeals for the Federal Circuit issued in *Richardson v. Suzuki Motor Co*. The Court, indeed, stated that nothing in the Patent Act suggests the legislator's intention to move away from traditional regulation according to equity. Furthermore, the Court, in analogy with the approach of copyright law, affirmed:

> This approach is consistent with our treatment of injunctions under the Copyright Act. Like a patent owner, a copyright holder possesses "the right to exclude others from using his property" […]. Like the Patent Act, the Copyright Act provides that courts "may" grant injunctive relief "on such terms as it may deem reasonable to prevent or restrain infringement of a copyright." 17 U. S. C. § 502(a). And as in our decision today, this Court has consistently rejected invitations to replace traditional equitable considerations with a rule that an injunction automatically follows.[56]

[54] «The *W. S. Dickey* decision demonstrates that the eBay decision did not fashion a new test, but was the product of more than seventy years of stare decisis». J. C. Lopez, *Weapon of Mass Coercion: How eBay Inc. v. MercExchange, L.L.C. Eliminated the Threat of Coercive Automatic Permanent Injunctive Relief and Restored Balance to the American Patent System*, Oklahoma Law Review, vol. 60 n. 3 (2007), p. 608.

[55] See *Nichia Corp. v. Everlight Americas, Inc.*, 855 F.3d 1328, 1342 (Fed. Cir. 2017).

[56] *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 392-393 (2006).

Two concurring opinions were delivered in *eBay v. MercExchange*: one by Justice Roberts and one by Justice Kennedy. The first one was joined by Justices Ginsburg and Scalia. The second one was joined by Justices Breyer, Souter and Stevens. Both concurring opinions argued that the decision to grant or deny the injunction depends on the discretion of the district courts. The two concurring opinions propose two different views on the exercise of district courts discretion.[57] From Justice Roberts perspective, it is relevant that district courts consider the historical precedents of patent injunctions when exercising discretion. Justice Kennedy's concurring opinion implicitly demonstrates the need to rethink patent exclusivity. Indeed, he wrote that the application of the four-factor test in patent matters «is well suited to allow courts to adapt to the rapid technological and legal developments in the patent system».[58] Incisively, Justice Kennedy recognized a substantial change in conditions unknown to the historical tradition on which the general rule of the Court of Appeals for the Federal Circuit was based. More specifically, he noted the frequent complementarity between new technologies and previous ones, including eco-innovation.[59] Consequently, he recognized a recurring use of patent exclusivity for opportunistic purposes. This is also demonstrated today by the patent troll phenomenon in the eco-sustainable innovation.[60]

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[57] See L. Dijkman, *The Proportionality Test in European Patent Law. Patent Injunctions Before EU Courts and the UPC*, Hart Publishing, Oxford 2023, pp. 98-99; R. T. Halte, *The Misinterpretation of eBay v. MercExchange and Why: An Analysis of the Case History, Precedent, and Parties*, Chapman Law Review, vol. 18 n. 3 (2015), pp. 701-702. S. A. Olsen Legrand, *eBay v. Mercexchange: on Patrol for Trolls,* Houston Law Review, vol. 44 n. 4 (2007), p. 1193.

[58] *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 397 (2006).

[59] See R. Fair, *Does Climate Change Justify Compulsory Licensing of Green Technology*?, Brigham Young University International Law & Management Review, vol. 6 (2010), p. 37.

[60] «Intellectual property rights are a necessary incentive for investment in development of sustainable technologies. Patent trolling is particularly problematic when it affects patents that are environmentally beneficial […]. In the context of environmental innovation, the benefits conferred by patents may not outweigh the high cost of obtaining and protecting them, nor the exclusivity problems presented by patent

Thus, Justice Kennedy's concurring opinion is extremely timely and enlightening because it provided courts with useful instructions for moving in a technological landscape,[61] such as the current one, in which much of the innovation makes use of previous discoveries. Then, with the extension of the four-factor test to permanent injunctions, after *eBay v. MercExchange* district courts have recognized greater potential for public interest. In other words, Justice Kennedy's interpretation induces district judges to consider the nature of the patent and the economic function of the owner of the infringed patent when examining the fourth factor, according to a perspective aimed at attributing primary importance to the overall product rather than to the interests of the

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trolls». A. M. Whitfield, *Blocking Eco-Patent Trolls: Using Federalism to Foster Innovation in Environmental Technology*, Journal of Environmental & Technology Law, vol. 21 (2015), pp. 322-324. «A sure sign that a technology is maturing is the advent of infringement action by nonpracticing patentees (NPPs). Often derided as "patent trolls", these individuals, patent-holding companies and other nonpracticing patent holders do not commercialize their patented technology but instead generate revenue through licensing […]. So it is in clean technology: the clean teach NPPs have arrived. They are making their presence felt by major tech implementers, particularly in widely commercialized sectors such as hybrid vehicles, light-emitting diodes, and other energy-efficient lighting products and, most recently, by utilitarian and companies developing and rolling out smart grid technologies. The rise of NPPs in clean tech coincides with a renewed sense of urgency in developing such technologies to combat climate change and raises difficult questions about the role of patents in innovation and implementation of clean technologies». E. L. Lane, *Clean Tech Intellectual Property. Eco-marks, Green Patents, and Green Innovation*. Oxford University Press, Oxford 2011, pp. 117-118. Of the same author see also E. L. Lane, *Keeping the LEDs on and the Electric Motors Running: Clean Tech in Court After Ebay*, Duke Law & Technology Review, vol. 13 (2010), pp. 1-32.

[61] «In cases now arising trial courts should bear in mind that in many instances the nature of the patent being enforced and the economic function of the patent holder present considerations quite unlike earlier cases». *eBay Inc. v. MercExchange, L.L.C.*, 547 U.S. 388, 396 (2006). In this context there was, among many others, the ruling relating to the *Apple v. Motorola*, NC. (2012). It stated: «A related reason for withholding injunctive relief in this case is that it would be likely to impose costs on the alleged infringer disproportionate both to the benefits to it of having infringed and the harm to the victim of the infringement, and would thus be a windfall to the patentee […] ». *Apple Inc v. Motorola, Inc.*, 869 F. Supp. 2d 901, 916 (N.D. III 2012).

individual patent owner. Therefore, this opening of the horizon of reference values[62] has led the district courts to adopt decisions capable of considering social values that are not economic and go beyond those purely concerned with health or public safety.[63]

Such a change of direction in the jurisprudence on permanent injunctions explains why the Supreme Court in *eBay v. MercExchange* emphasized the equitable nature of the injunction and the impossibility of a new categorical remedy alternative to the discretion of the district courts without the authority of Congress.[64] As evidence of this, in addition to establishing the applicability of the four-factor test, arising from a long tradition of jurisprudential precedents, «Justice Thomas' majority opinion did not provide any guidance on how those factors should be applied».[65] The district courts are therefore called upon from time to time to carry out a careful balancing act which

[62] «The public interest is a dynamic balance which […] would change relative to time and circumstance». R. I. Reis, *Rights and Remedies Post eBay v. MercExchange – Deep Waters Stirred,* Akron Intellectual Property Journal*,* vol. 2 (2008), p. 157.

[63] «The public interest factor may favor an infringer when injunctive relief will result in a socially valuable technology becoming unavailable». *Metso Minerals, Inc. v. Powerscreen In't Distrib. Ltd*., 788 F. Supp. Sd 71, 76-77 (E.D.N.Y. 2011). To grant a permanent injunction it is necessary «a workable balance between protecting the patentee's rights and protecting the public from the injunction's adverse effects». *Bio-Rad Lab'ys, Inc. v. 10X Genomics Inc.*, 967 F.3d 1353,1379 (Fed. Circ. 2020). «Some district courts have signaled a willingness to consider other aspects of the public interest, despite the seemingly small subset of factual scenarios that could traditionally invoke a valid public interest argument under historical precedent». P. A. Riley; S. A. Allen, *The Public Interest Inquiry for Permanent Injunctions or Exclusion Orders: Shedding the Myopic Lens*, Vanderbilt Journal of Entertainment & Technology Law, vol. 17 (2015), p. 767.

[64] The Court referred here to *Weinberger v. Romero-Barcelo*, 456 U.S. 305 (1982); *Roche Products Inc. v. Bolar Pharmaceutical Co.*, 733 F.2d 858 (1984); *Amoco Production v. Village of Gambell*, 480 U.S. 531 (1987).

[65] B. H. Chao, *After eBay Inc. v. MercExchange: The Changing Landscape for Patent Remedies*, Minnesota Journal of Law, Science & Technology, vol. 9 n. 2 (2008), p. 548.

is more in line with the equitable nature of the measure.[66] However, district courts' abuse of discretion can be asserted before the courts of the Federal Circuit.

In the jurisprudence after *eBay v. MercExchange*, there is a gradual erosion of patent exclusivity to protect the prevailing public interest.[67] Indeed, post-*eBay v. MercExchang*e district court case law offers many examples favoring the concrete enforcement of patents in certain cases where they become a tool for financial and strategic leverage, such as when the owner is a non-practising entity.[68] A similar change in perception has led to an environmental jurisprudential interpretation of the public interest in patent law. Indeed, after *eBay v. MercExchange*, it emerged chronologically in three cases. In all of them, the concrete application of an infringed green patent was saved. However, while in one decision the public interest expressed in terms of environmental benefit was formally considered absent, the other two decisions based the denial of a permanent injunction on environmental considerations.

The first case is *Paice L.L.C. v. Toyota Motor Corp.* (2006),[69] concerning infringement of a patent useful for hybrid engines. In this case, Paice sued Toyota for violating its so-called '970 patent. The '970 patent concerns propulsion systems for hybrid electric vehicles, using a microprocessor and a controllable torque transfer unit (CTTU) to manage the torque of an internal combustion engine and an electric motor. Toyota's hybrid vehicles employed a similar system but used a planetary gear unit instead of CTTU. The District Court for the Eastern District of Texas

[66] Furthermore, it is consistent with the Article 44 TRIPS, where it is only provided that the judicial authorities of the signatory countries have the authority to grant injunctions.

[67] This tendency is also supported in some legal literature. See S. Basheer, *The End of Exclusivity: Towards a Compensatory (Patent) Commons*, IDEA vol. 58 n. 2 (2017), pp. 229-265.

[68] See Y. H. Tang, *The Future of Patent Enforcement After eBay v. MercExchange*, Harvard Journal of Law & Technology, vol. 20 n. 1 (2006), p. 236.

[69] *Paice L.L.C. v. Toyota Motor Corp.*, 04 – CV-211 (E.D. Tex 2006).

nevertheless established infringement of the '970 patent by virtue of the doctrine of equivalents.[70] Regarding the granting of the permanent injunction requested by Paice, the district court rejected Toyota's defense, which argued that the permanent injunction would have conflicted with the public interest in reducing emissions harmful to the environment.[71] Toyota, indeed, was unable to prove the lack of hybrid vehicles produced by other automakers to meet demand. However, the court did not grant the permanent injunction on the basis of the third factor, effectively saving Toyota's hybrid car production.[72] The court found that, in addition to disrupting Toyota's hybrid car manufacturing operations and damaging its reputation, a permanent injunction would have adverse consequences on the hybrid market. Therefore, from this conclusion it can be inferred that Toyota's environmental argument still played a significant role in the court's decision.[73] On appeal, the Federal Circuit found no abuse of discretion in the District Court's ruling.[74]

The second case is *BASF Plant Science v. Commonwealth Science & Industrial Research Organization* (2019),[75] concerning the infringement of a patent in the biotechnology sector in a complicated set of licenses and co-development activities between the parties. In particular, the District Court for the Eastern District of Virginia denied the grant of a permanent injunction against BASF Plant, company active in the biotechnology sector, for having exploited a method patented

[70] This doctrine was developed by the Supreme Court starting from *Winans v. Denmead* (1853) and is based on the equivalence of fact between the elements of the counterfeit product and those indicated in the claim of the infringed patent. This happens, for example, when a product, although presenting a structure of its own, performs the same function as a patented product.

[71] *Paice L.L.C. v. Toyota Motor Corp.*, 04 – CV-211 (E.D. Tex 2006), 10-17.

[72] *Id.* at 18.

[73] See A. S. Fowler, *No Need to Reinvent the Wheel: The Positive Relationship Between Green Technology and Patent Enforcement*, Villanova Environmental Law Journal, vol. 35 (2024), p. 143.

[74] *Paice L.L.C. v. Toyota Motor Corp.*, No. 06-1610 (Fed. Cir. 2007).

[75] *BASF Plant Science, LP v. Commonwealth Science & Industrial Research Organization*, 17 – CV-503 (E.D. Virginia 2019).

by the Commonwealth Scientific and Industrial Research Organization (CSIRO), the Australian national agency responsible for scientific research. This patent was aimed at genetically modifying rapeseed plants to produce oils rich in omega3. Although CSIRO and BASF initially worked on a joint research project, with the commercial goal of using omega3-rich oils in salmon farming to improve their nutrition value, the court stated that each was working on the introduction of different enzymes. The Court recognized the public interest deriving from the environmental advantage in the use of the infringed patent because it eliminated the need to resort to intensive fishing to feed farmed salmon.[76] Furthermore, it ruled that the patent owner was unable to demonstrate that the permanent injunction had no effect on the public interest. Considering this, the Court denied the injunction requested by CSIRO. On appeal, the Federal Circuit found no abuse of discretion.[77]

The third case is *Siemens Gamesa Renewable Energy A/S v. General Electric Co.* (2022),[78] concerning wind energy patent infringement. The Massachusetts District Court found that GE infringed the Siemens patent related to wind turbines installed in New Jersey. The court granted the permanent injunction requested by Siemens against GE. More specifically, it recognized the irreparable damage for Siemens, given the loss of a significant market share following the violation, and the impossibility of quantifying compensation. However, the Court adopted some particular measures in consideration of public interest. Indeed, it allowed GE to continue to execute the

[76] *BASF Plant Science, LP v. Commonwealth Science & Industrial Research Organization*, 17 – CV-503 (E.D. Virginia 2019), pp. 57-59.

[77] *BASF Plant Science, LP v. Commonwealth Science & Industrial Research Organization*, No. 20-1415 (Fed. Cir. 2022).

[78] *Siemens Gamesa Renewable Energy A/S v. General Electric Co*., 626, F. Supp. 3d 468 (D. Mass. 2022).

contracts in order to prevent the blocking of wind farms, useful for fighting the climate crisis.[79] Avoiding an appeal, the parties resolved all their issues through a cross-licensing agreement.

Therefore, the three cases examined, although not very significant from a numerical point of view, share a common trait: the infringed patent was assessed by the district courts for its concrete function and, since the infringement was producing environmental advantages, the district courts saved the concrete application, imposing only ongoing royalties.[80] These cases reveal an unprecedented sensitivity in U.S. jurisprudence regarding the granting of permanent injunctions for patent infringements, which is capable of making the non-economic interests of community prevail over the property interests of the patent holder. If consolidated, it will lead to a new balance of the values at stake in regarding patent infringement litigation in the United States. Moreover, from the qualification of the permanent injunction as an act of equitable discretion of the district courts, a jurisprudential system has been defined which «operates through information exchanges between district courts, which tailor their remedies based not on guidance from the courts of appeal often, little such guidance exists but by comparison with, and analogy to, remedies implemented by other district courts in similar circumstances».[81]

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[79] *Siemens Gamesa Renewable Energy A/S v. General Electric Co*., 626, F. Supp. 3d 468, 475 (D. Mass. 2022).

[80] «The change in patent law brought about *eBay* helps combat climate change by allowing important clean technologies to remain in the market». E. L. Lane, *Clean Tech Intellectual Property. Eco-marks, Green Patents, and Green Innovation*. Oxford University Press, Oxford 2011, p. 120.

[81] D. Zaring, *National Rulemaking Through Trial Courts: The Big Case and Institutional Reform*, UCLA Law Review, vol. 51 n. 4 (2004), pp. 1016-1017.

4.3 The International Trade Commission and the Public Interest: What Role for Environmental Protection?

The International Trade Commission (ITC) is an independent federal administrative agency established in 1916 by Congress with broad investigative responsibilities regarding trade matters. Pursuant to Section 1330 of Title 19 of the United States Code, it is composed of six Commissioners appointed by the President of the United States with the advice and consent of the Senate. It is a forum other than district courts for asserting intellectual property rights claims, including infringements of U.S. patents by imported goods. It is indeed possible to turn to the ITC when the companies importing the counterfeit products are foreign, as they are not otherwise subject to U.S. jurisdiction. More specifically, while a district court must have *in personam* jurisdiction over the parties in order to adjudicate, the ITC operates by virtue of the importation of products into the United States, under *in rem* jurisdiction.

The ITC, therefore, is not a judicial authority under Article III of the United States Constitution but performs quasi-judicial functions in proceedings involving alleged infringements of intellectual property rights by imported products. The proceedings are conducted in accordance with Sections 551 et seq. of Title 5 of the U.S. Code, concerning the administrative procedure, as well as with Sections 210 et seq. of Title 19 of the Code of Federal Regulations (CFR), relating to the regulation of the ITC, and involve three different authorities: the ITC, the designated administrative judge and the Office of Unfair Import Investigations (OUII). The procedure begins with a tie or majority of favorable votes from the Commissioners based on the complaint received. The case is then assigned to the administrative judge. The Office of Unfair Import investigations, in addition to a preliminary examination of the complaints submitted to the ITC to verify the existence of all the necessary conditions, can participate in the proceedings as an independent party representing the public interest. The administrative judge makes a violation decision that represents

the ITC's final determination if at least one Commissioner does not request review of the violation by the Commissioners within sixty days. After the Commission makes its determination, the President of the United States may dissent for political reasons.[82]

Unlike district courts, for a violation of Section 1337 of Title 19 of U.S. Code, the ITC cannot order monetary compensation for infringement of intellectual property, but can grant an injunction.[83] There are three types of injunctions: the exclusion order, which prohibits the importation into the United States of an infringing product; the exclusion order of an article from entry during investigation if there is reason to believe that there is a violation; and the cease-and-desist order, designed to prohibit unfair activity associated with infringing products that were imported into the United States prior to the effective date of an exclusion order. Even if it finds that there is a violation of Section 1337 of Title 19 of the U.S. Code, the ITC does not issue injunctions unless the four requirements of public interest are present: 1) protection of health and employment; 2) protection of competition conditions in the U.S. economy; 3) protection of the production of U.S. articles that are like or directly competitive with those that are subject to investigation; 4) protection of U.S. consumers.[84]

In this sense, although the ITC is not bound by *eBay v. MercExchange*,[85] following this ruling, procedural changes occurred which made the evaluation of the four factors of public interest more incisive. In 2011 the ITC renewed its procedure, so that «consideration of the public

[82] 19 U.S.C. § 1337 (j) (2).

[83] On further differences between ITC and district courts see M. N. Bathon, *IP Enforcement: Domestic and Foreign Litigants in the ITC and U.S. District Courts*, University of Pennsylvania East Asia Law Review, vol. 10 (2014), pp. 1-12.

[84] 19 U.S.C. § 1337(d)(1), (e)(1), (f)(1).

[85] «The [ITC] is not required to apply the traditional four-factor test for injunctive relief used by district courts» *Spansion, Inc v. Int'l Trade Comm'n* 629 F.3d 1331, 1359 (Fed. Cir. 2010).

interest has transitioned from a final, secondary step in Section 337 investigations to a prominent requirement at the very commencement of an investigation».[86] Indeed, pursuant to current Section 210.8 (b) of Title 19 of the Code of Federal Regulations, the complainant has the burden of providing specific information on public interest, attaching to the complaint a statement regarding how the requested relief would affect public interest. Furthermore, pursuant to current Section 210.10 (b)(2), the Commission may delegate to the administrative law judge a public interest investigation based on the complaining party's allegation. These two provisions, therefore, allow the ITC to establish analytical elements useful for examining considerations of public interest, anticipating the determination of patent infringement.

With respect to the powers of the ITC in this context, on May 18, 2023, the draft Advancing America's Interests Act (AAIA)[87] was presented at the House of Representatives by Congresswoman Suzan DelBene (D) and Congressman David Schweikert (R). The aim of the draft is to redefine the role of the ITC in patent litigation contexts, preventing its power from being exploited by patent trolls to target U.S. businesses and stifle competition. Despite this, however, there are at least two proposals that attribute a more incisive role to public interest in general. First, an amendment of Section 1337(c)(1)(b) of Title 19 of the Code is proposed, allowing the ITC to decide that on the grounds of public interest no further determination be made. An amendment to Section 1337(e)(1) is also proposed requiring the ITC to affirmatively conclude that the exclusion order serves the public interest.

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[86] P. A. Riley; S. A. Allen, *The Public Interest Inquiry for Permanent Injunctions or Exclusion Orders: Shedding the Myopic Lens*, Vanderbilt Journal of Entertainment & Technology Law, vol. 17 n. 3 (2015), p. 762.

[87] The draft is accessible at: https://schweikert.house.gov/wp-content/uploads/2023/05/SCHWEI_019_xml.pdf.

Before the introduction of the procedural changes, there were few cases in which the ITC found the four public interest factors to prevail.[88] Subsequently, however, by virtue of a more in-depth analysis of the values at stake, the ITC has begun to issue injunctive measures on the grounds of public interest.[89] In such a panorama, it is necessary to remember the so-called *Batteries Investigation*,[90] especially because on this occasion environmental concerns were expressly referred to by the ITC in the analysis of the first of the four factors of public interest. This controversy arose from LG Energy Solution's action against SK Innovation, denouncing the misappropriation of trade secrets in order to import and sell lithium-ion batteries in the United States. The public interest factor was carefully examined by the Commission because the batteries were used by major U.S. car manufacturers to produce electric vehicles. In this context, «the Commission is cognizant of the contribution EVs make to reduce automobile emissions and the contribution reduced automobile emissions make in efforts to combat climate change and its adverse impacts on public health and welfare».[91]

Following its public interest analysis, the Commission adopted a customized remedy because the respondent's arguments were unable to demonstrate the ability of a possible exclusion

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[88] These are cases in which the ITC has excluded the issuance of injunctive relief: *Certain Automatic Crankpin Grinders*, Inv. No. 337-TA (1979); *Certain Inclined-Field Acceleration Tubes*, Inv. No. 337-TA-67 (1980); *Certain Fluidized Supporting Apparatus and Components Thereof*, Inv. No. 337-TA-182/188 (1984).

[89] See, for example, *Certain Baseband Processor Chips and Chipsets, Transmitter and Receiver (Radio) Chips, Power Control Chips and Products Containing Same, including Cellular Telephone*, Inv. No. 337-TA-543 (2007); *Certain Personal Data and Mobile Communications Devices and Related Software*, Inv. No. 337-TA-710 (2011); *Certain Road Milling Machines and Components Thereof*, Inv. No. 337-TA-1067 (2019); *Certain Microfluidic Devices*, Inv. No. 337-TA-1068 (2020).

[90] *Certain Lithium Ion Batteries, Battery Cells, Battery Modules, Battery Packs, Components Thereof and Processes Therefor*, Inv. No. 337-TA-1159 (2021).

[91] *Id* at 70.

order to reduce adverse environmental effects. Thus, the Commission, considering the lack of a reasonable and quick replacement for batteries, saved the production of electric cars for a limited period.

In the *Batteries Investigation* ruling, the parties recalled the *Certain Automatic Crankpin Grinders* case of 1979. It represents one of the very few cases in which the ITC issued an exclusion order. In this case the Commission found that the public interest precluded issuing an exclusion order for fuel-efficient car engine components. This decision, indeed, was based on the inability of the national industry to satisfy domestic fuel demand within a reasonable period, as oil imports from Iran were blocked for political reasons. The Commission considered the analogy with *Certain Automatic Crankpin Grinders* relevant to demonstrating that the capacity of the contested product with respect to energy saving were relevant to the evaluation of the first factor of public interest. There are, however, at least two differences between the two cases. First, in *Certain Automatic Crankpin Grinders* the question of energy saving was not expressly related to climate change but rather was caused by political problems of oil supply connected to the crisis in Iran in 1979.[92] In the *Batteries Investigation* the reasons connected to the fight against climate change were expressly mentioned. The second difference concerns the role of Congress: in the first case, the Commission aligned itself with the energy saving policy promoted by Congress (and the President of the United States) to deal with the oil shock following the political crisis in Iran in 1979.[93] In the second the Commission did not overtly invoke any congressional policy but only stated that it recognized the importance of reducing emissions in the fight against climate change.

[92] «In this period of rapid changes in the energy field, there are overriding public interest considerations in not ordering a remedy which will hamper the supply of energy efficient automobiles». *Certain Automatic Crankpin Grinders*, Inv. No. 337-TA (1979), p. 21.

[93] See *Certain Automatic Crankpin Grinders*, Inv. No. 337-TA (1979), p. 20.

This case, therefore, constitutes an example where «the ITC has been using the public interest to effect policy choices in the technology innovation space».[94] Thus, the so-called *Batteries Investigation*, concerning the violation of commercial secrets which however results in environmental benefits, is the expression of a broader sensitivity that from federal jurisprudence is also beginning to spread in the ITC rulings on disputes between private individuals for infringement of intellectual property. Given the greater space for public interest and the express consideration of environmental reasons in the ITC's reflections, there are the foundations for also limiting the exclusive property rights of the patent and favoring the concrete application of technologies that benefit the collective interest, including environmental protection. After all, «the current one-sided patent protection is inconsistent with the fundamental principle of promoting the progress of useful arts for failing to take into account the new defensive and proactive uses of patents that have developed in complex technologies».[95]

4.4 The German Model and the Reform of the Section 139 (1) PatG, a Possible Environmental Perspective

In Europe, to limit the protectionism of intellectual property, jurisprudence has resorted to the principle of proportionality. The reflection on the link between proportionality and the permanent injunction in German patent law began with the issuing of the European Directive on the enforcement of intellectual property rights 2004/48/EC (so-called Enforcement Directive).

[94] K. J. Osenga, *What Happened to the Public's Interest in Patent Law?*, The Federalist Society Review, vol. 19 (2018), p. 203.

[95] T. Takenaka, *Patents for Sharing*, Michigan Technology Law Review, vol. 26 (2019), p. 133.

Although Article 11, in line with Article 44 TRIPS, establishes that Member States shall provide the courts with the authority to issue an injunction aimed at prohibiting the continuation of the violation, there are many references to proportionality that invite States to adopt a more flexible perspective.[96] Among these references:

- Whereas clause 17 states that intellectual property protection measures should be determined in accordance with all interests at stake and based on the intentional or unintentional nature of the infringement.[97]
- Article 3, paragraph 2, states that remedies for infringement of intellectual property rights should be effective, proportionate and dissuasive.[98]
- Article 12 grants Member States the power to provide that the judicial authorities can order the payment of pecuniary compensation instead of an injunction in favor of the owner of the infringed patent if the infringer «acted unintentionally and without negligence, if execution of the measures in question would cause him/her disproportionate harm and if pecuniary compensation to the injured party appears reasonably satisfactory».

[96] See P. Teunissen, *Intellectual Property, Injunctions, and Proportionality: Towards a Uniform Approach*, GRUR International, vol. 74 (2025), pp. 805-816.

[97] Whereas clause 17: The measures, procedures and remedies provided for in this Directive should be determined in each case in such a manner as to take due account of the specific characteristics of that case, including the specific features of each intellectual property right and, where appropriate, the intentional or unintentional character of the infringement.

[98] Article 3: General obligation – 1. Member States shall provide for the measures, procedures and remedies necessary to ensure the enforcement of the intellectual property rights covered by this Directive. Those measures, procedures and remedies shall be fair and equitable and shall not be unnecessarily complicated or costly, or entail unreasonable time-limits or unwarranted delays. 2.Those measures, procedures and remedies shall also be effective, proportionate and dissuasive and shall be applied in such a manner as to avoid the creation of barriers to legitimate trade and to provide for safeguards against their abuse.

Traditionally in the German legal system the owner of the exclusive right is naturally entitled to an injunction against the infringer.[99] Consequently, German courts, following the original formulation of Section 139(1) of the German Patent Act (Patentgesetz – PatG), automatically issued the injunction for a proven patent infringement.[100] After the Enforcement Directive, a part of legal literature criticized the German legal system, precisely for the lack of reference to proportionality in Article 139 (1) PatG.[101] This happened especially in two related directions.

On the one hand, it was underlined that the principle of proportionality constitutes a fundamental legal principle in the German legal system, therefore finding application in all areas of law.[102] In this regard Weideneder writes:

> The principle of proportionality is a general principle that results from the nature of fundamental rights and which has a constitutional status as a consequence of the principle of the rule of law […]. According to the imperative of an interpretation compliant with the Constitution, the principle of proportionality must be observed in the interpretation of law and therefore also for the violation of intellectual property rights [my translation].[103]

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[99] See F. Hofmann, *Der Unterlassungsanspruch als Rechtsbehelf*, Mohr Siebeck, Tübingen 2017, p. 77.

[100] In German law there is the so-called bifurcation: local courts determine whether there has been infringement of a patent; once patent infringement has been established, the federal courts determine the validity of the infringed patent and issue the permanent injunction.

[101] See, for example, J. Busche, *Vom Wert des Patents oder: Ist der Patentschutz absolut?*, GRUR (2021), pp. 157-161; C. Osterrieth, *Technischer Fortschritt – eine Herausforderung für das Patentrecht*, GRUR (2018), pp. 985-995; L. Tochtermann, *Injunctions in European Patent Law*, Intellectual Property Journal, vol. 11 n. 3 (2019), pp. 257-278.

[102] See P. Picht, *German Law on Patent Injunctions: Legal Framework and Recent Developments*, Chicago-Kent Journal of Intellectual Property, vol. 19 (2020), p. 244.

[103] N. Weideneder, *Der Unterlassungsanspruch nach § 139 Abs. 1 PatG*, Wolters Kluwer, Hürth 2023, p. 115.

On the other hand, it has been highlighted that the principle of proportionality makes the inhibitory remedy compatible with changed technological contexts, which are more complex and more collaborative than in the past. Specifically, scholars have reflected on two hypotheses of excessive grants of injunction: patent troll cases and cases involving complex products in which the infringement concerns only a minor infringing component.[104]

In this sense, the ruling of the Federal Court of Justice in the 2016 *Wärmetauscher* case played a significant role. On that occasion, the Court expressed the possibility of granting the infringer a grace period to market the counterfeit products after the infringement has been ascertained. In the specific case, however, the Court did not grant the grace period because the counterfeit product, a particular car heating system, did not constitute a substantial part of the cars. Furthermore, there was no evidence of the impossibility of obtaining a license for the counterfeit product, nor of serious economic damage resulting from the failure to authorize use during the grace period. In this regard, the Court stated that, in line with Article 3 of Directive 2004/48/EC, a grace period can only be granted if the effects of the injunction are seriously disproportionate in relation to the benefit produced by the infringement.

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[104] See A. Ohly, *„Patenttrolle" oder: Der patentrechtliche Unterlassungsanspruch unter Verhältnismäßigkeitsvorbehalt?, Aktuelle Entwicklungen im US-Patentrecht und ihre Bedeutung für das deutsche und europäische Patentsystem*, GRUR International, vol. 10 (2008), pp. 787-798. C. Osterrieth, *Patent-Trolls in Europa – braucht das Patentrecht neue Grenzen*, GRUR (2009), pp. 540-545. R. Uhrich, *Entwaffnung der „Patenttrolle"? Zur Einschränkbarkeit des patentrechtlichen Unterlassungsanspruchs im anglo-amerikanischen und deutschen Recht*, Zeitschrift für Geistiges Eigentum, vol. 1 (2009), pp. 59–93 H. Ullrich, *Patente und technische Normen: Konflikt und Komplementarität in patent- und wettbewerbsrechtlicher Sicht*, in M. Leistner (edited by), *Europäische Perspektiven des Geistigen Eigentums* (Geistiges Eigentum und Wettbewerbsrecht, 41), Mohr Siebeck, Tübingen 2010, pp. 14-95.

This judgment provided the legislature with a starting point to amend § 139 (1) PatG and introduce a statutory proportionality exception. In this regard Lizhou writes:

> Although the German academic and judicial circles have been changing their attitudes towards the automatic injunction, relevant amendment had been slow to make it on the legislative agenda. Until recent years, as vehicle-to-everything (V2X) has been increasingly popular, major German automobile manufacturers have gotten entangled in a large number of disputes over infringement of patents related to communication technologies, and their interests have been seriously threatened due to the grant of injunction. Since then they started to face up the defect of the German injunction system and further promoted the law revision directly. Through multilateral in depth consultation and repeated amendments, the legislators finally added the third to fifth sentences to Section 139(1) PatG to incorporate the proportionality defense into the factors to be considered for the claim for injunctive relief.[105]

In 2021 the German legislature modified Section 139, paragraph 1, PatG adding three new sentences to the existing two.[106] Pursuant to the third sentence, the judge, based on the circumstances of the individual case and the principle of good faith, may exclude or limit the request for injunction promoted by the owner of the infringed patent, to the extent that ("soweit") the injunction causes disproportionate inconvenience for the infringer or third parties.[107] The

[105] W. Lizhou, *Proportionality Defense in Claim for Injunctive Relief*, China Patents & Trademarks, vol. 3 (2022), p. 23.

[106] Zweites Gesetz zur Vereinfachung und Modernisierung des Patentrechts (10 August 2021).

[107] Section 139 (1) PatG: Any person who uses a patented invention contrary to sections 9 to 13 may, in the event of the risk of recurrent infringement, be sued by the aggrieved party for cessation and desistance. This right may also be asserted in the event of the risk of a first-time infringement. This right is ruled out if asserting it would, based on the particular circumstances of the individual case and the principle of good faith, lead to disproportionate, unjustified hardship for the injurer or third parties which is not justified by the exclusive right. In such cases, the aggrieved party is to be granted reasonable monetary compensation.

explanatory memorandum clarifies that «the burden of presenting and proving the disproportionate nature of the claim lies with the patent infringer. […] in this case, careful consideration of all the circumstances of the individual case is necessary, also taking into account the requirement of good faith and the fundamentally prevailing interests of the injured party in the execution of his request for injunctive relief» [my translation].[108] It seems clear that the third sentence of the Article 139(1), PatG is a general clause that the judge can use when relevant factors occur in the individual case.[109] It is an unnecessary remedy, as can be seen from the German term *soweit*, present in the third sentence. In German grammar, indeed, this conjunction introduces a subordinate clause with a limiting function, unlike *wenn*. This term can be translated as "if" and anticipates a subordinate conditional, expressing the necessary condition for what is stated in the governing proposition to occur. In other words, the new disproportionality exception applies if fundamental rights are disproportionately affected by the injunction. The granting of an injunction remains the general rule in patent infringement cases.[110]

If the injunction is partially or fully refused, the owner of the infringed patent is entitled to reasonable monetary compensation from the infringer. The fourth sentence of Section 139(1) PatG allows action against the transgressor to obtain compensation for damages referred to in Section 139, paragraph 2, PatG. Stierle writes in this regard:

The claim for compensation under subsection (2) remains unaffected thereby. https://www.gesetze-im-internet.de/englisch_patg/englisch_patg.html.

[108] Begr. RegE Bt-Drs. 19/25821, p. 53.

[109] Such case-by-case analysis is highlighted by H. Schacht, *Unverhältnismäßigkeit und Verletzerverhalten*, GRUR (2021), p. 442.

[110] See T. Kühnen, *Handbuch der Patentverletzung*, 14th ed, Heymanns Verlag, Köln 2021, para D. 546; M. Stierle; F. Hoffmann, *The Latest Amendment to the German Law on Patent Injunctions: The New Statutory Disproportionality Exception and Third-Party Interests*, GRUR International, vol. 71 n. 12 (2022), p. 1127.

> The possibility of denying the injunction request […] and therefore being able to manage it in a more flexible way, offers an internal correction to the system for the rare, but still verifiable functional or economic defects of the patent system [my translation].[111]

The element of proportionality serves to avoid the automatic granting of injunctions, for example to mitigate the damage caused to the interests of the infringer or to those of third parties by an injunction in exceptional cases. In this sense Lizhou writes:

> The newly added third sentence of Section 139 (1) is a general clause, not a specific rule, in its nature. The terms in the third sentence, such as "special circumstances", "good faith", "disproportionate" and "hardship … beyond what is justified", are undefined legal concepts. Therefore, this rule cannot be applied directly by means of subsumption.[112]

In the part dedicated to the legal consequences of Section 139(1) PatG, the German legislature explains that it is up to the judge to weigh all the circumstances and that a refusal of the request for an injunction is in any case exceptional in nature, not excluding a partial refusal of the request for an injunction.[113] In this sense, Dijkman's words are interesting:

> Because the proportionality test gives courts considerable freedom to tailor the injunction to the specific circumstances of the case, it can yield outcomes that traverse the infringer's proportionality claim as well as the rights of third parties in a manner compulsory

[111] See M. Stierle, *Der quasi-automatische Unterlassungsanspruch im deutschen Patentrecht. Ein Beitrag im Lichte der Reformdiskussion des § 139 I PatG*, GRUR, vol. 9 (2019), p. 875.

[112] W. Lizhou, *Proportionality Defense in Claim for Injunctive Relief*, China Patents & Trademarks, vol. 3 (2022), p. 23.

[113] Begr. RegE Bt-Drs. 19/25821, p. 55.

licenses could not. That includes, in particular, short-term stays to avoid arms that may not be very significant on the individual level, but that are large in the aggregate.[114]

The explanatory memorandum does not outline criteria for the exceptional limitation of the injunction but indicates by way of example some factors that can be taken into account when examining the individual case.[115]

Considering the interests of the infringer, the explanatory memorandum first mentions the case in which the right holder is a non-practicing entity (NPE) or patent troll, since «the interest of the injured party may be mainly directed at the conclusion of a licensing agreement and not to the guarantee of its development and production activities» [my translation].[116] For this reason, the opportunity for an injunction appears secondary to the injured party's objective of making profits through licensing or exploiting the economic value of its patents by seeking damages or compensation. Subsequently, the explanatory memorandum refers to the risk for the infringer of suffering exceptionally high damage from the injunction if «at the time of submitting the application for the injunction, huge investments have already been made in the development and manufacturing of a product and such consequences would be completely disproportionate compared to the value of the infringed patent» [my translation].[117] Then, the explanatory memorandum gives the example of complex products by providing that «if the infringed patent is a secondary element […] for a complex product […] serious and disproportionate economic effects on the activity of the infringer can be denied» [my translation].[118] Finally, the explanatory

[114] L. Dijkman, *The Proportionality Test in European Patent Law. Patent Injunctions Before EU Courts and the UPC*, Hart Publishing, Oxford 2023, p. 87.

[115] Begr. RegE Bt-Drs. 19/25821, p. 54.

[116] *Id*.

[117] *Id*.

[118] *Id*.

memorandum also recalls the subjective elements, highlighting that «the question of whether the author of the patent infringement has made sufficient efforts to obtain a licensing agreement may also become relevant» [my translation].[119] Paying attention to the interests of third parties, the explanatory memorandum provides that «a limitation of the request for an injunction can be assessed only if the violation of the fundamental rights of third parties clearly constitutes a burden for them such as to render void, exceptionally, the unconditional recognition of the exclusive rights and interests of the patent holder» [my translation].[120]

In relation to the protection of the environment, it may first be useful to delve deeper into the fundamental rights of third parties. Among the latter, there is certainly the right to life and physical integrity (Article 2 of German Fundamental Law). To understand the link between these two and the fight against environmental pollution, the 2021 ruling pronounced by the German Federal Constitutional Court in the case *Neubauer v. Germany* is essential.[121] It began with the appeal presented by numerous individuals to the German Federal Constitutional Court against the German Federal Climate Protection Act (Bundesklimaschutzgesetz – KSG). They argued that the KSG is incompatible with the fundamental right to life and physical integrity, underlining the inadequate goal of reducing greenhouse gases by 55% compared to 1990 levels by 2030. In its ruling, the German Federal Constitutional Court wrote that the fundamental right to life and physical integrity also depends on environmental pollution, and the State has an objective duty to protect it from the risks posed by climate change. In this ruling, therefore, the Court included climate action in the area relating to the fundamental right to life and physical integrity.

[119] *Id*.

[120] *Id*. at 55.

[121] 1 BvR 2656/18.

Regarding the extension of the category of third parties, legal literature clarified that third parties can also be those who reside in a non-EU jurisdiction.[122]

Speaking of injunctions for patent infringement, traditionally in German jurisprudence «the emphasis is placed on the need for protection of the IP rights holder and the need for deterrence [...]. General interests, such as the societal interest of environmental protection, play no key role in the assessment of proportionality».[123] In this sense Lizhou writes:

> As a matter of fact, there are indeed differences between compulsory license and proportionality defense based on the public interest. First, compulsory license requires a petition filed with the German Federal Patent Court in advance, whereas the proportionality defense is completely an ex-post measure. Second, under the compulsory licensing system, it is legal to implement a patent with reasonable royalties paid to the right holder, whereas even with the proportionality defense, the patent exploitation still constitutes infringement and the user is liable for damages. Last but not least, under the compulsory licensing system the right holder cannot refuse to license its patent or claim injunctive relief, whereas the legal effect of the proportionality defense is not "all-or-nothing", and the court may also decide to partially restrict the claim for injunctive relief, such as by granting a limited grace period (see below on the introduction to the legal effect for details), in addition to fully excluding it.[124]

For example, we can recall a 2022 ruling by the Düsseldorf regional court on a dispute between two pharmaceutical companies, the British NuCana and the U.S. Gilead, for a patent

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[122] See M. Stierle; F. Hoffmann, *The Latest Amendment to the German Law on Patent Injunctions: The New Statutory Disproportionality Exception and Third-Party Interests*, GRUR International, vol. 71 n. 12 (2022), p. 1134.

[123] C. J. S. Vrendenbarg, *Towards a Judicial Sustainability Test in Cases Concerning the Enforcement of Intellectual Property Rights*, GRUR international, vol. 72 n. 12 (2023), p. 1130.

[124] W. Lizhou, *Proportionality Defense in Claim for Injunctive Relief*, China Patents & Trademarks, vol. 3 (2022), pp. 25-26.

infringement committed by Gilead.[125] On this occasion, the German judges considered the proportionality test pursuant to Section 139(1) PatG, invoked by Gilead to protect patients. More specifically, the Düsseldorf Regional Court recognized that the interests of third parties would be prejudiced by an injunction, as many of them were dependent on the controversial medicines. However, the judges did not consider that the interests of patients could prevail over the protection of the owner of the infringed patent, since Gilead did not make efforts to obtain a compulsory license. Thus, the court wanted to prevent the circumvention of the requirements for compulsory licensing actions under Section 24 PatG, guaranteeing the jurisdiction of the Federal Patent Court. Indeed, as Gilead has not initiated action pursuant to Section 24 PatG, the Düsseldorf Regional Court, deciding on the violation, did not give any weight to the interest of third parties in the proportionality test. If Gilead had made serious efforts to obtain a compulsory license in advance, the Düsseldorf Regional Court could have considered the interest of third parties as prevailing over the interest of NuCana.

This solution is in line with the jurisprudence prior to the new version of the Section 139(1) PatG[126] «on the basis of the systematic argument that denying the injunction due to a prevailing public interest would be in contradiction with the legislator's provision of specific cases of compulsory licensing» [my translation].[127] Given that the Section 139 (1) PatG does not expressly provide for the consideration of public interest,[128] the Düsseldorf judges aligned themselves with

[125] Case No. 4c O 18/21.

[126] For example, see *Herzklappen* case, 4a O 137/15 LG Düsseldorf.

[127] P. Fabbio, *La proporzionalità dell'inibitoria per violazione di diritti di proprietà intellettuale*, Rivista di diritto industriale, vol. 70 (2021), p. 177.

[128] See P. G. Picht; A. L. Karczewski, *Germany*, in J. L. Contreras; M. Husovec (edited by), *Injunctions in Patent Law. Trans-Atlantic Dialogues on Flexibility and Tailoring*, Cambridge University Press, Cambridge 2022, p. 150.

previous jurisprudence. However, as can be seen from the wording of Section 139(1), as well as from the considerations in the explanatory memorandum, the interests of third parties involve the fundamental rights of the individual and, as such, must have effective protection.[129]

Thus, although the reasoning of the Düsseldorf judges finds a systematic explanation, it defines a situation in which the fundamental rights of third parties depend on the conduct of the transgressor. Such jurisprudential reading seems to conflict with the Section 139 (1) PatG, causing an unjustified compression of the fundamental rights of third parties. Indeed, they are incapable of knowing of patent infringements that may affect their fundamental rights and of influencing the actions of the user of a patent to obtain compulsory licensing. Despite the controversial decision in *NuCana v. Gilead*, but because of the ruling in *Neubauer v. Germany*, the German legal system presents a discipline of proportionality in the grant of permanent injunctions capable of embracing broader considerations than mere party interests, even to the point of adopting an environmental perspective.

[129] See F. Hoffmann, *Stelleungnahme zum Gesetzenwurf eines zweiten Patentrechtsmodernisierungsgesetzes* (2021), p. 7.

Conclusions

In this thesis the relationship between patent law and environmental protection was explored with the objective of promoting the spread of green patents through private law tools. The argument was developed on the basis of serious questions about the extent to which the exclusive property rights traditionally associated with the patent monopoly are capable of promoting the diffusion of environmentally sustainable technologies.

In patent law, the exclusive right allows the patent holder to prevent others from using or commercially exploiting the patented invention without their consent. It is a territorial right that is limited in time. Since the inception of patent law, exclusivity has been seen as a useful tool to promote innovation, guaranteeing economic returns to inventors and investors. For many years, the right of exclusivity has been an incentive as innovation has developed singularly. On the other hand, green innovation has a complementary character, since the complexity of green technologies requires the involvement of multiple patents often belonging to different owners. Therefore, patent rights often become an obstacle rather than an incentive.

In this context, the thesis retraced the transformation of private law in the face of environmental issues. If, originally, private law was only aimed at protecting private interests, from the second half of the twentieth century it has become attentive to the protection of the environment. This change came about through a new interpretation of its fundamental principles in the light of

environmental concerns. As a result, tort law, contract law and property law can be used to address environmental challenges outside of government regulation. This new configuration of private law therefore proves to be fruitful in promoting the spread of green patents in a context of complementary innovation.

With the aim of finding useful solutions to reduce the negative effects of patent monopoly on green innovation, the thesis evaluates various forms of intervention, both public and private. In this regard, it seeks to give a systematic and coherent reading of studies already present in legal literature in a fragmented manner.

First, the thesis analyzes the hypothesis of the usefulness of compulsory licenses for green patents. Historically, compulsory licenses have been used to disseminate drugs related to epidemic emergencies. On closer inspection, there are significant differences between green patents and patents in the pharmaceutical field. Indeed, the complexity of green technologies means that they depend on multiple patents, unlike drugs that can consist of a single patented molecule. Therefore, the complexity of green patents reduces the impact of compulsory licensing.

Subsequently, the thesis analyzes the possible application of fair use theory to green patents. This theory was born in the United States in order to permit the use of copyrighted works without authorization for certain limited purposes, such as criticism, teaching or research. Applying this theory to green patents would, however, still prohibit their commercial use and thumped large-scale diffusion of green technologies.

On the other hand, in the context of relations between private individuals, the thesis examines experiences of patent collaboration capable of limiting exclusive rights and promoting the spread of green technologies. Specifically, patent collaboration agreements are based on

limiting the exclusive rights of each patent holder and determining mutual contractual claims on the patents of all participants.

In short, the limitation of monopoly rights becomes necessary to innovate and commercially exploit new green technologies. These collaborations are governed by private law which, in its new configuration, proves to be useful in facing the environmental challenge.

The thesis focuses on how private law facilitates patent collaborations, exploring the different legal systems of the United States and Germany. Both of which have been characterized during the last years by an intense reflection on the relationship between patent law and environmental protection. Analyzing these developments, the thesis examines the default rules on joint patents. The analysis shows that the U.S. solution, compared to the German one, gives more support to the commercialization of joint patents, thus encouraging collaboration between patent holders and the spread of green technologies. Then, the thesis investigates how to make patent pledges binding through contract law, since they are generally made without formalities and based exclusively on the pledgor's goodwill. On this question, the U.S. legal system, given its conception of the contract based on mutual assent and bargain, appears weaker than the German regime for the contractual enforcement of patent pledges. This is primarily because German contract law does not require consideration as an essential element of a binding contract, thus favoring the configuration of patent pledges as contracts.

Finally, the thesis considered how the United States and Germany allow for limited use of infringed patents. In the United States, the case of *eBay v. MercExchange* (2006) is a turning point in the field of permanent injunctions for patent infringement, with significant implications also for green patents. In this regard, the U.S. Supreme Court emphasized the equitable nature of permanent injunctions, eliminating any form of mere automatism. As a result, district courts are required to carefully assess the equitable considerations pertinent to the grant of an injunction. After *eBay v.*

MercExchange (2006), in cases concerning green innovation, district courts considered infringed patents for their concrete function. Because their use produced significant environmental benefits, the district courts did not issue permanent injunctions, imposing only the obligation to pay royalties for use.

In 2021 the German legislature amended Article 139 PatG by adding three new sentences to the existing two. According to the third sentence, the court can exclude or limit injunctive relief in the light of the circumstances of the case and the interests of third parties. This novelty appears useful to promote the use of green patents.

The topics covered in this thesis allow for an in-depth reflection on how patent monopolies in the field of green innovation can be mitigated through private law. This encourages a line of research aimed at promoting private collaboration in the field of patents for the diffusion of green technologies.

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