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Interplay between Patent and Automotive from a European Perspective

Introduction

The automotive sector, omnipresent in our daily lives and constantly evolving technologically, provides a fascinating field for understanding the use of patents. Especially in Europe, where established brands have recently coexisted with disruptors like Tesla, these dynamics challenge the industry's status quo.

Within this evolving industry, two key points need to be understood: Firstly, it is an industry that invests heavily in research and development, with 53 billion euros recorded in 2018 according to the European Automobile Manufacturers' Association (ACEA). Secondly, it distinguishes itself by its intensive use of patents. According to ACEA, in the field of autonomous vehicles, Europe leads with more than "33% of all patent applications worldwide." Thus, patents prove to be tools shaping the automotive sector in Europe. Additionally, since Europe is home to numerous car brands, patents must also have implications for market balance. It is therefore important to question the roles that patents play in the European automotive industry, and how does strategic patent use contribute to maintaining balance in this dynamic sector.

By dealing with both the current state of the industry and its challenges, this study begins by highlighting the need for an effective patent system for the development of such industries (Chapter 1), giving rise to an exploration of the roles of patents as an essential tool for companies (Chapter 2). Such roles, enables the monopolization of technologies and creating barriers for competitors, which explains the static landscape of actors in the automotive sector and the electrical shift changing (Chapter 3). Which inevitably question the practice, the patent's interactions among actors, ranging from cooperation to deterrence (Chapter 4).

Chapter 1 – The Need For an Effective Patent System

After the Second World War (WWII), the automotive sector experienced significant technological advancements. This prompted the necessity for a European patent, which has been well-received by the industry.

1.1) The need for the European patent

The industry evolve thanks to significant investments. If through research and development (R&D) companies come up with something new, the next decision is whether to patent or not.[1] Thereby, The connection between patents and investments in Research and Development (R&D) is clear, especially in the fast evolving sector such as the automotive industry. And an effective patent system encourages companies to take risks and put effort into R&D by offering a reward and protection for their innovative ideas in the automotive sector and this is what they needed after the WWII as investments were done.

After the WWII, rejuvenating the European industry was the main objective. Especially, the automotive industry because motor vehicles were seen as a key to restore war-shattered economies through exports. Since the automotive industry was a key sector for European recovery, European countries started to invest massively to rebuild the automotive industry[2]

[1] Dominique Guellec, Bruno van Pottelsberghe de la Potterie, (2007), *The Economics of the European Patent System IP Policy for Innovation and Competition*, Oxford University Press, p. 63.

[2] Alfred Moustacchi, Jean-Jacques Payan, (1999), *L'Automobile Avenir d'une Centenaire*, Dominos Flammarion edition, p.50.

and technological advances increased and the number of patent applications as well. Consequently, national offices couldn't keep pace with their workload.[3] In addition, the objective of free trade of the European economic community couldn't be reached without a harmonization of national patent systems. So, National systems represented a serious obstacle that must be overcome.

Nearly twenty years after the adoption of the Treaty of Rome in 1958, an agreement is reached. In 1977, The European Patent Convention (EPC) establishing the European Patent Office and introducing a unified procedure for granting European patents. The European patent "*offers a mechanism for obtaining a bundle of patents effective in contracting states. In each contracting state for which it is granted, a European patent gives its proprietor the same rights as would be conferred by a national patent granted in that state."*[4]

The idea is to streamline the process of obtaining a patent in the European territory for those who wish to exploit their invention in multiple European countries. One single procedure rather than filling application in each national office and without having to pay application's fees in each country.[5] The issued patent becomes a national patent in one or several member states, subject to national rules. Therefore, patent protection within the EEC relies on two systems: the national patent systems and the European patent system. This was, in fact, a solution to the effectiveness issues that national offices faced post-WWII and a step further on the integration track of the EEC. Additionally, it presented an opportunity for growing brands to expand more easily across Europe, explaining why the newly established system was welcomed by the automotive industry.

1.2) The immediate Reaction of the Automotive Industry

The reaction can be observed both through the arrival of new players in Europe and an investment in R&D.

Regarding the arrival of new automotive companies, since it is possible to apply for a patent in one or more member states pretty fast, it will not go unnoticed by companies looking to expand into other markets, such as Nissan, a Japanese company. A study conducted by the Committee of French Automobile Manufacturers reveals that in Europe, the invasion of the Japanese automobile industry commenced as early as 1983, six years after the signing of the convention (see figure 1). However, the 'invasion' is not a direct consequence of the EPC; rather, it exerted

[3] In fact, during the preamble to a resolution taken at the Hague in 1956 by the patent Commissioners of Germany, the Netherlands, Britain, Austria, Norway and Sweden it can be read as follows : *"This meeting, taking notice that nearly all the European Patent Offices which undertake a search for novelty have difficulty in disposing of the present very large number of applications for patents because of the general shortage of technically-trained staff, and the increasing volume of search material and complexity of inventions, observing that where applications in respect of the same invention are lodged in more than one of these Offices the search for novelty has to be made in each of them, thus leading to a considerable repetition of work, and being of the opinion that this repetition of work might be avoided to some extent if the result of a search in one Office could be available to other Offices in which an application in respect of the same invention has been made"* See, Thomas Nicolai, (1971), *The European Patent Convention: A Theoretical and Practical Look at International Legislation*, The international lawyer, Vol 5, No. 1, p.136-137.

[4] Seville Catherine, (2016), *EU Intellectual Property Law and Police*, second edition, Edward Elgar Publishing, p.128

[5] "the EPO application path is typically preferred over the individual national paths once the applicant seeks protection in more than three EPC countries, since the total cost of a European patent amounts to approximately EUR 29,800, roughly three times as much as a typical national application." Stefan Wagner, 2006, *Economic Analyses of the European Patent System*, Gabler edition wissenschaft, p. 36.

an influence by simplifying the system procedurally and financially. Therefore, brands like Nissan and Toyota, among others, promptly submitted their first European patent applications.[6]

Figure 1 : The establishment of Japanese automobile industry in Europe

Manufacturer	Country	Localization	Product	Année de Year of establishment
Nissan	Espagne	Barcelone	Véhicules utilitaires	
Nissan	Royaume-Uni	Sunderland	Voitures (Primera, Micra)	1986
Santana (Suzuki)	Espagne	Linares	Véhicules tout terrain	1985
IBC (co-entreprise GM-Isuzu)	Royaume-Uni	Luton	Fourgons et 4x4	1985
Toyota	Allemagne	Hanovre	Pick-up (Hilux) produits par Volkswagen	1989
Toyota	Royaume-Uni	Burnaston	Voitures (Carina E, Corolla)	1992
Honda	Royaume-Uni	Swindon	Voitures (Accord et Civic)	1992
Piaggio Daihatsu	Italie	Pontedera	Fourgon léger Hijet	1992
Mitsubishi	Pays-Bas	Born	Voitures Carisma	1995

Source : Comité des constructeurs français d'automobiles (CCFA).

Regarding investment in R&D, one of the reasons for the establishment of the EPC is the growth in innovation and the workload that national offices couldn't keep pace with. The innovation tendance continues with the European patent.[7] During the 1980s, companies sought to explore areas in which they did not yet have expertise while facing safety and emission standards. The technological challenge for the automotive industry was to integrate mechanics and electronics.[8]

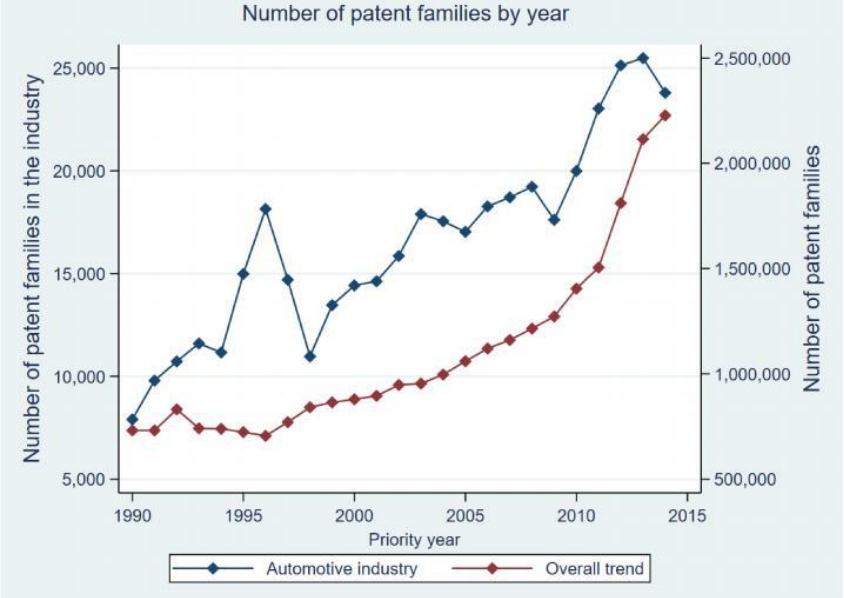
Thus, from the 1980s, innovations emerged that illustrated the investment of companies at that time, such as Anti-lock Braking Systems (ABS), airbags, electromagnetic parking sensors, among others. Furthermore, investments in R&D continue to thrive in the automotive sector, in such a way that patenting activity between 1990 and 2014 was more significant in the automotive sector than the overall patenting activity as it can be observed on *figure 2*.

[6] Examples: Nissan's patent applications n° 79901268.7 (in 1979) and n° 87117607.9 (in 1983) – in France, Germany and England. / Toyota's patent application n° 80103860.5 in 1980 – in France, Germany and England.

[7] Example: Peugeot filed a total of 1,315 European patents out of 4,242 granted patents. So 31% of their patents between 1979 and 1999 are European patents, according to the French National Institute of Industrial Property (INPI).

[8] Sauzay Michel, (1982), *L'industrie automobile dans les années 80 : Jeux de Meccano et façades en trompe l'œil*, Revue d'économie industrielle, vol. 19, 1er trimestre 1982, p. 58-64.

Figure 2 : Evolution of patenting activity in the automotive industry in the period 1990-2014[9]



Upon obtaining patent for technological and technical advancements, exclusive rights emerge, conditioning the exploitation of the protected product or process to the patentee's authorization. These rights safeguard the company's invention and confer commercial advantages, which questions the role of patent in the industry.

Chapter 2 – Understanding The Role Of Patent In The Automotive Industry

This chapter deals with a general approach of the patent role in the automotive industry, so the focus will be on the patent as an appropriation tool and, as a valuation tool.

2.1) The patent, an appropriation tool

Patent protection aims to secure the final invention against any use, manufacture, or simple possession for commercial purposes. Thus, when a company innovates, it protects itself, ensuring that no one can appropriate its research efforts without facing legal action. The significance of the patent is accentuated by the fact that the automotive industry, characterized by minimal recourse to open innovation,[10] that favors internal developments to ensure absolute control over inventions.

However, there are two nuances that must be considered: first, concerning the trend of exclusive internal R&D, and second, regarding the protection by patents in a highly competitive sector.

Concerning the company's internal R&D, it is important to note that this vision is being questioned over time. On one hand, the actual state of the art requires astronomical investments for small innovations. For instance, in 2006, Porsche and BMW spent around 80 million euros on a single invention.[11] This may explain that companies are increasingly turning to co-development strategies or alliances. On the other hand, the changing landscape towards electrification destabilizes the sector, which forces it to rethink its strategies by considering more collaborations between brands to progress rapidly in the field of electric vehicles.

[9] Alessandra Perri, Daniela Silvestri and Francesco Zirpoli, (2020), *Change and stability in the automotive industry : A patent analysis*.

[10] Serhan Ili, Albers Albert, Sebastian Miller, (2010), *Open Innovation in the automotive industry*.

[11] Ibid

Regarding the protection, it is tempered by the obligation to describe the invention, in accordance with Article 83 of the EPC, which requires a disclosure of the invention and a description. The latter description, gives competitors the opportunity to draw inspiration and create alternative solutions, novel enough to avoid infringement. Nevertheless, popular brands have to be innovative on their own to build and maintain their reputation. They prefer not to wait for others then to imitate them, because such behavior requires time and money for less recognition and success on the market.[12]

2.2) The patent, a valorization tool

The valorization here has a dual meaning: it concerns both the appreciation of the company and the enrichment of the knowledge base of the automotive industry. Initially, the patent acts as a lever for valorization for the company. On the one hand, valorization strengthens the company's position in partnerships, as a company with a multitude of patented knowledge enjoys a dominant position in negotiations, having more to offer than its potential partners. On the other hand, valorization is also economical for the company through licenses. Indeed, the license is an exploitation authorization; the licensee obtains the right to use the invention, thus discouraging or delaying 'imitation' and competition in turn because they benefit from it. In exchange, the licensee pays a royalty to the licensor.[13]
Complementarily, the patent not only fosters the growth of a single company but also contributes to the advancement of the entire automotive industry. The patent, through its function as a knowledge vector, valorizes the entire sector and fueling the engine of innovation across the entire industry.[14] Logically, the more an industry has knowledge, the easier it becomes to innovate, while a lack of knowledge makes innovation more challenging. However, it is interesting to note that despite this enrichment of knowledge, technical and technological similarities emerge across all vehicles. Many similarities arise from standards that push companies to innovate in one direction rather than another. For instance, legislation on emission reduction since 1980 makes companies concentrate on environmentally friendly engines, such as hybrid engines, electric engines or simply combustion engines with less emissions.

Chapter 3 – Patents and Standards at the Heart of the European Automotive Oligopoly

Patents enable monopolization and the creation of barriers for competitors. But how does this happen? standards are the key drivers. To understand this, it's crucial to contextualize it within the European reality of the oligopolistic sector, then to delve into the standard-essential patents (SEPs).

3.1) The Automotive Oligopoly, a changing landscape

First of all, defining an oligopoly is crucial. An oligopoly is “a state of limited competition whereby the market is characterized by a small number of producers or sellers.”[15] An oligopoly happens when at least three companies are in control like it happens in the auto industry. Even though there are plenty of car brands, they are controlled by a limited number of companies all

[12] Jan Gerken, Martin Moehrle, Lothar Walter, (2014), *Investigating the time lag between patent publication and market launch : insights from a longitudinal study in the automotive industry.*
[13] Granstrand Ove, (1999), *The Economics and Management of Intellectual Property Towards Intellectual Capitalism, p.* 75-76.
[14] Alessandra Perri, Daniela Silvestri and Francesco Zirpoli, (2020*), Change and stability in the automotive industry : A patent analysis*.
[15] According to LexisNexis glossary.

over the world and in Europe there are many of them like : Volkswagen Group, Renault-Nissan-Mitsubishi Alliance, BMW Group, Daimler AG and Stellantis are the most known. Therefore, very large patent portfolios are formed which makes it difficult for new competitors to enter with a patent blocking strategy. Here, blocking means two things: "first, to block their R&D and business activities, and second, to block the possibilities of their blocking the company's own R&D and business activities."[16] European companies invested heavily in internal combustion engines strategically creating barriers that logically serve to block new entrants. These potential new actors will need money to buy licenses, and to have something to offer in exchange. Even though they have both there is no obligation for European companies to welcome new actors that have the ability to compete with them. As a result, it makes sense why new companies aren't usually seen in the European automobile industry. It takes a lot of time, resources, knowledge to become competitive and it is not even sure that they can succeed because reputation is to take into account. This is a problem for new car brands as they will have to find ways to entice customers, which can be quite difficult if their needs are being already satisfied but not impossible if not. Take Tesla, for example, which saw a need for innovation that other carmakers weren't meeting. While most were investing in traditional engines or a bit in electric, Tesla went all-in on electric vehicles. But they didn't stop there; they also innovated in areas like autopilot, car design, and infotainment, which many other companies were neglecting.
In addition, with the new regulation that ban thermal engines by 2035 in Europe.[17] This measure will remove a barrier, allowing Chinese manufacturers to launch a significant offensive in the electric car market.[18] This shift towards electrification will become a standard by 2035 which inevitably question the standards in the industry and its relation with patent.

3.2) Understanding the Standard-Essential Patent

Standards play a crucial role in the automotive industry by influencing the innovation capabilities of companies, often guided by government regulations or international consensus established by standardization bodies such as the European Committee for Standardization (CEN). The transition from a consensus standard to a technical regulation is justified by the pursuit of the public interest.[19] Thus, 30% of European standards are developed in response to specific requests from the European Commission, known as "standardization requests,"

[16] Granstrand Ove, (1999), *The Economics and Management of Intellectual Property Towards Intellectual Capitalism, p.* 75-76.
[17] See, regulation (EU) 2023/851.
[18] The Commission estimates that Chinese brands such as BYD, Nio, and Xpeng have already captured 8% of the European electric car market, up from 4% in 2021, and could reach 15% by 2025 if the trend continues uninterrupted. Indeed, on 4 October 2023, the European Commission published a notice of initiation of EU anti-subsidy investigations into EU imports of battery electric vehicles (BEVs) from China. This has already been announced by European Commission President Ursula von der Leyen during her State of the Union Address on 13 September 2023. She stated that the 'global market is flooded with cheaper electric vehicles' the price of which 'is kept artificially low' owing to 'huge state subsidies'.
[19] Soumya Patra, Raju Kd, (2020), *Application of standard essential patents in automotive industry: An analytical perspective*.

followed by proposals that culminate in regulations, which are mandatory. In Europe, for example, there are emissions[20] or safety[21] standards.
Distinctions primarily manifest at the level of car design for most part. From a technical standpoint, similarities emerge due to adherence to standards like CO2 emissions regulations in Europe.
As previously seen, only few European companies control most of car brands in Europe. Even though most of brands are controlled, few remains independent such as : Ferrari, Aston Martin, McLaren, Tesla and BAC, among others. Independent companies whether small like BAC or well-known like Aston martin don't use their own engines but use others' engines[22] and this is justified by two reasons : firstly, it is expensive to develop its own engines and using others' engines doesn't impact company's credibility unless for specific case of prestigious brands like Lamborghini that are known for their speed-breaking engines and have already an expertise in the field. The second reason, which is connected to the first, is the necessity of 'green-engines' and developing such environmentally friendly engines in compliance with emission standards is both expensive and time-consuming. It is more advantageous to benefit from those who already have expertise in manufacturing what we need and what is compulsory to be market ready than to manufacture. For instance, Briggs Automotive Company (BAC) is a company founded in 2009, that fill the gap in the market for single-seater cars. To be on the road it must comply with some standards : lighting Euro standards, emission standards etc. To do so, its new engine is co-developed with Mountune and based on a Ford engine that was improved. The idea was to break performances and to enable the car to comply with emission regulations, making the vehicle market-ready.
As a result, standards become formidable assets when a patent protects an invention essential to their compliance. Since, an invention is not necessarily a unique object but could be like a set of constituent elements forming a final invention, each of these elements being protected by a patent. It means that there could be several SEPs holders. In this situation, all companies which must comply with standards will have to go through the holders of SEPs by paying licenses. Even though, these licenses must be fair, reasonable, and non-discriminatory to prevent abuses of dominant position, the majority of SEPs are held by a limited number of companies.[23] This reinforces the automotive oligopoly in Europe and, consequently, solidifies the European landscape, making it almost impossible for new players to emerge in a pre-established market if not to fill market's gaps. This explains why, at this moment, with the changing landscape in the automotive industry towards electrification, there is a race for the company that will manage to have an essential invention for electric technology (regarding batteries, the engine, etc.). Companies are on ventures, as seen with Volkswagen and its modular platforms, which could become the standard reducing production costs for example.[24]

[20] To reduce harmful gas emissions, European regulations were introduced in the early 1970s. These standards, called Euro standards since 1990, were established by the European Union in 1988 for heavy-duty vehicles and are covered by Regulation No. 595/2009 of the European Parliament and of the Council of June 18, 2009, which encompasses all vehicles.
[21] Directive 2003/102/EC makes the emergency braking technology ABS mandatory on all cars). For further information, see, Acea, (2021), *The Automotive Regulatory Guide, p.14-18.*
[22] This practice is usual in the industry, for e.g., Aston Martin DB11 available with an engine not made by Aston Martin, but Mercedes-Benz. Or even, Pagani that uses Mercedes's engines.
[23] Soumya Patra, Raju Kd, (2020), *Application of standard essential patents in automotive industry: An analytical perspective*, p.186.
[24] According to Volkswagen, the architecture of the modular electric drive matrix will fundamentally change electric cars and cars in general. Leading to fundamental changes in body design, interior design, the package and the powertrain characteristics of electric Volkswagens (and maybe electric cars in general).

Thus, the European automotive industry will have to welcome a new generation of manufacturers in a rapidly changing landscape. However, this should not create a 'hostile' climate between companies.

Chapter 4– Patent In Practice In The Automotive Industry

To better understand the interaction between patents and the automotive industry, it is necessary to see the patent in practice as a strategic tool for the company and the flip side of this coin.

4.1) A Strategic Tool

In practice, the use of patents is generally not hostile. Interactions between companies are not necessarily pacifistic but rather motivated by mutual interest, often materializing through agreements and arrangements. In practice, the patent plays several roles.
Firstly, the patent is a tool of exclusion and appropriation. It is known that the patent grants a temporary monopoly lasting for 20 years in Europe. During these 20 years, the owner controls the exploitation of their invention by others. It blocks competitors. In practice, companies exclude competitors during the initial years. Once the product reaches the peak of profits, licenses are then granted. For example, Citroën was long known for its hydropneumatics suspensions that offered unparalleled comfort for drivers. Citroën had decided to be the only one to produce it during the initial years of patent protection, meaning they did not authorize others to integrate this technology into their cars.[25]
Secondly, once licenses are granted, the patent allows for monopolistic advantages and royalty generation. In practice, the company allows its competitors to use its technology in exchange for money. Sometimes, the granting of licenses does not occur between automotive manufacturers because, in fierce competition, it is understandable that a company may not want to pay its competitor to use its technology; they prefer to find other alternatives. However, there is a way to circumvent this, which involves licensing the technology to engine suppliers who, in turn, sell it to competitors without them realizing it. For example, at Peugeot, there was a technology they were known for: hydroelastic engine suspensions.[26] Thanks to these suspensions, the engine noise is almost nonexistent; it's quieter. Now, everyone has this technology, which has become a 'standard.'
Thirdly, in practice, the patent allows for dominating partnership negotiations. When two companies want to collaborate,[27] In order to reduce the astronomical costs of research, which are divided by two, there is always one that comes out with a better position than the other because often they have more patents. For example, the Industrial Property Director of the PSA Group recounts the partnership with Ford for the development of a diesel engine. Ford, having no experience in this field, sought Peugeot's expertise, estimated at 60 million dollars. In another collaboration, Peugeot and Toyota jointly built a factory in the Czech Republic. To preserve its processes, Toyota asked Peugeot for compensation of 10 million euros, but after evaluation, it turned out that Toyota had no patents in the Czech Republic, and Peugeot had no obligation to pay.[28]

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[25] Gendraud Pierre, (2008), *Conférence d'ouverture des 3èmes Journées de la Propriété Industrielle dans l'Ouest organisées par le REPI les 27 et 28 novembre 2008 : « Comment la Propriété Industrielle va aider l'industrie automobile à faire face à la crise / aux nouveaux défis (énergie, matériaux, environnement, ...) ?»,* Revue juridique de l'Ouest, N° Spécial 2010-1 , Les 3ème Journées de la Propriété Intellectuelle dans l'Ouest, p. 13-44.
[26] Patent N° FR2604231A1
[27] Example: In 2019, Volkswagen entered an industrial partnership with Ford to collaborate on the development of pickups, utility vehicles, and electric vehicles.
[28] Gendraud Pierre, op. cit.

Finally, the patent proves to be a powerful deterrent. The Industrial Property Director of the PSA Group compares patents to "missiles," that makes the automotive industry a kind of cold war. A concrete example concerns Mazda, which, having observed Peugeot's use of a patent concerning them on the "rear brake of the Peugeot 406"[29], claimed several million in compensation. They argued that production had started years ago, indicating that Peugeot had been using their patent for some time. However, after thorough verification, it turned out that Peugeot held a patent for a "method of manufacturing pillar posts"[30] that Mazda was using. In the end, the situation was balanced, thus ending the confrontation. Nevertheless, it is important not to forget the other side of the coin, as everything is not always positive with a patent.

4.2) The Flip Side of the Coin

The other side of the coin lies, firstly, in the threat of manufacturing bans, a formidable weapon that competitors can deploy to completely halt a production line. Simultaneously, the company grants licenses but must also pay fees to other market players. Moreover, collaborations are not always advantageous and can incur high costs if there is nothing significant to offer in return, as in the case where a company engages in a collaboration to use a patented electric motor owned by another company. Patents can also impose restrictions not on the invention itself but on certain variants or alternative methods that are not necessarily optimal, for example, a patent limiting the use of certain electric window technologies in vehicles. Additionally, threats of retaliation are a tangible reality, where sending a "missile" can trigger similar responses from our competitors. Similarly, limitations in the choice of supplies can be imposed by patents held by suppliers, restricting our options, especially if the supplier holds a monopolistic position in the market, forcing us into costly choices, such as using patented components in gearbox systems supplied by a single dominant supplier. Thus, skillful management of these different facets is a key element in maintaining balance in this complex game.

Conclusion

In essence, this study highlights the crucial roles that patents play in the European automotive industry and explores how patents use shape this rapidly evolving sector.
While a patent provides exclusive marketing rights to its holder, the influence of customers and the persistence of competition are crucial factors. Realizing the benefits of a patent requires the holder to persuade customers and outperform competitors. It's essential to recognize that a patent alone is not a magic solution; if the invention isn't high-quality, too expensive, or if competitors offer better alternatives.
As the industry anticipates the shift towards electrification by 2035 in Europe, securing essential inventions becomes paramount. It means that companies whether Europeans or not will not be able to produce combustion cars in Europe. But, the particularity is that companies won’t stop investing in combustion engines for other markets. So the competition is double, both in low emission cars and internal combustion cars.
The challenge is to combine electrification and performances, companies must take new pathways offering ‘green lifestyle’ cars that do not compromise on power, performance and driving pleasure but use high-tech solutions to increase energy efficiency. In such way to differentiate from Chinese actors producing affordable electric cars.
Moreover, autonomous cars, and increasingly connected cars rise cybersecurity standards as every point of connection is a potential 'entry' for hackers. For the EU “*In order to take into*

[29] Ibid.
[30] Ibid.

account such risks, UN Regulations or other regulatory acts on cyber security should be applied on a mandatory basis as soon as possible after their entry into force."[31]

As seen, the establishment of the European Patent Convention streamlined the patent process, attracted international players. Nowadays, the shift towards electrification is resulting in new standards, new actors and a new highly competitive landscape in which patents continue to serve as multifaceted tool from exclusion and appropriation to fostering collaboration.

[31] See, regulation (EU) 2019/2144 of the European parliament and of the council.