Technology cooperation, intellectual property, and standards

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Since the work of Hagedoorn (1990) on the organizational modes adopted by technology cooperation and the intellectual property issues it raises, the situation has changed dramatically: now, thirty years later, we see new organizational modes that were only embryonic at that time, such as open-source software and "patent pools" associated with the development of technology standards. In general, there has been an increase in R&D contractual agreements as a proportion of all technology cooperation agreements, and a corresponding decrease in joint ventures. The latter have very high organizational costs (relative to the number of ventures that fail) and generate litigation over intellectual property (Hagedoorn 2002).

Hagedoorn's work is of interest because it also examines the consequences of these organizational modes for market structures. A high level of interdependence among the companies in question leads to modification of these structures. In the choice of a mode of organization, analysis in terms of companies' strategic behavior turns out to be just as important as taking account of transaction costs.

This strategic component has only grown in importance, particularly because of the increased role of intellectual property rights (IPR), but also because of the standardization of technologies that goes along with the globalization of the economy. This increased standardization calls for research into a topic rarely addressed hitherto: namely, the strategies of businesses that seek to promote an entire industry or coalitions within the same industry, where each defends its own "technology" and has its own conception of intellectual property and licensing (see Dobusch and Quack (2012) on copyright). By a "technology" we mean not only a particular product or technical process but also a body of knowledge shared by a community of practice that brings together technical workers who produce building-blocks of knowledge (a product such as a computer, for example) that possess some degree of complementarity. At a more aggregate level, this community of practice includes experts who can assess the state of the art, particularly within a class of the International Patent Classification (IPC). Since the creation of a new class (and of a subgroup of assessors for it) is a significant economic concern for professionals in the field, they are encouraged to build coalitions (professional "clubs" or associations) in order to support their common cause and participate to some degree in building up a shared collection of patents as well as a shared vocabulary for defining the property rights and licenses derived from them. (Bessy 2006a).

It is worth pointing out that the creation of a new class around "sustainable development patents" (across various domains), carried out jointly by the World Intellectual Property Organization (WIPO), the European Patent Office (EPO), and the UN, was preceded by the setting up of a patent pool, the Eco-Patent Commons (EPC), orchestrated by several large Information and Communication Technology (ICT) companies including IBM, Nokia, and Sony, who share the same problem of the growing energy use of their operations (Hermitte 2013). Following the Creative Commons model for copyright, these firms retain ownership of their patents, but all the members of their "club" have the right to use them (royalty-free) to promote environmental innovation. They decide on the admission of new members as well as the destination and modes of operation of their inventions. Authors such as Boynton (2011), who has drawn up a list of the advantages and disadvantages of the EPC, argue that its chief advantage compared to the traditional type of patent pool is that it eliminates all license costs within the club and promotes greater dissemination of knowledge (not all of it necessarily specified in the text of the patent) and hence improved collaboration between inventor and user. Although the EPC is still in its infancy, one of the chief objections to it so far is the lack of involvement by the major energy-producing companies and therefore a relatively low level of participation, which hampers its development.

From this perspective, the same problems are found as in the traditional patent pools: that is, some players can go it alone, since they have other ways to add value to their patents or can participate in a different pool altogether. The resulting uncertainty creates a problem of coordination, of the expectations of all concerned about the participation of all in the pool, which needs to reach a certain critical size if it is to work well.

Unlike the patent pools that make use of a technical standard for solving interoperability problems, EPC seeks to build shared knowledge about sustainable development and to solve problems of the interdependence of different patent holders. But what is in fact at stake is a process of standardization for environmental patents worldwide, requiring not only shared technical knowledge but also market intermediaries and experts in the collective management of intellectual property (Bessy 2006a). It is in this sense that in the case of this new type of pool one could speak of an "organizational standard" (or more generally a convention that defines the expectations of actors) whose dissemination will depend on how many belong to the pool, and on the marketing strategy that enhances the brand image of companies concerned about the environment. This idea of an 'organizational standard' can also be

understood in the sense of a new type of patent pool that is developing in the environmental context but may also apply to the protection of other public goods such as health (see below on the example of PIPRA).

This example is interesting for three other reasons.[1] Firstly, there is only a difference of degree between the different types of patent "collection" (a class of the International Patent Classification, a patent pool concerned with a technical standard, the Creative Commons) once we put the emphasis on the collective management (and shared related costs) required to create and maintain these collections. We are purposely using the term "collection" because it designates a way to build standards analogically, which is different from a set of explicit criteria and is especially valuable for identifying forgeries (Bessy and Chateauraynaud 1995). Secondly, this EPC may appear oxymoronic, since the term "patent" evokes exclusive use while that of "commons" suggests the idea of sharing, ideas that are currently in conflict, ideologically as we might say; we will return to this point below. Finally, the EPC connects in a way to the system of Proprietary Variety Protection Certification (PVPC), and it is hardly a coincidence that in both cases the natural environment is treated as a "common good."

In this context, seed variety development is a good example of an industry sector in which experts have wanted intellectual property rights to be less stringent than patent rights. As M.-A. Hermitte (2013) has shown, the rights to new seed varieties, whose legalization in France in 1970 was the outcome of a collective learning process that lasted for more than 50 years, are relatively limited and adapted to the specific character of this sector. Developers have preferred to limit the exclusivity they enjoy, allowing competitors to use protected varieties without authorization and without charge, in order to generate new varieties. Hermitte also points out that "free access" to genetic resources goes back to the old idea in Roman law that the natural world is inappropriable. In contrast, the biochemical conception of the genome is helping to remove this ban on privatizing nature, and to strengthen the protection of innovation through patent law.

[1] One might also point out that this initiative was promoted by the World Business Council for Sustainable Development, an organization of 190 multinational corporations concerned with sustainable development. This exemplifies the participation of other entities in the definition of "intellectual property" and reflects a form of self-regulation (one that has its own marketing-related purposes).

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Given the inadequacy of legal regulation (more and more often introduced at a supra-national level), the collective management of intellectual property is an important issue for inter-firm cooperation (Bessy and Brousseau 2006). Businesses not only exchange technical knowledge but also contribute jointly to establishing information formats for these exchanges in addition to intellectual property rights and statutes governing relations among "inventors" and "imitators." The resulting definition and stabilization of technical standards, and the organizational modes associated with them, will depend on their acceptance by the majority following the increasing returns to adoption by a user-manufacturer network.

Apart from its intrinsic characteristics, the usefulness of a standard depends directly on the number of its users. The increasing returns to adoption of a standard may be linked to the fact that the more a technology is disseminated the more attractive it is, because, rather like a language, it facilitates communication with the rest of the group (one example is software compatibility that makes digital files easier to exchange). Another reason is that more widespread adoption promotes the production of new applications, thus increasing the appeal of the technology in question (Arthur 1988). We would argue that a single standardization process may be valid for all organizational modes, and that we are witnessing ever greater use of inter-firm cooperation aimed at the imposition of standards and conventions, a standardization process in which some intermediaries play an indefinable but key role (Bessy and Chauvin 2013).

It is thus important to identify correctly the various organizational modes of technical cooperation in order to study the importance (if any) of the principles behind the standard, since this raises the question of the value of any standard – given that its dissemination depends on the emergence of crossed expectations and on the economies to be made through adoption rather than on its intrinsic qualities. This perspective allows us when analyzing technological cooperation to better integrate the strategies that companies use to acquire significant market power, given that they are the ones who define the relevant characteristics of the product or services to be exchanged, thus contributing to the construction of the market and of the hierarchy of innovators and imitators. We thus argue that the more pressing is the issue of market dominance, the more likely it is that the partners in the construction of the standard will jointly adopt licensing policies that are very open among themselves and to their imitators, but will start to enforce their IPR when the latter start to become threatening. From the standpoint of public policy, this raises the question of the distortion of competition caused

by these pools or alliances, especially since outsiders to the pool have no incentive to innovate.

In the present paper, we would like to start from this background to present some case studies relevant to the economic and legal issues surrounding technology standardization. Subsequently, these case studies will allow us to review the recent history of the institution of intellectual property, the product of tensions between "exclusiveness" and "sharing," by repositioning it within the context of broader institutional changes.

From a theoretical point of view, such an analysis draws on various institutionalist approaches, especially the French school of Economics of Convention (Bessy and Favereau 2003) and New Institutional Economics, which emphasize the inadequacy of legal regulation and the consequent importance of standards and conventions defined within communities of professionals (Ostrom 2005), and of the role of legal experts in defining the connections between these two levels of regulation (Bessy and Brousseau 2006; Bessy et al. 2011). These approaches maintain links with the economics of standards as developed by authors such as David (1985) and Arthur (1988), and also with the work of Shepard (1987) on second source agreements in the micro-electronics components industry. [2] This latter case can be generalized to all the strategies of companies that aim at generating joint profits across an entire industry.

The expansion of forms of standardization and intellectual property concerns

A study of the principles behind the search for a standard or a dominant technology in cooperations among several companies, to ensure them significant market power, belongs within a more general account of organizational modes. It is thus important to analyze the rules for the organization and allocation of the various kinds of individual property right (use, compensation, transfer). But it is also important to describe the characteristics of the technologies involved (codifiability, complexity, modularity, stage of development, rate of obsolescence, breadth and structure of the market) and to show in what ways technology is conducive to increasing returns to adoption. Innovation protection strategies will vary depending on differences in these characteristics (Levin, Klevoric, Nelson, and Winter 1987; Cohendet and Penin 2011).

[2] In this type of production, licenses (readily accorded to other manufacturers) function like guarantees to reassure the users of the technology, who have a number of different options for acquiring standard components.

In what follows, we will first analyze some cases of patent pools connected to standardization processes. Secondly, we outline some disputes over copyright to illustrate the conflict between two groups of professional workers in the domain of creation. Lastly, we examine the dynamics of standards by taking into account the defining of a market in the initial R&D phase and hence the importance of marketing in cooperations between companies, using the example of the fashion industry. The order in which the various cases are discussed parallels the increasing weakness of the role of proprietary ownership in each one (Teece 2008).

Patent pools and standards

Patent pools are often created as a way to introduce standards into sectors where returns to adoption are increasing substantially (as in the case of consumer electronics). The principle behind these pools is to encourage all those concerned to use the same technical options and to develop them further. Since often no single dominant player on the world stage is able to impose its own standard, the purpose of these pools is to bring together the maximum number of major players, especially those who possess the largest market share in the various segments of the global market, so that all the other players will recognize that the solution proposed by the pool will win out.[3] Within these pools, it is in each player's interest to adopt the pool's own standard. This standard thus has to incorporate patents owned by each player. Within the pool, royalty fees have to be close to zero, so that no one has the feeling that belonging to another, competing, pool would be more advantageous. However, once the standard is imposed each member of the pool has to be able to derive royalties from its use by third parties. It follows that within pools that seek to impose standards, technologies that have been developed through varying degrees of technical cooperation among the members will be put together rather like an erector set, where various patents are connected together on the principle that the distribution of royalties will be guided by the respective market shares of the members of the pool.

We begin by examining the Apple/Samsung case (or cases) in order to highlight the issues around standardization associated with the formation of a patent pool, then look into what lies behind the application of standardization in biotechnology.

The Apple/Samsung case

[3] On patent pools and the mutual exchange of licenses between manufacturers resulting from their technological interdependence, see Bessy and Brousseau (1998).

> In the summer of 2012, a San Jose (California) court convicted Samsung of infringing on six patents held by Apple for the design of the iPhone (such as its famous rounded corners) and several of its features (such as the finger-activated "pinch-to-zoom"). This conviction, which awarded an unheard-of amount in damages (more than a billion dollars), bears witness to the recurring emergence of intellectual property issues, which reignite the tension between a process of standardization – in this case of products related to new technologies – and the intensifying economic competition among firms on a global scale. This case is reminiscent of the conflict in the late 1980s between Apple and Microsoft about the "look and feel" of Windows software, which gradually made the IBM PC resemble the Apple Macintosh more and more closely. It was once again the appearance, the "look" so widely recognized around the world, that was at issue in the most recent trial, which saw two companies bound by close ties of technological cooperation in conflict with each other: Apple is Samsung's largest customer, and the screen displays, chips, and processors it manufactures are designed by Apple itself, so taking advantage of substantial economies of scale and of the cooperative development of technology exchanges.

We can detect in this case the model of the counterfeit economics, which standardizes a product in the sense that by introducing tiny deviations from the original model it makes its particular look or shape more widely known. It is important to distinguish between "standard" in the technical sense, meaning one that arises from the constraints on the interoperability of the various components of (for example) a cell phone, from "standard" in the sense of a model (the Apple "look and feel") that counterfeiters and imitators of all kinds seek to capture for the public domain, based on what they know about the mimetic desires of their consumers.

What has changed in recent decades is both the scale of the target market and the increased intensity of the legal battles, which are now fought over patent infringement and not only over copyright ownership. This expansion of the domain of the patent in information technology reflects the strategic importance given by businesses to intellectual property and the parallel development of large consulting and legal firms (even of "patent trolls").

The kinds of evidence involved have thus altered. Evidence no longer focuses on the distinctive characteristics or physical features that consumers are likely to identify but on functionalities; this means that more advanced technical skills are needed to determine who

originally created them. At the same time, litigation has moved on to address the very notion of "functionality" and by extension to the validity of patents issued.

Thousands of patents are essential to cell phone standards: they enable activity in this sector to operate smoothly while nourishing continual warfare between the manufacturers, who accuse each other of violating their respective patents. As in all cases of technological standardization, the different manufacturers are obliged to cooperate with each other by permitting cross-licensing. Special status can be demanded for more "essential" patents, resulting in forced renegotiation of royalty fees for licenses, especially if an outsider should begin to win too much market share. This is what lies at the heart of the suit brought by Apple against the Korean giant Samsung. A company that cannot negotiate increased royalties has to get ahead in the technological race in that area of the mobile internet sector that depends on the Smartphone operating system. For that matter, Google's ambitions for the internet of the future are also the target of Apple's legal strategy, since it was Google that created the Android operating system, also used by Samsung and other Smartphone manufacturers, which is the chief competitor of Apple's iOS.

These labyrinthine "coopetition" relationships among manufacturers help to demystify one of the outcomes of the lawsuit. The legal decision also had the effect of strengthening America's "creative energy" and its status as an inventor, while Samsung, and by extension Korea, was relegated to the rank of a mere imitator. It was the US economy and US law, as much as Apple in particular, who were on trial: we may recall that the fight against foreign counterfeiting is primarily dependent on the power of the state.

"Patent clusters" for specific products

In contrast to the establishment of patent pools based on the principle of the standard, we can look at the example of patent pools that depend instead on the possibility of manufacturing a specific product with a very narrow market, in a field such as agricultural biotechnology. This sector is characterized by the combination of innovation, difficulties in identifying rights owners, and often expensive licenses.

"Golden rice" is the prototypical instance of a public-private partnership for humanitarian purposes. This is a transgenic rice (invented at an American university), whose high vitamin A content can help solve malnutrition problems; its manufacture required separate authorizations by a dozen holders of more than 70 patents. The private company Syngenta put

together this "patent cluster" from humanitarian motives, granting the right to sublicense the invention at no cost to organizations active in improving plant strains in developing countries.

We see here that, unlike patent pools that seek to develop standards, the "patent cluster" makes it possible to manufacture a very specific product for combating malnutrition in those developing countries that are major rice consumers. These "orphan crops" do not offer biotech companies (such as Bayer and Monsanto) a sufficiently profitable market, since they cannot take advantage of standardization and economies of scale (unlike the case of wheat and maize). The situation is like that in research on drugs for orphan diseases, the unanticipated consequence of the systematic standardization of products and patent applications that makes massive R & D investment profitable.

The PIPRA case: a shift in the market

According to Vanuxem (2012), in the early 2000s the golden rice example was a great inspiration for PIPRA's attempt to set up a system for the collective management of IPRs to respond to standardization and increasing legal restriction. PIPRA is a consortium of several universities and non-profit institutes, based in California. Their idea was to unify the agricultural technology portfolio of the public sector to fight against the orphaning of crops by researchers and to encourage minority crops throughout the world, thus fulfilling its public service mission and, more generally, speeding up research and development in the field of varietal improvement through GMO technology.

The idea of creating a database of current patents and licenses is a response to the lack of detailed information from patent offices and the heterogeneous nature of regulation across different countries (in particular with respect to the use of GMOs). [4] It assumes the involvement of all stakeholders and in particular their technology transfer departments. The license exchange function (an exchange facilitated by access to biological material) presupposes that the identity of owners of intellectual property is known, that buyers and sellers can enter into relationships at preset prices and under predetermined conditions, and that the execution of the contracts will be monitored, as

[4] The database was supposed to cover non-patented plant technologies and plant variety certifications. This is an important point and reflects one aspect of this "commons," that is, the building of a database on the use rights of plant varieties. But the trend toward building systematic databases is encouraged by the increasing importance of issues around IPR.

in the case of a traditional patent pool or collective licensing agreement. Grouping complementary patents into "micropools" thus emerges as one of the features of a clearinghouse, whose main goal is the freedom to operate.

Vanuxem (2012) shows that PIPRA's two central functions, the clearinghouse (license exchange between public partners) and the creation of patent pools, were not actually implemented. This failure is primarily due to the fact that the partners did not play the game of supplying information to the database, and secondly to a shift in PIPRA's mission toward providing something closer to the services of a patent consultant: IP strategies, drafting and negotiating agreements, interaction with the private sector, extension to other sectors beyond agriculture (health, water, energy technologies in developing countries). But PIPRA has gone beyond traditional patent consulting to offer services such as patent mapping, analysis of commercialization opportunities, IP training, building technology platforms and patent pools, and support for the collective management of IPR: so what we see emerging is all the expertise of the patent lawyer, including software for performing analyses (for example of commercialization opportunities), whose business model is not really clear but which seems to be very complex and widely recognized, including by multinational companies in the field. PIPRA charges for its services and even offers to broker agreements between patent owners. The least one can say about this is that the company adds value to public research while its concern for developing countries seems to be vanishing in the distance.

This monograph shows how such a policy, focused on value-added services, risks abandoning the public service mission and the idea of the "commons" if it gives too much weight to commercial uses, which is true for the development of any databases that can be used for commercial purposes. The collectively constructed patent maps are primarily intended to be used for individual analyses of commercial opportunities.

One of the reasons for this mission failure is identified as the dependence on the private sector for the creation of patent clusters, which had not been fully expected at the outset, and also the fact that none of the partners (university departments of technology transfer) really committed themselves, due to the poor return on investment of specialized food crops.

As PIPRA's changes of direction show, for its promoters IPR is really not the problem but the solution, provided that an adequate collective management system is established, which in turn presupposes effective selection of the patents to be added to the pool, along the lines of the patent pools grouping private-sector partners. PIPRA does in fact provide management advice about the best way to draw up licensing contracts and preserve access to knowledge for humanitarian and research purposes.

Discussing the more structural reasons for the failure of PIPRA, Vanuxem mentions that this attempt at collective management only concerns innovator-sellers (scientists) and not innovator-users – the farmers whose knowledge may be a necessary condition for the sustainability of the commons – following the model of free software in the software industry. [5] This brings us back to the idea that patent pools are primarily a way of managing IPR and reciprocal licensing grants and do not involve actual technology transfer. However, one property of the "intellectual commons," as emphasized by Coriat (2011), is that it promotes cumulative additions to knowledge in order to spark new innovations.

A conflict between two coalitions over copyright

The current globalization of the economy is intensifying the tendency to standardization, thus encouraging a constant race for standards and concomitantly a degree of acceptance of counterfeiting and pirating, reflecting a kind of instrumentalization of the law.

The Napster case

We can cite the Napster case as an example of this. Founded in 1999, Napster was part of the emergence of new modes of access and distribution of artistic works through digital file downloads. The company had to cease its software development activities in 2002, after a lawsuit was filed by the music industry majors.

The judges in the case sided with the copyright holders, drawing on the economic argument that they were losing market share after investing resources in it. They might have argued the opposite position, based on a different economic principle, that of the

[5] The purpose of the analysis by Demazière et al. (2009) in the software field is to show how users can become real contributors and thus gradually build careers within the community as and when the value of their creations is recognized. Progressing in one's career does not only mean perfecting technical skills but also the acquisition of social skills involving ways of perceiving and behaving within the community of practice: compliance with these norms is essential to collective training and the transmission of knowledge.

benefit to consumers of an open market. The judgment, finding for the IPR holders, adopts an instrumental use of the law. In fact, among the arguments put forward by advocates of digital intermediaries we find the claim that implied licenses are granted by the majors in the music industry (the plaintiffs in the case), who seek to encourage the exchange of MP3 files over the internet. What this argument claimed is that some plaintiffs, including Warner Music, sought to build a network of alliances that would limit Napster's share of this emerging market. Seeking gradual control of the market, through a series of mergers and acquisitions they did all they could to play a dominant role in it. The strategy followed by the majors consisted in not committing themselves completely to this potential new market while trying by various means to ensure control of it over time, and closing their eyes initially to the piracy that was judged to be necessary for its development. [6] The collapse of this attempt at control, largely due to the massive expansion of file-sharing, which they failed to anticipate through a lack of understanding of the ways the internet is used, made it difficult to come to a favorable agreement with Napster. The option of going to court was then seen as necessary, the complaint being the breaking of copyright law by illegally using protected music and making it available to third parties.

This tolerance for "rampant piracy" is central to the software industry, based as it is on "open access." Many economic models show that it is not always in the interest of innovative firms to punish those who "pirate" their software once their return to adoption is increasing: that is to say, the utility of the software increases with the number of users, because they can easily exchange files over a network. [7] When these networking effects are particularly extensive, not protecting the software anticipates the emergence of a standard. Moreover, because the sophistication of the software requires a long period of training in its use, it is important to encourage demand by promoting the ownership of these tools by internet users. This encouragement is all the more desirable because the "pirates" (often described as "home consumers") can not only train new users but also contribute to improving the quality of the

[6] It was only with the introduction of Apple's iPod and the possibility of making its users pay that a licensing agreement was signed with the music industry majors.

[7] On this point see Shy and Thysse (1999). Using a duopoly model, they model the optimal behavior of two competing software developers, with respect to the protection and pricing of their product, by dividing their consumers into those interested and not interested in the related services that are offered so that they can make the best use of the software's capabilities. The most expert users in the field assigned little value to these additional services and thus could easily pirate the software.

software. The development of sophisticated licensing systems (hybrid licenses) enables licensors to take advantage of feedback from the licensees and maintain their advantage with respect to innovation by requiring grant-back clauses in the licensing contracts. [8]

The Napster case clearly exposes the strategy of those majors who possess IPR. Moreover, a substantially identical case came up in December 2008 when the Warner Music Group cancelled its license agreement with YouTube, which had authorized its users to create and publish freely, using content (mostly music) from the entire WMG library. Research into the users' reactions show that they not only condemned this new direction – all the more so since they were deeply committed to a creative enterprise within the communities of practice to which they belonged – but they also found it very difficult to know what was strictly legal or not, or legitimate at all, since Youtube was also taking advantage of the ambiguities of the situation. [9]

This type of conflict can be analyzed in terms of a process of definition of "standards" that sets the opposing coalitions at loggerheads: an industry coalition (the majors) that seeks to strengthen copyright through Digital Rights Management, and an emerging coalition of members of civil society who want to develop a "digital commons" based on "copyleft" licenses. The work of Dobusch and Quack (2012) shows that paradoxically the industry players, in spite of their powerful international lobbying capability, are struggling to enforce their regulations on the market, whereas the second coalition is more effective in the market than in the political sphere. This latter coalition values the decentralized power of users (and also producers) and invents frameworks for collective action (especially discursive and organizational devices) through mobilization of these user- producers, who have varying skills, motivations, and tools. It is because these technological and regulatory frameworks fit in with their practices that they are being disseminated as a kind of standard. [10]

[8] See Muselli (2002) who develops an analysis of the different licensing strategies in the software industry. Muselli distinguishes between strategies of control and strategies of openness, the latter strategies having a total absence of "lock-in" for the users but giving the licensor less autonomy than the former strategies, which are nonetheless very difficult to install, and in the case of Microsoft are essentially the outcome of historical accident.

[9] On this "netgraph" see Bajde, Dobusch and Quack (2013).

[10] This modeling with respect to a battle between the different standards backed by two coalitions nicely illustrates one form of race for the standard, but it ignores the fact that some of those involved operate in a hybrid area. As the work of Demazière et al. (2009) on groups of open-source software developers has shown, some members have interests directly related to their professional activity. The commercialization of the

This framing strategy is an example of a dynamic based on the expectation of increasing returns to adoption of a standard both in terms of its technical specifics and information format and its licensing models. The same strategy is also found in domains characterized by a very short product renewal cycle and a low level of proprietary ownership. The fashion industry is a good example, since it links a larger volume of sales to more rapid obsolescence (Raustalia and Sprigman 2012). More or less creative copies and variations contribute to the dissemination of the fashion trends that define each season, thus enabling a variety of manufacturers and designers to coordinate with each other. This is not a simple question of "first-mover advantage": we see here the same positive effects of adopting a "standard" that were illustrated in the Apple/Samsung case.

Beyond the issue of intellectual property, the cases discussed here highlight the importance of defining the market in the upstream R&D phase and hence the key role of marketing in the functioning of inter-firm cooperations that lead to introducing new products or processes. In this connection, a body of research by Teece (2008) shows the importance of (vertical) inter-firm cooperation for the development and commercialization of new technologies, since the firms can benefit from the complementary functions of their various assets and thus generate synergies leading to the consolidation of a technological advance in contexts characterized by low levels of proprietary ownership.

The extension of the concept of the standard to the fashion industry

This leads us to a more expansive understanding of the concept of the "standard" that would include, for example, the definition of the relevant features of a product (as in a convention of quality defined by a group of manufacturers) or the construction of fashion trends via the definition of new products.

Rinallo and Golfetto (2006) offer a good illustration of technological cooperation for the defining of trends in textile fashions. They cite a process of consultation between the most innovative Italian and French mass-market manufacturers of textiles and clothing, who have

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software developed by members of the group is in contradiction with the principle of disinterestedness that underlies the spirit, if not the ideology, of these communities who resist all attempts at personal appropriation of the collective good; but in many cases there is a fine line between private interest and involvement in the common good. On the issue of individual incentives for software developers, see also Foray and Zimmerman (2001).

jointly organized the annual Première Vision fashion fabrics show since the 1970s. This process of cooperation aimed at defining trends is a response to a highly fragmented textile and clothing industry and the need to reduce uncertainty about the features of textile products (color, structure, aspect, touch, decoration, and treatment) so as to improve coordination among the various entities concerned.

This process involves a multitude of players – not only the creative divisions of the manufacturers who have joined together in Première Vision, but also the "trend forecasters" companies and style bureaus that specialize in predicting fashion trends. Once the agreed-on trends have been predefined, all those concerned, both upstream and downstream from the textile manufacturers, come to the show (première Vision) to see for themselves what these trends are, as do all those who work in the field of "creation."

One could argue that the "group exuberance" generated by the show plays a role in the spread and establishing of the convention. But one might just as easily interpret this acceptance of a fashion standard as a function of the economies to be made through adoption, since it is in the interest of all those concerned, even remotely, to comply with it. How much is calculation and how much emotion in this collective acceptance process is hard to determine. For Rinallo and Golfetto, the calculations of the organizers of the show are comprehensive and leave little room for uncertainty. Such a strategy (unacknowledged and unacknowledgeable, Bourdieu would say) reflects the fact that the collective capacity both to represent the market and to create the market is unevenly distributed among the players in the "field," which, following Bourdieu (1993), Rinallo and Golfetto explain in terms of differences of "symbolic capital," differences that gradually over time give the earliest innovators the status and legitimacy to decide the new trends.

The connection between these manufacturers' power to assign value and the position of innovator that they lay claim to is particularly significant, as is the exploitation of a process of convention-making that helps them to recoup their initial investment. The organizers of Première Vision can be seen as the dominant market intermediaries who oblige the other players in the textile industry to follow in their footprints.

Reviewing the recent history of intellectual property: between exclusiveness and sharing

The various case studies presented here show that the recent history of intellectual property is characterized by companies' increasingly strategic use of the patent system (and of

copyright). Some even use their "patent portfolio" for highly speculative purposes, whether by creating patent pools in order to impose a technology standard or by introducing patent trolls to monetize their property through licensing arrangements and recovering damages awarded in infringement lawsuits.

The legal consequences of this situation are well known and have been the subject of numerous analyses, which have especially noted the "poor quality" of patents issued, especially in the case of the USPTO (Jaffe and Lerner 2004), and the excessive claims about their breadth of application, leading to lock-in situations due to the cumulativity of innovation processes. The increasing stakes relative to IPR litigation reflect overinvestment in legal resources and their instrumentalization, with the result that instead of being a source of security, the law in this area has became a force for uncertainty, criticized for its social and economic inefficiency (Coriat and Orsy 2005; Bessy 2006a). A study by Dobusch and Quack (2013) exposes the same uncertainty in the field of copyright, an uncertainty reinforced by the multiplicity and complexity of regulations (international treaties and directives, national laws, and private standards of regulation).

This growing criticism underlies the emergence, especially in the software industry and more recently in biotechnology (and more generally in sectors in which R&D is highly modular), of a community of innovators motivated by a belief in cooperation and information sharing, or at least in the benefits of innovation that may result from cooperation (Coriat 2011). [11]

As we have seen in the case studies discussed here, these communities are establishing original systems of intellectual property rights (Creative Commons, copyleft, and so on) that abandon the strategies of exclusive ownership and restriction that characterize the patent (or copyright) and more closely resemble the model of "open science" (Nelson 2005), though without obstructing the development of economically profitable activities.

But though the practices associated with the "commons" are now experiencing a boom thanks to the availability of storage and exchange offered by ICT, they have always existed, as we noted in the case of Proprietary Variety Protection Certification (PVPC) in the seed development sector. Moreover, it is important in this context to remember that in the software

[11] In addition to the critique on ideological grounds of proprietary systems, open-source software has its own kind of economic efficiency, since the degree of innovation, the quality, and the reliability are clearly superior to what is found in the realm of proprietary software. This efficiency has obviously improved thanks to the internet.

and drug industries patents are applied for at a very late stage, reflecting the US policy of harmonizing and tightening up IPR at the international level, which has led to the TRIPS (Trade Related Aspects of Intellectual Property Rights**)** and ACTA (Anti-Counterfeiting Trade Agreement) accords (Orsi and Zimmermann 2012). This initiative arose out of an in-depth reform of the US patent system, with an entire industry of IP lawyers who played an important lobbying role at the WTO. This power at the legal level gives US companies a great deal of flexibility, because they can wave their IPR in the air just at the point when they start to lose control over the market – a market that has often been constructed jointly with their competitors.

We can understand the reasons for attacking this type of imperialism, based as it on the privatization of knowledge, and the corresponding arguments for an "intellectual commons." But the case studies discussed above demonstrate that this collective movement in defense of the "commons" in general is also ideologically motivated, and that the "intellectual property" that it claims to oppose can refer to many different things. Although some proponents call for abandoning the legal categories in question, they are still shackled by them (Dulong de Rosnay and Le Cronier 2013)[12].

Some critical movements ask their activists who are creators to lift restrictions on the use of their works either by freely licensing them or by dedicating them to the public domain. Without questioning the sincerity of these activists, this demand for "free access" is open to use for marketing or dumping purposes, as soon as lots of internet users stop asking for a just price for their work; it has a negative effect on professionals who make a living through their creative work. Moreover, the PIPRA example shows how a collective initiative that adds value to public resources so as to fight poverty and disease can gradually turn into a very lucrative business.

Moreover, this libertarian approach underestimates the role of the collective management of intellectual property in "proprietary systems" and more generally the existence of complex organizational modes based on a carefully calibrated combination of exclusiveness and sharing. As we saw in the Introduction, in the case of environmental patent pools

[12] This is true of the signatories of the "Public Domain Manifesto" (published by COMMUNIA, the European Thematic Network on the Digital Public Domain) who proclaim that "The Public Domain is the rule, copyright protection is the exception."

exclusiveness and sharing can be combined within alliances whose profitability depends on the fact that the continuous production of shared knowledge and data creates the conditions for a gradual stabilization of technology standards developed for very large-scale markets. The development of these standards may be due to the intervention of a regulatory body (a legal standard) or to self-regulation among actors within a single area of activity who devote resources to the collective management of IPR. However, it can also be based on increasing returns to adoption by a network of users, as in the case of the Youtube community of user-producers who quickly understood the value of a framing strategy for the dissemination of a standard and the attainment of a dominant market position.

The search for a standard brings these types of open organization closer to the kind of technological cooperation within patent pools that is expanding in many areas (Delcamp 2010), especially in sectors with very short product renewal cycles, or passing fads, that involve little in the way of technology transfer.

This type of open organization is different from those research consortia that are not concerned strictly speaking with a technology standard and for whom knowledge exchange is central to inter-firm cooperation – even if in other respects, including the rules for profit-sharing, they share certain features. These rules are the result of a process of collective learning among the players concerned; they emerge spontaneously with their own specific features, while ultimately being dependent on the legal categories of the patent system (Cassier 1995).

In conclusion, it is clear that the situation that came into being during the decade of the 2000s was characterized especially by the "open systems" that forced a move from the principle of proprietary ownership to that of the common good or common cause (Aigrain 2005), most notably the Creative Commons and open-source licenses in the software domain. Ideally, the continued production of shared knowledge and data by proliferating numbers of players should create the conditions for a gradual stabilization of technological standards, without going through a long period of rivalry between proprietary firms. But as it has begun to lose touch with its roots in the "Another World is Possible" movement, this mode of production of technology standards is becoming dominant in the global economy, at the same time that it redefines the traditional uses of intellectual property rights. One result is the proliferation of arenas for the discussion and negotiation of the frameworks and rules for the new (self-)

regulation of economic activity on a global scale (Hermitte 2013). States, supranational bodies, and multinational corporations must now deal with players, previously excluded or not provided for on schedules of negotiations, who seek to develop alternative solutions by creating new forms of collective mobilization (Dobusch and Quack 2012). Although the deliberate instrumentalization of these forms of mobilization, based on the increasing returns to adoption of a standard, has political goals, economic interests may very soon get the upper hand.

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