SSOS v. SILOS AND THE "QUALITY OF INNOVATION"

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I. INTRODUCTION

In this paper, we propose an analysis of how the "*organization of innovation*" may affect its ultimate "*quality*" in certain important dimensions. In general, we start by recognizing the existence of at least four institutionally stylized models for the organization of innovation along an industrial value chain. These models can be led back to (1) a traditional firm, (2) a standard setting organization (SSOs), (3) a silo/platform system, (4) an open source community. All these "models" organize the exchange of information relating to products and processes, on all the different levels of an industry's value chain. In particular, they "solve" the problem of recognizing, aggregating and rewarding the contribution of the different levels of the chain.

We will concentrate only on the comparison between a standard setting organization ("SSO") and a silo/platform system ("SILO"), because these are probably the most interesting and relevant frameworks for examining the present innovation processes in digital markets. Furthermore, we will limit our comparison to only a few of the dimensions that affect the quality of innovation, namely: price, speed, transparency/social accountability and competition, our idea being that these dimensions, and the problems they cause in the final outcome, will shed some light on the relative value and efficiency of each model, in terms of the elusive concept of the "*quality of innovation*." After this Introduction, Section 2 compares SSOs and SILOs innovation processes with respect to price. Section 3 discusses the relative efficiency of the two models in terms of innovation's speed. Section 4 concentrates on the issues of transparency and social accountability, while Section 5 is dedicated to the concerns that relate to the effect of innovation on competition. Section 6 concludes, by linking these themes, with the aim of interpreting the effect of organizational arrangements on the "*quality*" of innovation.

II. PRICE

In an SSOs, the setting of a standard is carried out cooperatively, but raises questions with respect to pricing innovation, specifically in regard to defining the correct distribution of rewards amongst the innovators, and between innovators and implementers. As for other kinds of patents, for standards, the *true* value is measured by market success, which is only realized *ex post*. However, licensing agreements are often negotiated at an earlier stage. As is widely known, the large majority of SSOs have chosen to ask members to commit to the licensing of any patent that is *essential* to the standard ("SEP") operating on *fair, reasonable, and non-discriminatory terms* ("FRAND" or "RAND"). Generally speaking, the use of F/RAND terms entails various benefits.[2]

2 Licensing on F/RAND terms for SEPs is a commitment for innovators that is created by SSOs' policies and can be regarded as a contractual commitment by the patent holder to the SSO, and not to the public.

One of the most relevant advantages is that the technology encompassed by the standards is made available to all of the potential implementers without discrimination. On the other hand, SEP holders should be adequately rewarded for the use of their patents and should therefore be encouraged to continue to invest in R&D activities. Overall, the risk that SEP holders will gain an unfair bargaining advantage by *delaying* the manufacturers of standard compliant goods with FRAND licensing should significantly decrease. In this context, an issue that is of paramount importance is to identify the level of the royalties that may qualify as F/RAND. Besides the useful guidance that comes from the case law that has been developed in the U.S., in the last few decades the focus has shifted from the precise determination of the amount of the fee to the methodology that is to be used.[3] It is now commonly accepted that F/RAND negotiations should be driven by a series of economic considerations, such as the need: (i) to promote the adoption of the standard to mitigate both the risk of patent delay and that of royalty stacking, and (ii) to guarantee the patent holders a return on its investment, remunerating them, in a reasonable way, for the economic value of the patented technology itself.

Notwithstanding the intense discussions over the use of agreed parameters, heated litigation on SEP royalties demonstrate that the effectiveness of an SSO's "pricing" through the FRAND commitment is debatable. SEPs have high strategic value and, not surprisingly, there is more litigation in relation to them than there is to the "baseline" patents. As noted in a study that was financed by the European Commission ("EC") in 2014, 6.7 percent (393 of a sample of 5,768 U.S. patents analyzed by the study) of patent litigation cases involved SEPs (as of 2014), whereas only 1.5 percent (89 of 5,768) involved other patents.[4] According to the available analyses, the frequency of patent litigation, especially in the ICT sector, between the larger players, has increased considerably over the last 30 years, especially for SEPs (but also for baseline patents).

The problem, in a nutshell, is that SSOs are coping with the crucial problem of "contractual incompleteness" (Williamson 1988), and their pricing of innovation omits to govern "the future."[5] While contractual incompleteness could also be framed as an intended and efficient feature of SSOs contracts (Tsai & Wright, 2015)[6], a study on a wide sample of SSOs (N=36; see Baron and Spulber, 2018)[7] shows that, overall, licensing requirements have become more stringent over time, with many SSOs adopting additional rules on SEP licensing. Economists have advanced different possible solutions for the royalty issue. One possibility is to interpret FRAND as an access obligation and to use an efficient component pricing rule ("ECPR") tool in order to fix the access price. A second option is to interpret standardization as a cooperative game and to price royalties using fair apportionment instruments. An allocation through some sort of fair algorithm, applied only to actual SEP owners, and incorporating an adjustment for the effective success of the standard, may constitute an efficient way forward (Parcu & Silei, forthcoming).[8]

To understand SILOs' pricing of innovation, it is necessary to briefly examine how this specific network form of economic coordination that is enabled by modularity and open interfaces works in reality.

A platform ecosystem consists of a leader firm, acting as a value network orchestrator, and a number of partners. Ecosystems allow agents to coordinate their multilateral dependence through a set of economic and technological rules, thus obviating the need to enter into customized contractual agreements with each single partner.[9] The platform ecosystem takes a typical "hub and spoke" form, with an array of peripheral firms connected to the central platform via shared or open-source technologies and/or technical standards. By connecting with the platform, complementors not only generate complementary innovation but also gain access, directly or indirectly, to the platform's customers. Innovation that is produced beyond the platforms' core resources, therefore, creates highly valuable products and services.

The platform owner is able to influence the variety and depth of the innovation process by opening up more platform resources (APIs, SDKs, code libraries, templates), and by offering more favorable standard licensing agreements ("SLAs") to developers. Parker et al. (2017) have shown that a platform's strategy has a higher likelihood of success than a purchasing/subcontracting strategy, as long as the developer's base

3 Key references are the much-cited seminal 1970 judgment *Georgia - Pacific Corp. v. U.S. Plywood Corp.* case, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970), revisited and customized for SEPs by Judge Robart in *Microsoft Corp. v. Motorola, Inc.*, 2013 WL 2111217 (W.D. Wash. April 25, 2013, as well as the policy adopted in 2015 by the Institute of Electrical and Electronics Engineers ("IEEE").

4 R.N.A. Bekkers, J. Baron, A. Martinelli, Y. Ménière, Z. O. Nomaler & T. Pohlmann, Selected quantitative studies of patents in standards, 2014, PIE/CIS Working Paper; Vol. 626, Tokyo, Hitotsubashi University.

5 Williamson, O. E. (1988), The logic of economic organization, *JL Econ. & Org.*, 4:65.

6 Tsai, J. & Wright, J. D. (2015), Standard setting, intellectual property rights, and the role of antitrust in regulating incomplete contracts, *Antitrust LJ*, 80, 157.

7 Baron, J. & Spulber, D. F. (2018), Technology standards and standard setting organizations: Introduction to the Searle Center Database, *Journal of Economics & Management Strategy*, 27(3): 462-503.

8 Parcu, P. L. & Silei, D. (forthcoming), An algorithm approach to FRAND contracts.

9 Jacobides, M. G., Cennamo, C. & Gawer, A. (2018), Towards a theory of ecosystems, *Strategic Management Journal*, 39(8): 2255-2276.

reaches a sufficient size.[10] This "inverts the firm" (*ibid.*), since it moves innovation activities – as well as the cost of failures – outside the platform, leaving the profit from possible successes mainly to the latter. In summary, innovation rewards are mainly appropriated by the platform, while the complementors suffer a large proportion of the risks. Even if a given SILO's innovation pricing is very efficient for platform leaders, the final outcome in terms of total innovation may not be optimal.

Taking the complex pricing structure that has developed around online advertising as an example, Geradin & Katsifi (2020) argue that the auction mechanisms implemented by Google are extremely opaque and may lead to a loss of innovation, since the surplus that may have accrued to content creators is mostly captured by the platform, thus seriously reducing publishers' incentives to innovate and to invest in content generation.[11]

III. SPEED

A second dimension for comparison refers to the pace of innovation processes or, in other words, to the speed at which innovation is produced and adopted. Lengthy innovation production is an historical and critical feature of SSOs, where innovation advances by discrete steps. Gupta (2014) describes the complex standardization process that took place during the 3rd Generation Partnership Project ("3GPP").[12] This organization is split into 4 broad technical areas and 17 working groups; in a typical working group that is developing the technical *specifications* of a new feature, member organizations submit technical documents that are called *contributions*, which are reviewed and discussed among all the members before approval/rejection. As an example, Release 13 of the Long-Term Evolution ("LTE" Rel 13) standard – a standard for wireless broadband communication for mobile devices and data terminals – was developed through the submission and revision of some 730,000 technical contributions, which later gave rise to 1,261 technical specifications.

Clearly, any innovation that requires such laborious consensus-building is slowed down by the coordination processes, and a tradeoff can be manifested between high-quality outcomes and time. Most SSOs choose standards by voting, but decision rules vary significantly across SSOs, ranging from majority rule to full consensus. Studies found that the welfare implications of standards are highly sensitive to the decision procedure adopted (Farrell & Saloner 1988; Goerke & Holler, 1995) and, most importantly, that a supermajority decision rule is necessary in order to induce the standards' organization to choose an efficient standard.[13] The pace of the process may be even slower due to the presence of firms with vested interests, where proponents argue for their preferred solution, or simply hold out, until one side concedes. In these cases, Farrell & Simcoe (2012) suggest that it can be more efficient to relax the method of consensus, encouraging neutral participants in order to break deadlocks.[14]

In terms of the speed of innovation, SILOs appear to be an organizational "innovation" that is largely unrivalled. The speed of innovation in these ecosystems, as well as the intensity and speed of innovation in the surrounding industries, seems to be unprecedented. In particular, the production of innovation and its adoption are characterized by fluidity and continuity. In the app market, where innovation is produced on top of platforms' core resources, developers are key to a platform's ability to scale up rapidly, mainly because all the key processes of hiring, training, project selection, and so on, are all realized outside the core of the platform.

10 Parker, G. & Van Alstyne, M. W., & Jiang, X. (2017), Platform ecosystems: How developers invert the firm, *MIS Quarterly*, 41(1): 255-266, March 2017.

11 Geradin, D. & Katsifis, D. (2020), "Trust me, I'm fair": Analyzing Google's latest practices in ad tech from the perspective of EU competition law, *European Competition Journal* (2020): 1-44.

12 Gupta, K. (2014), Technology standards and competition in the mobile wireless industry, *Geo. Mason L. Rev.*, 22, 865.

13 Farrell, J. & Saloner, G. (1988), Coordination through committees and markets, *RAND Journal of Economics*, 19(2): 235-252, Summer 1988; Goerke & Holler (1995), Voting on standardization, *Public Choice*, 83: 227-351 (1977).

14 Farrell, J. & Simcoe, T. (2012), Choosing the rules for correct standardization, *RAND Journal of Economics*, 43(2): 235-252, Summer 2012.

IV. TRANSPARENCY AND ACCOUNTABILITY

The transparency and accountability of the innovation process is a third category that we can use to compare SSOs and SILOs. In the context of SSOs, the complex rules governing participation and decisions are particularly effective in preserving the accountability and transparency of the standard-setting processes. Baron et al. (2019) underline that most SSOs have majority voting as a written policy, with the voting threshold ranging from simple to two-thirds majority.[15] Individual voting is mostly kept secret, while many organizations have voting rules that are designed to avoid significant stakeholders being overruled. However, their empirical work shows that votes are rare: and consensus-finding, or even unanimity, are what happen in practice.

As regards transparency, SSOs' policies may vary: some favor the transparency of the process over the transparency of the final outcome (the standard), which is sometimes available only against a fee. In any case, the tension between openness and the balance of interests remains a delicate matter for all SSOs. As discussed by Contreras (2017), standards have enjoyed a public character for much of their history, even when their primary function is to support purely commercial ends.[16] In particular, since the 2000s, governmental agencies in the U.S. and the EU have begun to take explicit consideration of the public welfare arguments that relate to standards. In any case, while SSOs are not democratic institutions *per se*, and their legitimacy derives essentially from technical expertise, in many instances they perform tasks that are delegated by democratic institutions (this is the example of ETSI and CEN-CENELEC in the EU).

On the other hand, a great part of the SILOs' success rests on their trade secrets. As an example, the essential technology behind PageRank, the core of the dominant search engine, is a well-kept secret. While there is a Google patent filed for PageRank (No. 6,285,999), many aspects of this search technology are not addressed by the patent (i.e. the number of parameters that are used to weight webpages). In the recent *Google Android* decision, the Commission commented on the many private features of the source code of the operating system Android, quoting a report that defines it "as the most closed open source project."[17]

Given the two main general functions of the Internet – interpersonal communication and content dissemination over digital media – the lack of transparency in regard to the ways in which algorithms process, sort and, ultimately, orient our social and economic life, presents worrying implications. Well known examples are the campaigns for the "Brexit" referendum and for the 2016 U.S. Presidential Elections. Since these episodes, several studies have addressed the circulation of misleading and false news on online platforms, and especially on Facebook and Twitter. While none of the phenomena observed during these episodes is new in itself, the relevant aspect is that online platforms help to promote the spread of news, both rapidly and globally, thus triggering the "viralization" of fake content. Moreover, many studies have underlined that algorithms may "inadvertently" discriminate against certain groups. Google's search algorithm, for example, has been accused of discriminating against women, people of color, minorities and underrepresented groups. Increasingly, the public requests addressed to SILOs ask for more transparency and accountability, which are, of course, not easy to achieve, as shown by the controversies surrounding the role of the major social media in political elections.

V. COMPETITION

The traditional tension between IP rights and competition law may become particularly serious in the case of IPRs that are linked to standards recognized by SSOs. First, while it is true that standard-setting brings pro-competitive benefits, at the same time, it involves, by its very nature, competitors sitting around a table agreeing on the selection of a particular technology for common adoption. In order to avoid companies using SSO activities that are outside their legitimate scope, for instance, as a cover to fix prices or to exclude or disadvantage competitors, it is vital that a respect for strict conditions of transparency is always ensured.

Nonetheless, at present, the most relevant antitrust concerns focus on the phase *following* the selection of a standard. In particular, they concentrate on the consequence of conferring significant market power on SEP holders once investments have been made, and implementers may *de facto* become "locked in." In this context, three possible types of conduct that raise anticompetitive concerns can be identified: patent

15 Baron, J., Contreras, J. L., Husovec, M., Larouche, P., & Thumm, N. (2019), Making the Rules: The Governance of Standard Development Organizations and their Policies on Intellectual Property Rights, JRC Science for Policy Report, EUR, 29655.

16 Contreras, J. (2017), From Private Ordering to Public Law: The Legal Frameworks Governing Standards-Essential Patents, *Harvard Journal of Law and Technology*, 30: 211.

17 Commission Decision of 18.7.2018 relating to a proceeding under Article 102 of the Treaty on the Functioning of the European Union (the Treaty) and Article 54 of the EEA Agreement (AT.40099 – *Google Android*), p. 34.

ambush, which is related to deceptive behavior as a form of unilateral abuse; patent hold-up, and other disputes regarding licensing (including "reverse hold-up" or "hold-out"); and patent "thickets" or "royalty stacking," which is related to the accumulation of SEPs.

The first scenario represents a veritable breakdown of the standard-setting system. It can arise when a company hides the fact that it holds essential IPRs over the standard being developed and then starts asserting them only at a later stage, when the implementation process is well under way, putting the company in the position of charging a monopoly price.[18] The way patent disclosure is regulated within SSOs to avoid the creation of ambush opportunities can certainly vary, depending on different factors. In the vast majority of cases, there is a provision that patents must be disclosed before technologies are considered for inclusion in a standard.

The second scenario occurs when operating in the downstream market is fully dependent on there being access to the technology in the upstream market, in this case, SEPs can be regarded as "essential facilities" and their holders may engage in anti-competitive behavior by either refusing to license the necessary patents to implementers, or imposing royalties at an exploitative level. In particular, excessive licensing terms usually reflect not just the value of the patent, but also the significant costs of switching to a new technology, or even exit costs if switching is impossible. Conversely, however, implementers may adopt a similar position by refusing to engage with a licensing negotiation, thus impeding SEP holders from receiving a legitimate royalty income, generating a "reverse hold-up" situation. Similarly, to what happens with disclosure rules, a great deal of diversity exists in how all these aspects are treated within SSOs; in this case, such organizations have a vested interest in ensuring that the standards they publish can be widely commercialized, making them particularly keen to ensure that access to SEPs is granted on FRAND terms and conditions.

Finally, the accumulation of SEPs typically takes place when several patents protecting components of a complex modular technology exist, and different sets of elements can be assembled to yield a variety of technological products, generating "thickets" when patents belong to different firms.[19] For the purpose of remaining competitive against their rivals, smartphone manufacturers are increasingly adopting this strategy, accumulating vast portfolios, which often represent a barrier to entry into patenting, while impeding technological development and innovation at the same time (Larouche & Van Overwalle, 2015).[20] A related concern is the accumulation of the royalties to be paid to a multitude of patent owners, which results in "royalty stacking." Overall, although the discussion around these issues has recently started to capture increasing attention in policy discourse, the empirical evidence to support the intensity of the harmfulness of SEP-related abuses appears to be scarce.

By contrast, the market power acquired by dominant SILOs is clearly stronger, thus attracting worldwide anti-trust authorities' attention (Evans & Schmalensee, 2013).[21] A platform is typically dual- or multi-sided when presenting direct and indirect network effects. In particular, if network effects are strong and positive, large platforms tend to enjoy increasing returns to scale: users pay more to access a larger network, and margins improve as the user base grows. In the markets where they operate, platform orchestrators can use the resulting higher margins for greater investment in R&D or to lower prices, thus driving weaker rivals out of the market, which also leads to the dominance of a few large players, especially when multi-homing is costly, is not attractive or is impossible.

In this respect, an influential strand of economic literature has recently suggested that multi-sided platforms may provide particularly fertile ground for exclusionary conduct, such as exclusivity clauses or predatory prices, although it is vital to assess their effects on a case-by-case basis.[22] This phenomenon can be transitory in those markets in which this type of platform may evolve through sequential winner-take-all battles, with superior new players replacing old ones.[23] Nonetheless, in other situations, a single platform can emerge as the winner, "taking all," or almost all, of the market, which may give rise to permanent "tippy" outcomes, thus turning the market into a quasi-monopoly. This is what Schumpeter described as competition *for* the market, which is more likely to be primarily based on radical innovation, as opposed to competition *in* the market, which is normally characterized by evolutionary dynamics.

18 The anti-competitive effects of non-disclosure of relevant IPRs have been analyzed in the Rambus case, in which a U.S.-based technology firm was accused of having engaged in such a conduct by the U.S. FTC and the EC. *Rambus Inc. v. FTC* 522 F 3d 456 (DC Cir 2008).

19 The main definition has been provided by C. Shapiro, "Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard-Setting," in A. B. Jaffe et al., *Innovation Policy and the Economy*, 2001, Cambridge, MIT Press, pp. 119–150.

20 Larouche P. & Van Overwalle G. (2015), Interoperability standards, patent and competition policy, in P. Delimatsis (ed.), The Law, Economics and Politics of International Standardisation, 2015, Cambridge, CUP, pp. 367-393.

21 Evans, D. S. & Schmalensee R. (2013), The Antitrust Analysis of Multi-Sided Platform Businesses, NBER Working Paper No. 18783, 2013.

22 OECD, Hearing on Re-thinking the Use of Traditional Antitrust Enforcement Tools in Multi-sided Markets, Note by M. Katz ("Exclusionary Conduct in Multi-Sided Markets"); Note by A. Amelio, L. Karlinger & T. Valletti ("Exclusionary practices and two-sided platforms"), June 2017.

23 One prominent example often mentioned in this respect is given by the console war between Sony's Playstation and Nintendo's SNES.

Finally, another recent major anti-trust concern in relation to SILOs relates to strategic "killer acquisitions" whereby digital platforms target smaller innovative companies for the ultimate purpose of eliminating potential future rivals by discontinuing their innovative projects.[24] Although these kinds of transactions were previously commonly identified as a concern in the pharmaceutical sector, they have been increasingly problematic in digital markets, especially due to the prohibitive challenges that are posed to anti-trust authorities who are called to assess future harm only in terms of potential competition.

VI. CONCLUSIONS

In this paper we have assessed SSOs and SILOs as two different models for organizing innovation. In contrast to other models, these two appear to be very successful, both in fostering innovation and in shaping the most important industries of the digital era. Neither model's merits in the different areas of the digital economy are understood well, and we have not tried to explore the determinants of their respective reach. Instead, we sought to compare their results according to certain dimensions that may be relevant in terms of the "*quality of [the] innovation*" that is produced by each solution. Since quality is an elusive concept, we discuss it indirectly, comparing SSOs and SILOs through the way they perform according to the four dimensions of pricing, speed, transparency and accountability, and competition.

The result of our analysis is that, in relation to two categories, namely, speed and transparency/accountability, the response is relatively clear. There is little doubt that SILOs produce innovation more rapidly and continuously than do SSOs. Nevertheless, it is also clear that the innovation produced by SILOs is much less transparent and accountable than the consensus-building technical process brought about in major SSOs, sometimes with the support of a clear public mandate.

On the two other dimensions that we examined, namely, pricing and competition, the relative evaluation is more nuanced. On the one hand, the pricing of innovation by SSOs remains a thorny problem, which is addressed by F/RAND institutional arrangements, but which is still marred by major conflicts with implementers. On the other hand, the pricing of innovation in SILOs is easily solved by the proprietary dominance of the core, with its ability to embody (and appropriate) peripheral contributions. Doubt remains, however, whether this clear imbalance in favor of platform owners is a brake on future innovative efforts.

Finally, for SSOs, and focusing on competition, historical worries related to potential restrictive agreements, which are due to collusion among competitors (in the EU, these are violations of Art. 101 TFEU), seem to be less compelling. Instead, worries that are related to the abuse of the market power that is derived by SEP abuse (i.e. possible violations of Art. 102 TFEU), and the validity of the FRAND commitments as a safeguard, are still heavily debated. Regarding SILOs, presently, the public policy pendulum is offering a strong challenge to the winner-take-all characteristics and the lack of transparency of algorithms, both of which create serious concerns about the quasi-monopoly characteristics of major platforms. It is fair to note that, at least for now, these worries do not primarily concern the issue of innovation. The one important exception, however, is the debate regarding acquisitions by SILOs, recently dubbed as *killer mergers* which are realized with the possible primary purpose of absorbing or blocking innovative competitors.

24 M. Holmström et al., "Killer Acquisitions? The Debate on Merger Control for Digital Markets," 2018 Yearbook of the Finnish Competition Law Association.

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