

RESEARCH ARTICLE

Taking Technological Infrastructure Seriously: Standards, Intellectual Property and Open Access

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This paper introduces an 'infrastructural approach' to the problems of *de facto* and cooperative standard-setting in high technology. It reviews recent case law in the area, and attempts to provide robust economic arguments for the maintenance of 'open access' rules over such standards. First, it begins by qualifying such resources as technological 'infrastructure' according to the work of Brett Frischmann and Peter Lee. Subsequently, game theoretical tools are applied to the problem of cooperative standard-setting to demonstrate how the 'quasi-open access' FRAND commitment can constrain strategic behaviour. A legal analysis—including an examination of recent case law about the availability of injunctions—then follows to demonstrate the optimal 'negotiation framework' for the latter commitment to become credible. Finally, the infrastructural approach is expanded to demonstrate how it can elucidate a number of current controversies in high technology markets, where the tension between private ownership and public use of technological infrastructure is at its sharpest.

Keywords: Patents; Standards; Injunctions; Game Theory; Infrastructure; High Technology; Antitrust; EU Competition Law; FRAND

I. Introduction

At the core of today's high technology markets are networks, both real and virtual.¹ Real networks—links between devices and systems—scaffold the lower levels of information exchanges by ensuring a common hardware platform. Examples of real networks include the mobile communication networks (e.g. 3G UMTS, 4G LTE), local area networks (LANs), and the 'network of networks', the Internet. On top of real networks, there may also be networks built around software platforms, which enable users to share and exchange information important to them. These 'virtual networks' are formed by users as they select and utilise software applications, such as word processors, image editing programs, and social media.²

To many consumers, the complex pattern of networks that underwrites the success of high technology markets is more or less invisible.³ Consumers tend to cluster their activity around only a limited number of platforms (network hubs), and markets tend to 'tip' towards dominant solutions.⁴ The user experience is therefore often one of seamless interoperability. But the seamlessness of the user experience is sometimes bought at a steep price. Dominant software and hardware companies may utilise their intellectual property

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¹ Richard N Langlois, 'Technological Standards, Innovation, and Essential Facilities: Toward a Schumpeterian Post-Chicago Approach' (1999) Economics Working Paper 199907, 37 <http://digitalcommons.uconn.edu/econ_wpapers/199907/> accessed 4 January 2016 (states that '[...] "virtual networks" [are those] in which the connections are not physical but rather in the nature of economic complementarity').

² For an interesting analysis of the importance of software platforms in industry, see eg David S Evans, Andrei Hagiu and Richard Schmalensee, *Invisible Engines: How Software Platforms Drive Innovation and Transform Industries* (MIT Press 2008).

³ *ibid.*

⁴ As will be discussed further in Part II, Section B; the 'tipping' characteristics of a platform or standard is an *empirical* question, and should not be inferred *a priori*. Whether or not 'tipping' confers 'infrastructural' status on an asset also depends heavily on the demand-side 'switching costs'. See generally Joseph Farrell and Paul Klempner, 'Coordination and Lock-in: Competition with Switching Costs and Network Effects' in Mark Armstrong and Robert Porter (eds), *Handbook of Industrial Organization* (Elsevier 2007).

rights (IPR) to foreclose competition, and limit consumer choice by isolating competitors from the network or by raising their costs.⁵

In particular, IPR over technological standards (the technical details which define device and software interoperability within a network) may be used anti-competitively. In the case of '*de facto*' standards,⁶ which arise from the market due to demand side efficiencies (network effects), the European Union (EU) Commission and European Courts have elaborated 'exceptional circumstances' whereby dominant companies and standard owners may be compelled to license their IPR to downstream competitors under so-called 'open access' rules.⁷ The competition law basis for these 'refusal to deal' or 'essential facilities' cases (e.g. *Microsoft*,⁸ *IMS*)⁹ has generally been motivated by a 'monopoly leveraging' theory under Article 102 of the Treaty of the Functioning of the European Union (TFEU): the refusal to license IPR is seen to work as a 'complementary strategy' to extend a dominant position from an upstream market to one downstream, constituting an exclusionary abuse.¹⁰ More recently, the EU Commission and European Courts have also demonstrated their willingness to intervene in cases of '*de jure*' or 'cooperatively-set standards'.¹¹ Unlike *de facto* standards, *de jure* standards arise by a process of cooperative standard-setting in formal standard-setting organisations (SSOs).¹² When companies contribute technology for inclusion in a standard, they undertake a commitment to license any standards-essential patents (SEPs)¹³ under Fair, Reasonable and Non-Discriminatory (FRAND) terms. The precise content given to these terms is left to be hashed out by private negotiations between the parties, with the caveat that the framework for the negotiation may require a softening of some of the hard edges of IP law. In particular, recourse to injunctions may be limited. According to the recent EU Commission statements in *Samsung*¹⁴ and *Motorola*,¹⁵ and the Court of Justice of the European Union (CJEU) judgment in *Huawei v ZTE*,¹⁶ the threat or use of injunctions by the SEP-holder during these negotiations may thwart the process of FRAND bargaining,¹⁷ leading to the anticompetitive exclusion¹⁸ of competitors' products from the market.¹⁹ As in the case of *de facto* standards, the Commission and CJEU also elaborate 'exceptional circumstances' under which a finding of abuse can be sustained, and simultaneously define a

⁵ Mark A Lemley, 'Intellectual Property Rights and Standard Setting Organizations' (2002) 90 CLR 1889.

⁶ Jae Hun Park, *Patents and Industry Standards* (Edward Elgar 2010) 10 (arguing that '[s]ince the standards formed by network effects in markets are not formal standards but represent proprietary technologies that reach a dominant position in the market, they are called informal standards or *de facto* standards').

⁷ Marina Lao, 'Networks, Access, and "Essential Facilities": From Terminal Railroad to Microsoft' (2009) 62 SMULR 557, 563 (reads 'the essential facilities doctrine can be a useful tool in ensuring open access and interoperability').

⁸ Case T-201/04 *Microsoft Corp v Commission* [2007] ECR II-3601.

⁹ Case C-418/01 *IMS Health GmbH & Co. OHG v NDC Health GmbH & Co. KG* [2004] ECR I-5039.

¹⁰ Commission, 'Commission Concludes on Microsoft Investigation, Imposes Conduct Remedies and a Fine' (24 March 2004) Press Release IP/04/382, para 1 (noting that '[t]he European Commission has concluded, after a five-year investigation, that Microsoft Corporation broke European Union competition law by leveraging its near monopoly in the market for PC operating systems [...]') <http://europa.eu/rapid/press-release_IP-04-382_en.htm> accessed 4 January 2016. Censuring 'exclusionary abuses' rather than merely 'exploitative abuses' is an enforcement priority of the EU Commission, see 'Guidance on the Commission's Enforcement Priorities in Applying Article 82 of the EC Treaty' [2009] OJ C 45/02, para 6 ('The emphasis of the Commission's enforcement activity in relation to exclusionary conduct is on safeguarding the competitive process [...]') (Commission Guidance on Enforcement of Art. 82 EC).

¹¹ The terms '*de jure*' standard and 'cooperatively-set standards' shall be used interchangeably in this paper. Strictly, 'cooperatively-set standards' is a broader category as it also includes non-official SSOs such as private consortia and fora, eg the Bluetooth SIG <<https://www.bluetooth.org/en-us>> accessed 4 January 2016.

¹² Tim Pohlmann, 'Six Essays on Patenting and Coordination in ICT Standardization' (PhD Thesis, Technical University Berlin 2012) vi (states 'standards are described as *de jure* standards when they are specified by a formal standard-setting body').

¹³ See the definition of 'essentiality' according to the European Telecommunications Standard Institute Rules of Procedure (19 November 2014) art 15(6) (ETSI Policy).

¹⁴ *Samsung* (Case AT/39.939) Commission Decision [2014] OJ C-350/8.

¹⁵ Commission, 'Antitrust: Commission Finds that Motorola Mobility Infringed EU Competition Rules by Misusing Standard Essential Patents' (29 April 2014) Press Release IP/14/489 <http://europa.eu/rapid/press-release_IP-14-489_en.htm> accessed 4 January 2016.

¹⁶ Case C-170/13 *Huawei Technologies Co. Ltd v ZTE Corp & ZTE Deutschland GmbH* EU:C:2015:477.

¹⁷ *Motorola* (Case AT/39.985) Commission Decision [2014] OJ C-344/6. In *Motorola*, these 'un-FRAND' terms also including conditional threats of injunctions if the licensee challenged the essentiality or validity of the SEPs. See also Press Release IP/14/489 (n 15).

¹⁸ The precise competition law theory of harm is difficult to deduce from the decisions so far. For an overview of possible theories of harm see eg Nicolas Petit, 'Injunctions for FRAND-Pledged SEPs: The Quest for an Appropriate Test of Abuse under Article 102 TFEU' (2013) 9 ECJ 677. See also Alison Jones, 'Standard-Essential Patents: FRAND Commitments, Injunctions and the Smartphone Wars' (2014) 10 ECJ 1.

¹⁹ *Huawei* (n 16) para 52 ('the fact that that patent has obtained SEP status means that its proprietor can prevent products manufactured by competitors from appearing or remaining on the market and, thereby, reserve to itself the manufacture of the products in question').

'safe harbour' within which licensees may negotiate FRAND rates without threat of injunctions, although the precise competition law 'theory of harm' remains uncertain.²⁰

This paper aims to contextualise the recent Commission and CJEU statements in *Huawei*, *Samsung* and *Motorola* as part of a broader 'infrastructural approach' to technological standards consistent with the *de facto* standards line of cases of *Microsoft* and *IMS*.²¹ The nerve of the argument is that despite the different competitive and cooperative processes that give rise to them, both these types of standards perform the economic role of 'technological infrastructure', and function as necessary inputs to downstream production in high technology markets.²² Achieving such infrastructural status has the potential to create an economic windfall on the supply side and demand side simultaneously by lowering production costs, increasing consumer surplus, and fostering static and dynamic competition, leading to greater product choice and diversity.²³ However, as with traditional indispensable infrastructure, these social and private gains are only fully realised when the essential infrastructural resource is managed under an open access rule.²⁴ The approach of this paper is both descriptive and normative. It is argued that despite the differences in the identified 'exceptional circumstances' and the legal rules used, the European approach to both *de facto* and *de jure* standards is underwritten by an implicit concern to ensure open access to technological infrastructure.²⁵ A two stage 'infrastructural approach' is argued to be at the core of this approach, which can be roughly summarised as including (i) an 'infrastructural screening test', followed by (ii) an assessment of the appropriateness of an open access rule. This is the descriptive component. The normative component argues that by making this infrastructural approach explicit it becomes possible to taxonomise the access disputes over SEPs, 'interoperability information' and other privately owned technological infrastructure as part of a wider societal debate²⁶ about the merits and pitfalls of private control over 'public' infrastructure, whether these are the traditional 'top down' infrastructures of roads, electricity and telecommunications; the (private) cooperatively set infrastructure of, *e.g.*, mobile communications; or the 'bottom up' infrastructures of super-dominant software products, such as operating systems, search engines or social media websites.²⁷ It is submitted that all these examples of infrastructure share a number of key characteristics that may jeopardise the efficient application of 'property'²⁸ rules and frustrate the normal process of market bargaining for access.²⁹ Furthermore, as network products and markets continue to proliferate and take centre stage in the modern economy, the social trade offs involved in private ownership over technological infrastructure are starting to sharpen, as shown by the increasingly regulatory and interventionist tendencies of governments towards companies like *Microsoft*,³⁰ *Intel*,³¹ *Google*³²

²⁰ See Parts IV and V, Sections A respectively.

²¹ Although the CJEU and Advocate-General in *Huawei* worked hard to distinguish the *de facto* standards case law from the operative part of the newly minted *de jure* standards decision, there are a number of essential similarities between the decisions which point to this shared overarching concern. See Part V, Section A for a more detailed discussion.

²² Nicholas Economides, 'Antitrust Issues In Network Industries' in Ioannis Kokkoris and Ioannis Lianos (eds), *The Reform of EC Competition Law* (Kluwer 2008).

²³ Carl Mair, 'Openness, Intellectual Property and Standardization in the European ICT Sector' (2012) 2 IP Theory 52, 55 (arguing that '[t]he benefits of a single dominant standard accrue on both the demand and supply sides simultaneously: software suppliers reduce costs by focusing their production on a single platform; meanwhile, consumers benefit "from a large installed base that generates lots of software and other complementary goods and services"').

²⁴ Brett M Frischmann, 'An Economic Theory of Infrastructure and Commons Management' (2005) 89 Minn L Rev 917, 928.

²⁵ Although the language of 'infrastructure' was not used in *Huawei*, AG Wathelet discusses the concept of 'dependence', which is foundational to this approach. See Case C-170/13 *Huawei Technologies Co. Ltd v ZTE Corp & ZTE Deutschland GmbH* EU:C:2014:2391, Opinion of AG Wathelet, paras 73–74 (pointing to '[...] a relationship of dependence between the intellectual property right holder occupying a dominant position and other undertakings').

²⁶ This is a debate of deep historical provenance, and can be traced back (in modern times) at least to the notion of 'conveniences affected with the public interest' in the seventeenth jurisprudential writings of the English jurist Sir Matthew Hale, as discussed in Walton H Hamilton, 'Affectation with Public Interest' (1930) 39 Yale LJ 1089, 1093; this provenance is also briefly discussed in Brett Frischmann and Spencer W Waller, 'Revitalizing Essential Facilities' (2008) 75 ALJ 1.

²⁷ At its most capacious, the debate also touches on issues of 'net neutrality' and personal data protection, but these topics are outside the scope of this paper.

²⁸ 'Property rules' refer to the application of exclusive ownership regimes, which provide owners with near-total discretion to determine access.

²⁹ Derek Ridyard, 'Essential Facilities and the Obligation to Supply Competitors under the UK and EC Competition Law' (1996) 17 ECLR 438, 450 ('free negotiation cannot be expected to provide a satisfactory solution. If the essential facility is indeed a monopoly, the outcome of free negotiation between a monopoly asset owner and a competitive complainant must also be unsatisfactory [...]').

³⁰ *Microsoft* (n 8).

³¹ *Intel* (Case COMP/37.990) Commission Decision [2009] OJ C-227/13.

³² Commission, 'Antitrust: Commission Sends Statement of Objections to Google on Comparison Shopping Service; Opens Separate Formal Investigation on Android' (15 April 2015) Press Release IP/15/4780 <http://europa.eu/rapid/press-release_IP-15-4780_en.htm> accessed 4 January 2016.

and Facebook.³³ Unlike with traditional infrastructure—where access issues have historically been solved by public provisioning or sector-specific regulation—the ‘bottom up’ provisioning of technological infrastructure presents governments with extremely difficult, if not intractable, efficiency gambles over private incentives and the public interest. By building on the insights of Brett Frischmann, Suzanne Scotchmer and Ian Ayres, and some useful tools from game theory, this paper develops and defends the utility of an infrastructural approach to technological standards and demonstrates how an open access regime can be efficient and principled in both law and economics.

The paper will develop the above arguments in the following framework. After this introduction, Part II will unpack the concept of ‘technological infrastructure’ as used in this paper. It will begin by introducing the infrastructural approach (Part II, Section A), before applying it to the special case of IP-protected essential ‘technological infrastructure’ (Part II, Section B). Part III will then focus on the strategic and legal dynamics of standard-setting in high technology. It is divided into three sub-sections. Section A (Part III) will provide an overview of the relationship between *de facto* and cooperative standards, by making use of tools from game theory to highlight the strategic aspects of standards development, both as a coordination game, and as a prisoner’s dilemma (Part III, Section B). Section C (Part III) will then hone in on the (EU) legal status and enforcement of the FRAND commitment in cooperative standard-setting. To this end, it will provide a review of recent cases in the EU, as well as a brief look at some key case law that has emerged internationally. Part IV then zooms in on the recent CJEU case law and Commission statements about the (un)availability of injunctions during FRAND negotiations, in certain conditions. The discussion will focus on teasing out the economic and strategic consequences of removing the availability of injunctions during FRAND negotiations. It aims to demonstrate that, in contrast to arguments of commentators who suggest that such an approach is tantamount to non-market price-setting, removing injunctions as a remedy may actually lead to an increase in successful private bargaining over FRAND, due to its ‘information-forcing’ negotiation framework. Part V is integrative, and attempts to synthesise the legal approaches adopted by the European Courts with respect to *de facto* and *de jure* standards and demonstrate that they form part of a single concern to apply an open access rule to technological infrastructure, thus allowing producers, consumers and society in general to benefit from the ‘synergies’ and network spillovers which may result (Part V, Section A). Section B (Part V) will conclude.

II. Infrastructure Theory

Although an ‘infrastructural’ approach to certain type of IPR has arguably been implicit in a number of key legal decisions and academic commentaries for some time,³⁴ the first explicit development of this perspective was made by Brett Frischmann in 2005. In his paper, ‘An Economic Theory of Infrastructure and Commons Management’,³⁵ Frischmann developed the idea that certain information resources (such as IPR) may share key attributes with traditional infrastructural resources (such as the power grid or the road system) which qualify them for special management in the public interest. As with traditional infrastructure, Frischmann argued that certain kinds of IP-protected information resources should be managed in a manner that promotes openness over private control. Below, these special attributes of infrastructural resources will be unpacked and explained (Section A) before the special case of IP-protected privately owned ‘technological infrastructure’ is developed (Section B).

A. Economic Characteristics of Infrastructure

‘Infrastructure resources are intermediate capital resources that serve as critical foundations for productive behaviour within economic and social systems’.³⁶ Put simply, infrastructure functions as an input to downstream production but is not used up by such production. In order to fulfil this role, infrastructure

³³ See Samuel Gibbs, ‘Facebook’s Privacy Policy Breaches European Law, Report Finds’ (*The Guardian*, 23 February 2015) <<http://www.theguardian.com/technology/2015/feb/23/facebook-privacy-policy-breaches-european-law-report-finds>> accessed 4 January 2016.

³⁴ Frischmann and Waller (n 26) 64 (argue that ‘[...] the EU cases seem to instinctively understand the value of the essential facilities doctrine when applied to infrastructural assets, both physical and incorporeal’). Explicit use of the term ‘infrastructure’ is also found in a number of EU essential facilities cases such as Case T-158/00 *ARD v Commission* [2003] ECR II-3825, para 199 (‘digital infrastructure’); *Sealink/B&I Holyhead: Interim Measures* (Case IV/34.689) Commission Decision 94/19/EC [1992] OJ L15/8, para 41 (‘an essential facility, i.e., a facility or infrastructure [...]’)

³⁵ Frischmann (n 24).

³⁶ Brett M Frischmann, *Infrastructure: The Social Value of Shared Resources* (OUP 2012) 11.

is characterised as being non-rival,³⁷ intermediate³⁸ and generic.³⁹ Traditional infrastructure is often characterised by two chief attributes: government involvement in its provision and/or management, and its predominantly open accessibility. Governments and the public have both historically recognised that certain resources tend to yield socially optimal outcomes when managed in an openly accessible manner. On the supply side, these socially optimal outcomes have traditionally been explained in terms of the returns-to-scale advantages inherent in natural monopolies, or by the 'public good' status of some infrastructural goods, which inhibits their private provision at socially optimal levels. Government regulation and public provision of such resources was therefore considered to be essential. Although in recent years, many of these resources have undergone some privatisation (e.g. the unbundling of telecommunications networks in many countries), they often still benefit from sector-specific competition policies, which mandate openness and non-discrimination as a condition of their private ownership.⁴⁰ One consequence of the push towards liberalisation has been the necessity to develop 'access rules' for the downstream suppliers requesting access to indispensable assets owned by the incumbent (often state-sponsored) monopolist. The solution was the adoption of 'open access' terms, which were intended to prevent both exploitative and exclusionary abuse on the part of the monopolist as well as to 'lower prices, stimulate technological innovation and increase consumer choice'.⁴¹ Pithily defined, an open access regime is an access regime implemented by the resource holder(s) or regulator, which permit all potential users to have access to the resource on similar terms.⁴² Such rules aim to 'leverage' the (partial) non-rivalry of the resources at stake, in order to realise maximum social spillovers and encourage competition.⁴³

An important contribution made by Frischmann to the economic analysis of infrastructure is his focus on the 'demand side' aspects of open access to infrastructural resources, as opposed to the supply side. Indeed, the supply side arguments in support of government management of infrastructural resources fell out of vogue in the late 1970s and early 1980s, triggered in part by the notion that 'government failure' in the management of natural monopolies may lead to greater 'deadweight losses' than the 'market failure' inherent in their deregulation.⁴⁴ Frischmann's arguments on the demand side focus on the idea that infrastructural resources are effectively 'conduits' for downstream value production, serving to scaffold vast positive externalities: value which spills over into society at large without being completely captured by private interests.⁴⁵ To illustrate his point, Frischmann gives the example of the traditional infrastructural resource of public highways. By being open access, the public transport network lowers transaction costs on commerce and thus leads to 'scale returns—greater social value with greater use of the resource'.⁴⁶ Frischmann argues that the same goes for any resource whose social function is that of a conduit for value production, including in special cases, intellectual property, as discussed in Section B (Part II).

As opposed to the logic of the 'tragedy of the commons',⁴⁷ where open access to resources results in negative externalities and competitive exploitation, Frischmann and others⁴⁸ argue that infrastructural resources are often characterised by a 'comedy of the commons'⁴⁹ or a 'cornucopia of the commons', meaning simply,

³⁷ Non-rivalry refers to an asset's ability to sustain multiple- sometimes infinite- downstream uses simultaneously.

³⁸ 'Intermediacy' refers to an asset's status as an input rather than as an end product, meaning that demand for the asset is generally a 'derived demand'.

³⁹ 'Genericness' means that the range of final products or services to which the asset may function as an input is very broad, and may be undefined. For another, related definition, see Peter Lee, 'The Evolution of Intellectual Infrastructure' (2008) 83 Wash L Rev 54: ('(i) the resource is at least partially nonrival; (ii) it derives its primary social value from facilitating downstream productive activity; and (iii) it serves as an input into a wide range of goods and services, including private, public, and nonmarket goods').

⁴⁰ Natascha Freund and Ernst-Olav Ruhle, 'The Evolution from Sector-Specific Regulation Towards Competition Law in EU Telecom Markets from 1997 to 2011 – Different Effects in Practical Implementation' (22nd European ITS Conference, Budapest, September 2011).

⁴¹ Commission, 'Unbundled Access to the Local Loop: Enabling the Competitive Provision of a Full Range of Electronic Communication Services Including Broadband Multimedia and High-Speed Internet' COM(2000) 237 final, 3 'Objectives'.

⁴² But 'open access' does not mean that access is free: in cases where payment is not integrated into the tax system, other 'tolls' or fees may apply- provided these are 'reasonable' and do not extract the 'strategic value' of the input.

⁴³ Furthermore, an open access rule 'diffuses pressure within both market and political systems to "pick winners and losers" and leaves it to users to decide what to do with the opportunities (capabilities) provided by infrastructure'; Frischmann, 'Infrastructure' (n 36) 15.

⁴⁴ See eg Richard Posner, *Natural Monopoly and its Regulation* (Cato Institute 1999).

⁴⁵ Yochai Benkler, *The Wealth of Networks* (Yale University Press 2006) 153–161.

⁴⁶ Frischmann, 'Commons Management' (n 24) 928.

⁴⁷ 'Tragedy of the commons' is the idea that common control of a limited resource may lead to competitive overexploitation. See Garrett Hardin, 'The Tragedy of the Commons' (1968) 162 Science 1243.

⁴⁸ Carol M Rose, 'Romans, Roads, and Romantic Creators: Traditions of Public Property in the Information Age' (2003) 66 Law and Contemporary Problems 89, 95.

⁴⁹ *ibid.*

that greater use may lead to greater gains, such as in the well-known case of network goods subject to the 'positive externalities' of 'network effects'. For example, as a telecommunication network expands to include a greater number of users, all existing users experience a value increase in the asset (as measured by the growth in possible connections to members of their social network). Moreover, this increase in consumer surplus is exponential, according to Metcalf's law.⁵⁰ Although networks are a special case since the generated value follows a power law, traditional infrastructures also tend to yield increasing social returns to use: a village's use of a sewage system leads to public health gains; education infrastructure leads to a better informed electorate etc. All these outcomes derive from the 'scaffolding' role of infrastructure: the locus of value creation is downstream of the infrastructural good itself, and its value 'spills over' into a number of 'adjacent and sometimes, completely unrelated markets'.⁵¹ The nub of the above arguments means that essential infrastructural assets attract an economic logic which can be summarised as 'if infrastructure, then open access'.⁵²

In modern high technology markets, networks play a central role in value creation and productivity as both producers and consumers leverage the network effects of real and virtual (software) networks to enhance the value of their products and intellectual creations. While the underlying real networks are often regulated and in some sense publicly provisioned (e.g. telecommunications cables, electricity grid, and the regulation of mobile spectrum),⁵³ the 'wealth of networks'⁵⁴ in high technology is often purely privately provisioned and managed, such as in the case of software operating systems, applications and web services. As will be shown below, in some cases the intellectual property rights that 'read on' to these networks (and the network interfaces, such as standards) may qualify as essential infrastructural resources, thus demanding special treatment analogous to traditional infrastructure.

B. Privately Owned Technological Infrastructure

Although the argument for previously publicly owned facilities being treated as 'essential facilities' and made subject to an open access regime following deregulation is reasonably uncontroversial, the case of fully privately owned assets being treated the same way has proven more problematic. In particular, the idea that purely privately provisioned infrastructural assets should be subject to the 'forced-sharing' of an open access regime has provoked vituperative criticism from both academics and some Courts.⁵⁵ The literature in this area is dense, but can be usefully summarised as clustering around two nodes. One node of the literature aims to undercut the premise of the infrastructural approach, by arguing that in dynamic environments privately owned assets rarely fulfil the requirements of infrastructure. It begins by acknowledging that the competitive process in network markets (which characterises high technology) may lead to super-dominant market shares. But it argues that the dominant positions that result only enable innovators to extract 'Schumpeterian rents',⁵⁶ since the dominance is time-limited by the pressure of dynamic competition. The crux of the argument is that a static 'snapshot' of the market may well show that an asset is infrastructural, but that when viewed dynamically, these infrastructural attributes fade away and are replaced by a moving image of constant turmoil: a process of cascading dominance by competitors and new entrants.⁵⁷ The second node of the literature is intimately related to the first, but focuses instead on the dangers of implementing an open access rule, even if the asset is found to be infrastructural. This argument may well concede that an asset is infrastructural in both static and dynamic senses, but argues that it was only the *ex ante* incentive of exclusive private control, often in the form of intellectual property rights and the corollary ability to restrict competition and charge monopoly prices, which justified the 'infrastructural' investment in the first place.

⁵⁰ Knut Blind and colleagues, 'Interaction Between Standards and Intellectual Property Rights' (European Community 2004) 52 ('Metcalf's Law of the Telecoms show(s) the magic of interconnections: connect any number "n" of machines—whether computers, phones or cars and get "n squared" potential value').

⁵¹ Frischmann, 'Infrastructure' (n 36) 38. The key economic characteristic which permits such increasing returns to consumption is that of 'non-rivalry'. However, it should be noted that some assets may only be partially non-rival, meaning that the regime must also be designed so as to avoid the negative consequences of partial non-rivalry, such as 'congestion'.

⁵² Frischmann, 'Commons Management' (n 24) 923 ('if a resource can be classified as infrastructure [...] then there are strong economic arguments that the resource should be managed in an openly accessible manner').

⁵³ Ken Binmore and Paul Klemperer, 'The Biggest Auction Ever: The Sale of the British 3G Telecom Licences' (2002) 112 Econ J 74.

⁵⁴ Benkler (n 45).

⁵⁵ For an early though still relevant summary of the main arguments, see Phillip Areeda, 'Essential Facilities: An Epithet in Need of Limiting Principles' (1989) 58 ALJ 841.

⁵⁶ Or 'time limited rents' due to early entry, see Giovanni Battista Dagnino, 'Understanding the Economics of Ricardian, Chamberlinian and Schumpeterian Rents – Implications for Strategic Management' (1996) 43 Int Rev Econ 213.

⁵⁷ This roughly 'Schumpeterian' argument was used by counsel for Microsoft in the EU case; see *Microsoft* (n 8).

In the words of Justice Scalia in the US Supreme Court 'essential facilities' case of *Trinko*:⁵⁸ 'The opportunity to charge monopoly prices—at least for a short period—is what attracts "business acumen"'. The argument runs that if private control is diluted *ex post* by a mandatory open access rule, then private companies' incentives to invest in such infrastructural assets would be drastically reduced, curtailing dynamic efficiency and innovation.

Both these arguments are often advanced as deriving *a priori* from economic theory;⁵⁹ however, both claims are actually empirical in nature. Whether or not a privately owned asset performs the role of infrastructure—even under dynamic conditions—is a *factual* inquiry. Although it is true that such factual assessments are prone to significant uncertainty, the legal and economic components of these tests can nevertheless be tuned to include an 'error cost framework',⁶⁰ by, *e.g.*, raising the threshold needed to support an infrastructural finding so as to avoid type 1 errors.⁶¹ Second, whether an open access rule would in fact negatively impact dynamic efficiency is also an empirical assessment, though one that relies on counterfactual analysis under certainty. An IP-protected infrastructural asset is both an output and an input⁶² of research and development (R&D). It may be true that the possibility of exclusive ownership triggered the asset-owner to invest in the first instance. However, the availability of that asset as an input also has the capacity to trigger follow-on and downstream productivity. What is required is a balancing of the two dynamic efficiencies,⁶³ rather than the reliance on the *a priori* assumption that strong intellectual property protection is somehow equivalent to dynamic efficiency. These arguments and their rebuttals will be developed further in Part V, Section A.

By emphasising that the identification of technological infrastructure is a factual inquiry, we also usefully limit the scope of this paper's thesis. At first glance, one might be tempted to argue that all technological platforms and standards are in some way 'infrastructural', in the sense of being intermediate, generic, and non-rival assets. However, just because an asset has the characteristics to become infrastructural does not yet mean that it has achieved the status of essential infrastructure. What is missing is the consideration of the demand side. In the case of technological infrastructure that arises via the market (*de facto* standards), it is the power of social demand and network effects that transform (for example, patented) high technology assets into indispensable inputs for downstream productive activity. Examples of such *de facto* standards abound in high technology, and include dominant document formats,⁶⁴ audio-visual compression codecs,⁶⁵ and microprocessor architectures.⁶⁶ Such technological infrastructures emerge from the competitive process in network markets, characterised by a 'winner takes all dynamic'. Only in cases where the infrastructural asset has replaced all viable substitutes—and it has become uneconomic for a competitor or new entrant to create an alternative—can the infrastructure be considered 'essential'.⁶⁷ In such cases, access to the infrastructural asset may perform the role of a market bottleneck. For example, in *Microsoft*, downstream networking software companies were found to require access to the upstream Windows operating system 'quasi standard' in order to compete on the networking software market.⁶⁸ Furthermore, when the essential technological infrastructure is IP-protected, mandatory open access rules may only apply when the denial of

⁵⁸ *Verizon v Trinko* (2004) 540 U.S. 398 (USSC).

⁵⁹ See Jonathan BBaker, "Dynamic Competition" Does Not Excuse Monopolization' (2008) <https://www.researchgate.net/publication/227387559_Dynamic_Competition_Does_Not_Excuse_Monopolization> accessed 4 January 2016 (for a good summary and robust critique of this approach).

⁶⁰ See Frank H Easterbrook, 'The Limits of Antitrust' (1984) 63 Tex L Rev 1.

⁶¹ ie the errors which result from unnecessary intervention in a self-correcting market.

⁶² To some extent, the problem of IPR attaining an infrastructural status is pre-empted by the IP system itself. See Lee (n 39) 55, which identifies the various 'feedback' mechanisms within Trademark law and Copyright, and specific subject matter requirements in patent law, as controls against the monopolisation of infrastructural assets.

⁶³ This may well be the purpose of the 'new product'/technical development' test in *Microsoft*; see Parts IV (A) and V(A) below.

⁶⁴ eg Microsoft's proprietary '.doc.' format, now replaced by the 'open' '.docx' format.

⁶⁵ eg H.264 or MP3 codecs for compressing audio-visual and audio information, respectively. It should be noted that in the EU, copyright-protected 'interface information' in the form of software object code may be legally 'reverse engineered' ('decompiled') for the purposes of interoperability, see Directive 2009/24/EC of 23 April 2009 on the legal protection of computer programs [2009] OJ L111/16, art 6(1).

⁶⁶ See generally the EU Commission's Decision in *Intel* (n 31), discussing the dominant PC 'x-86' CPU 'instruction set architecture'.

⁶⁷ In the EU, the case law is usefully summarised in the Commission Guidance on Enforcement of Art. 82 EC (n 10) para 83 (which reads '[. . .] an input is indispensable where there is no actual or potential substitute on which competitors in the downstream market could rely so as to counter—at least in the long-term—the negative consequences of the refusal').

⁶⁸ See *Microsoft* (n 8) para 387 ('[. . .] Windows represents the "quasi-standard" for those operating systems'). However, it could also be argued in this case that the true 'standard' was in fact the 'interoperability information' rather than the OS.

access undermines industry-wide dynamic efficiency, such as by preventing the emergence of a new product or by retarding technical development.⁶⁹

But it is important to stress that not all platforms or standards, nor all consumer markets, have the necessary attributes to transform a technological infrastructural asset into essential technological infrastructure. For instance, if switching costs⁷⁰ are low,⁷¹ innovation rates are extremely rapid,⁷² and/or consumer preferences are fragmented.⁷³ For the sake of completeness, it should also be noted that private companies who own technological infrastructure may choose to adopt open access rules as part of a business strategy to stimulate technological innovation downstream, even in the absence of any mandatory access rules.⁷⁴ Such strategies are often observed in network industries characterised by two-sided markets.⁷⁵ For example, an owner of a *de facto* standard in the form of a mobile operating system (OS) may choose to open up its Application Programming Interface (API) to software developers for free or at very low cost, such as in the case of both Apple and Android. By permitting application designers to create and sell applications (Apps) to consumers, the OS owner leverages indirect network effects to increase the value of its upstream infrastructure to consumers. In addition, companies owning 'infrastructural' software libraries or hardware⁷⁶ may also choose to adopt open access regimes (such as open source licenses) in order to benefit from indirect value appropriation mechanisms like 'Linus's Law',⁷⁷ or to stimulate the dissemination and use of complementary hardware and software, or simply to engage more fully with the open source community. Finally, even where an infrastructural asset does qualify as an essential infrastructure, access problems may still be addressed by private-ordering solutions, such as patent pools or cross-license agreements.⁷⁸

It is only as a last resort, where private-ordering access solutions fail, and the infrastructural asset is truly indispensable to downstream companies, that the asset may attract antitrust scrutiny and the mandatory application of an open access rule. In both the EU and US jurisdictions, 'indispensability' has been understood to mean that, on objective grounds, there is no actual or potential substitute to the contested resource and that the 'denial of access [...] can reasonably be expected to make competitors' activities in the market in question either impossible or permanently, seriously and unavoidably uneconomic'.⁷⁹

Although the essentiality of some technological infrastructures may be challenged on dynamic grounds using the Schumpeterian argument mentioned earlier, any robust analysis must also take into account that while 'technology' dominance can be limited over time, ownership over technologies often may not be.⁸⁰ Fast innovation rates in dynamic markets may drive some technological infrastructures towards obsolescence, but the sequential nature of R&D trajectories⁸¹ often means that patents continue to 'read on' to subsequent

⁶⁹ *ibid* para 647 (stipulating that 'the appearance of a new product [...] cannot be the only parameter which determines whether a refusal to licence an [IPR] is capable of causing prejudice to consumers within the meaning of Article 82(b) EC. As that provision states, such prejudice may arise where there is a limitation not only of production or markets but also of technical development').

⁷⁰ See Farrell and Klemperer (n 4).

⁷¹ Commission, 'Mergers: Commission Welcomes General Court Judgment in Microsoft/Skype Merger Case' (11 December 2013) Press Release MEMO/13/1137 <http://europa.eu/rapid/press-release_MEMO-13-1137_en.htm> accessed 4 January 2016 ('[...] if Microsoft started to make PCs users pay for such a product, this would only encourage them to switch to other providers that continue offering their services free of charge [...]'). *Microsoft/Skype* (Case COMP/M.6281) Commission Decision [2011] OJ C-341/02.

⁷² *ibid*.

⁷³ If consumers value the small distinctions between the products then the market dynamic might not be 'winner takes all'.

⁷⁴ For a detailed overview of this strategy, see Jonathan M Barnett, 'The Host's Dilemma: Strategic Forfeiture in Platform Markets for Informational Goods' (2011) 124 *Harv L Rev* 1861.

⁷⁵ Jean-Charles Rochet and Jean Tirole, 'Platform Competition in Two-sided Markets' (2003) 1 *J EU Econ Ass* 990.

⁷⁶ Also the case with so-called 'open source hardware', see Eli Greenbaum, 'Open Source Semiconductor Core Licensing' (2011) 25 *Harv J L & Tech* 131.

⁷⁷ Eric S Raymond, *The Cathedral and the Bazaar* (O'Reilly Media 1999) 12 ('Given a large enough beta-tester and co-developer base, almost every problem will be characterized quickly and the fix obvious to someone. Or, less formally, "Given enough eyeballs, all bugs are shallow." I dub this: "Linus's Law" [...]'). Indeed, both the W3C and the IETF (two prominent Internet and Web related SSOs) have adopted royalty-free IP policies due to arguments similar to those summarised in this section, cf. Mair (n 23) 56–57 ('SSOs... mainly in the context of the Web and the Internet—tend to adopt either non-proprietary standards or standards adopted according to policies mandating RF licensing.')

⁷⁸ Adam Mossoff, 'The Rise and Fall of the First American Patent Thicket: The Sewing Machine War of the 1850s' (2009) 53 *Ariz L Rev* 165, 170 ('patent owners have substantial incentives to overcome a patent thicket without prompting by federal officials or judges, and that they can in fact do so through preexisting private-ordering mechanisms').

⁷⁹ For the US formulation, see the case *MCI Commc'n Corp. v AT&T Co.*, 708 F.2d 1081, 1132–33 (7th Cir. 1983) ('a competitor's inability practically or reasonably to duplicate the essential facility'). For the EU formulation see Case C-7/97 *Oscar Bronner GmbH & Co. KG v Mediaprint Zeitungs- und Zeitschriftenverlag GmbH & Co. KG and Others* [1998] ECR I-7791, Opinion of AG Jacobs, para 65 (quoted in main text).

⁸⁰ Of course patents only last 20 years, but this is often a very long time compared to the development rate of technological infrastructure.

⁸¹ James E Bessen and Eric S Maskin, 'Sequential Innovation, Patents, and Imitation' (2000) MIT Dep of Econ Working Paper No 00-01 <<http://papers.ssrn.com/abstract=206189>> accessed 4 January 2016.

generations, and technologies may need to be backwardly compatible. For example, the current *de facto* standard for PC CPU 'instruction set' architectures—the 'x86 architecture'—has a legacy stretching back over 36 years.⁸² The process of 'creative destruction' cannot therefore be used as a blanket justification for refusal to intervene in dynamic markets characterised by persistent intellectual property rights, as a (promptly retracted) 2007 US Department of Justice Guidance Report once seemed to suggest.⁸³ Such an approach would be tantamount to allowing the IP owner of an essential technological infrastructure to have significant control over the development of the downstream market. It is a pernicious misreading of economic theory to argue that such exclusive control leads to efficient outcomes. Under the neoclassical approach only *market* decision-making leads to optimal outcomes, not individual ones.⁸⁴ The core of the infrastructural approach is to enquire into the nature of these hubs of exclusive control. Scholars such as Suzanne Scotchmer and Stephen Maurer have argued that the 'heart' of antitrust's' mandatory open access rules (e.g. the essential facilities doctrine) is to leverage the sharing of assets to harness synergies, resulting in consumer welfare gains such as cost reduction or value enhancement.⁸⁵ Put another way, the competitive harm caused by the owners of technological infrastructure denying access to downstream companies is the foregone consumer welfare boon, resulting from excess unilateral control over R&D trajectories.⁸⁶ This point will be picked up again in Part V, Section A.

So far most of the above analysis has focussed on *de facto* standards as technological infrastructure. While the emergence of *de facto* standards can largely be explained by the power of demand transforming the market from the inside out, *de jure* standards gain their essential infrastructure status by a different route. During cooperative standard-setting, companies agree on key infrastructural technologies on which to scaffold their downstream products, such as interoperability protocols and agreed bandwidths of the electromagnetic spectrum. Once these standards are agreed (usually in conjunction with a FRAND commitment, see Part III Section B), then companies often make 'relation-specific investments [...] because *ex post* design decisions are specifically based on the essential technologies selected *ex ante*'.⁸⁷ As with the competitive process in relation to *de facto* standards, these relation-specific investments transform the character of the market, and push the agreed standards (and any SEPs) in the direction of essentiality for the downstream markets⁸⁸ by creating a 'relationship of dependence between the intellectual property right holder [...] and other undertakings'.⁸⁹

Now to sum up. It is important not to oversell the point. Only some IP-protected technological infrastructures have characteristics enabling them to work as bottlenecks to downstream value creation, namely those for which social demand and network effects or relation-specific investments in the context of cooperative standard-setting have eliminated substitutes and where demand has become inelastic due to their status as necessary inputs. These IP-protected resources take on the function of essential technological infrastructure by becoming indispensable, non-rival inputs for downstream value creation and potential bottlenecks for further technological development. Given their role as essential technological infrastructure, they attract the economic logic of the 'infrastructural approach', which demands 'if infrastructure, then open access'. Although it is argued that this approach applies equally to *de facto* and *de jure* standards (see Part V, Section A), there are nevertheless some crucial differences between them, which must also sound in the relevant

⁸² Paul E Ceruzzi, *A History of Modern Computing* (MIT Press 2003) 270.

⁸³ Herbert J Hovenkamp, 'The Obama Administration and Section 2 of the Sherman Act' (2010) 90 *Bost Univ L Rev* 1611, 1613 ('The Report was extremely tolerant of single-firm conduct, making it extraordinarily difficult to prove a violation in many areas, particularly those involving pricing and refusals to deal.'). See Report at <<http://www.justice.gov/sites/default/files/atr/legacy/2009/05/11/236681.pdf>> accessed 4 January 2016.

⁸⁴ Mark A Lemley, 'The Regulatory Turn in IP' (2012) 36 *Harv J L & Pub Pol'y* 109, 109 ('It is important to remember, because it is quite often lost in the rhetoric surrounding these debates, that it is not the case that individual private decision-making is necessarily efficient. It is the case, however, that *market* decision-making is generally efficient').

⁸⁵ Stephen Maurer and Suzanne Scotchmer, 'The Essential Facilities Doctrine: The Lost Message of Terminal Railroad' (2014) 5 *Calif L Rev Circuit* 247.

⁸⁶ The market failure in this case is caused by the excess 'centralisation' of R&D decision-making power provided by IP rights. As argued by Tim Wu, 'Intellectual Property, Innovation, and Decentralized Decisions' (2005) 92 *Va L Rev* 104 ('Even accepting that useful incentives can be created by intellectual property, the effects on decision making suggest a reason to be cautious about the assignment of broad rights. The danger is that centralization of investment decision making may block the best or most innovative ideas from coming to market').

⁸⁷ Petit (n 18) 7.

⁸⁸ Commission Guidance on Enforcement of Art. 82 EC (n 10) para 83 (reads 'requesting undertaking [...] had made relationship-specific investments in order to use the subsequently refused input, the Commission may be more likely to regard the input in question as indispensable.')

⁸⁹ *Huawei* (n 16) para 71 ('[...] creating a relationship of dependence between the intellectual property right holder occupying a dominant position and other undertakings').

competition law tests. Unpacking the strategic components (in relation to standards participation) of these differences will be the focus of Part III.

Below, Part III builds on the distinctions between *de facto* standards and cooperatively-set standards, and deploys game theoretical tools to explain why the latter might be preferred in high technology markets. Section A focuses on cooperatively-set standards as a solution to a 'coordination problem' afflicting standard choice in high technology. Section B then explains why this solution is nevertheless 'unstable' unless standard participants are prepared to make *ex ante* 'FRAND commitments', in order to help solve a 'prisoner's dilemma' problem that emerges *ex post*, after the cooperatively-set standard is adopted. Section C will then take a closer look at the legal nature of FRAND, and the extent to which its legal status makes its function as an *ex ante* commitment 'credible'.

III. From De Facto to De Jure Standards

The purpose of this section is to take a closer look at the strategic nature of cooperative standard-setting in contrast to *de facto* standards. As mentioned in the previous section, there are some important differences between the two ways technological infrastructure emerge from the market, and these differences have consequences for how they can and should be managed. Section A aims to explain using game theoretical tools why companies in high technology may have incentives to coordinate their standard-setting efforts. Section B then deals with the related question of why cooperative standard setting generally requires *ex ante* FRAND commitments in order to be successful. Once these strategic aspects of cooperative standard-setting and FRAND commitments have been explained, Section C will look into FRAND as a 'creature' of law, including how its legal form attempts to make its status as a commitment 'credible.'

A. Why High Technology Markets Prefer De Jure Standards: Game Theory Approach

When a *de facto* standard emerges from the market—often as the outcome of a 'standards war'—the company that owns the standard reaps an economic windfall, as consumer markets and downstream producers⁹⁰ 'tip' their consumption in its direction. The company then goes on to assume a dominant position on the market for the asset, along with the corollaries of volume increases, relative pricing independence, and a (comparatively) 'easy life'.⁹¹ In fact, in contradistinction to non-network monopolies, the economic bonanza of achieving a standard in a network industry is general: both the demand side and the supply side profit. Consumers benefit from exponentially increasing network effects according to Metcalf's law; the producer benefits from a larger consumer market, greater commercial certainty, and a single 'platform' on which to focus its production.⁹² But the nature of a standards war is that there are also losers. Companies who developed competing standards endure significant sunk costs without payoff. Consumers and producers who backed the 'wrong horse' end up with rapidly depreciating assets, as well as the costs involved in adopting and switching to the winning standard, where possible.

For the losing company, it would have been better to have coordinated with the winning company in advance and agreed on a common standard and to have shared in the windfall, even if that meant agreeing to use a standard 'owned' by the other. Likewise for the winning company. If we assume that the outcome of a standards war is essentially stochastic (an assumption with reasonably strong theoretical backing),⁹³ then it too would have preferred in advance to have agreed on a common standard and shared in the windfall rather than risk ending up empty-handed. Ending up 'empty-handed' here refers to the worst outcome in the 'game' (also known as the 'sucker's payoff'), where no standard is agreed and the losing company is left with significant sunk costs and no payoff. For example, in the High Definition (HD) audio-visual standards war between HD-DVD and Blu-ray, consumers and producers (including Microsoft Xbox) who bought and sold HD-DVD discs and readers were left with near worthless assets after Blu-ray achieved market traction and became the *de facto* HD standard. However, it was a near thing; the standards war included

⁹⁰ Of course, not all *de facto* standard owners are willing to license to downstream producers, but it can happen, especially in cases of pure upstream companies. For example, the ARM CPU architecture has achieved status of *de facto* standard for embedded computing, and is licensed by ARM to downstream producers such as Apple, Qualcomm, Samsung etc; see <<http://www.arm.com/products/processors/instruction-set-architectures/>> accessed 4 January 2016.

⁹¹ John R Hicks, 'Annual Survey of Economic Theory: The theory of Monopoly' (1935) 3 *Econometrica* 1, 8 ('The best of all monopoly profits is a quiet life').

⁹² Mair (n 23).

⁹³ W Brian Arthur, 'Competing Technologies, Increasing Returns, and Lock-In by Historical Events' (1989) 99 *Econ J* 116, 116 ('When two or more increasing-return technologies 'compete' then, for a 'market' of potential adopters, insignificant events may by chance give one of them an initial advantage in adoptions [...]']).

a number of episodes when HD-DVD significantly outsold Blu-ray.⁹⁴ In its subsequent generation of Xbox (Xbox One), Microsoft switched over to the Blu-ray standard, despite the patents being substantially owned by its main downstream competitor in the console space, Sony,⁹⁵ meaning that Sony profited from Xbox sales. The losses, both social and private, involved in Microsoft's loss of the standards war would have been avoided if Microsoft and Sony (and the other stakeholders in the standards war) could have agreed on either one of the standards upfront. It is the purpose of cooperative standard-setting to help companies reach this outcome.

In the taxonomy of game theory, the structure of a 'standards war' is referred to as a 'coordination game'. If only the parties could coordinate their behaviour *ex ante* they would be able to reach the best outcome: a commonly agreed standard (referred to as a 'Nash Equilibrium'⁹⁶ in game theory) as opposed to risking ending up at the worst outcome of having no standard at all. The purpose of cooperative standard-setting is to permit the emergence of coordinated market solutions to the problem of achieving a standard, enabling all participating producers (and also, eventually, consumers) to share in the economic windfall. Participants avoid the cost of standards wars and fragmented standards and consumers benefit from increased 'downstream' competition due to interoperability between competing technologies. To elucidate this game more clearly, **Figure 1** contains a payoff matrix for the HD-DVD/Blu-ray 'standards war'.⁹⁷ The numerical values⁹⁸ represent 'producer surplus', and stand in for the players' (in this case either Sony or Microsoft) incentives to select a certain standard. Note that this game has two Nash Equilibria (the underlined values), where the parties agree on a single standard: (i) one where Microsoft agrees to a Sony-owned standard (Blu-ray); and (ii) one where Sony agrees on a Microsoft-owned⁹⁹ standard (HD-DVD). If they select different standards, then neither benefits since the market remains fragmented. Naturally, the game is a simplification because it misses the outcome where one party 'wins' the standards war, but it does succeed in capturing the key motivations behind why companies favour cooperative standard-setting in high technology: because the cost of losing the standards war is often significantly greater than the benefit in winning. Although this is not the case in all industries, it is generally the case in high technology markets with complex products.¹⁰⁰

		Microsoft	
		HD-DVD	Blu-ray
Sony	HD-DVD	<u>1, 3</u>	0, 0
	Blu-ray	0, 0	<u>3, 1</u>

Figure 1: The Standards War Game (Coordination Game).

⁹⁴ See Brian P Cozzarin, William Lee and Bonwoo Koo, 'Sony's Redemption: The Blu-Ray vs. HD-DVD Standards War' (2012) 30 Prometheus 377, 384 ('Toshiba launched the HD-DVD player for \$936 in 2006 in response to the Blu-ray player introduced in 2003 for \$3,815. With the help of a lower price, more HD-DVD players were sold than Blu-ray players').

⁹⁵ See list of patent licensors in the Blu-ray patent pool at <<http://www.one-blue.com/licensors/>> accessed 4 January 2016.

⁹⁶ The strategy that cannot be improved upon given the payoff structure in the game, and taking into account the other players' best moves.

⁹⁷ All 'standards wars' are generally analysed in the same way. See Richard McAdams, 'Beyond the Prisoner's Dilemma: Coordination, Game Theory and the Law' (2009) 82 South Calif L Rev 222.

⁹⁸ What matters here is the relative values not the absolute numbers, which are arbitrary.

⁹⁹ Of course there were other stakeholders involved in both standards, but both companies (Microsoft and Sony) had SEPs and both had made relation-specific investments in the relevant standards.

¹⁰⁰ This is because the more complex the product, the greater the number of standards that are required to help 'manage' that complexity, and it is difficult if not impossible for companies to anticipate all of these in advance, thus requiring some sort of pre-market coordination; See Gregory Tassey, 'Standardization in Technology-Based Markets' (2000) 29 Res Pol'y 587, 587: ('The complexity of modern technology, especially its system character, has led to an increase in the number and variety of standards that affect a single industry or market').

Although not necessarily the best outcome for companies at all times (the best outcome would be to *win a de facto* standards war)—cooperative standard-setting represents the best ‘risk averse’ outcome.¹⁰¹ As shown in the payoff matrix above, when companies can agree on a standard upfront, they each harvest positive returns [1,3] or [3,1]. By adding the two values together (3+1=4), we also see that the total social welfare (spillovers excluded) is maximised at these two equilibria. These positive returns derive from the agreement ‘not to compete’ on the upstream market of the standard, allowing companies to instead divert more resources to creating better (interoperable) products downstream across a much wider consumer market. Consumers benefit from this downstream competition of interoperable products by avoiding ‘lock in’, and by getting a greater diversity and choice of products. As is also shown by the payoff matrix, failure to agree on a standard results in a fragmented market with zero payoffs. Although a zero payoff is not an entirely accurate representation of reality, it should be noted that in high-technology markets complex products often incorporate hundreds of different standards (and, sometimes, thousands of SEPs)¹⁰² so that the consequences of making wrong standards decisions can be drastic. Absent cooperative standard-setting, the multi-faceted and multi-technology devices that characterise current high technology markets would be severely handicapped. In the worst case, failure to adhere to a common standard (and consequent standard fragmentation) leads to lack of product interoperability and complete isolation from both real and virtual networks. From society’s perspective, the social cost is also considerable: significant losses in social welfare (lost network effects) due to absence of a common standard.¹⁰³

Having now reviewed the strategic considerations for high technology companies to engage in cooperative standard-setting, it falls to consider why a FRAND commitment generally accompanies such standard-setting. It will be shown in Section B below that the stability of cooperative standard-setting relies heavily on the extent to which strategic behaviour after the standard is adopted is controlled (and seen to be ‘credibly’ controlled) *ex ante*, by legal commitments.

B. Solving the Ex Post ‘Prisoner’s Dilemma’: The Purpose of FRAND Commitments

As shown in the previous sub-section, cooperative standard-setting is a solution to the ‘coordination problem’ which afflicts high technology markets: high technology markets require standards, but simply relying on standards to emerge via the competitive process is extremely risky, both for the companies involved and for society. Although cooperative standard-setting might help solve the problem of coordination in achieving a common standard, it also creates the conditions for another strategic game to play out among standard-setting participants: the well-known prisoner’s dilemma.

The dilemma takes the following form. Companies who agree to coordinate with others on setting a standard still retain strong incentives to absorb as much of the economic windfall as possible. They may attempt this by ‘competing on the merits’ in markets ‘downstream’ of the standard, an outcome which also benefits consumers. Alternatively, and more dangerously, they may do so by attempting to ‘capture’ the ‘upstream’ standard once it is agreed, often by asserting intellectual property rights in the form of SEPs. This type of behaviour is referred to as ‘patent holdup’¹⁰⁴ or ‘*ex post* opportunism’¹⁰⁵ in the literature. Such *ex post* opportunism may manifest in the standards’ participant either refusing to license its SEPs to competitors once the standard is adopted or by charging excessive licensing fees in an attempt to raise competitors’ fixed costs. (As will be discussed in Part IV, the role of injunctions in enabling such threats and pricing strategies is crucial.) The structure of this game is that of a cooperation game or ‘prisoner’s dilemma’ because although both companies are better off not asserting their SEPs over the agreed standard (or not asserting them excessively), each nevertheless has strong incentives to do so, which results in each company attempting to prevent the other from using the standard. The payoff matrix in **Figure 2** summarises the essential features of the strategic choices facing the standards’ participants after the standard has been adopted. To ‘share the standard’ refers to the strategy of choosing not to assert IPR (in the form of SEPs) to try to capture

¹⁰¹ Companies are generally acknowledged to be more risk adverse than is optimal in any case, see Albert N Link and John T Scott, *Public Goods, Public Gains: Calculating The Social Benefits of Public R&D* (OUP 2010) 7 (“most private firms are risk averse (i.e. the penalty from lower than expected returns is weighted more heavily than the benefits from greater than expected returns”).

¹⁰² See Jones (n 18) 5 (‘at least 250,000 SEPs and non-SEPs are estimated to read on the average smartphone’).

¹⁰³ According to Cottrell, the Japanese computer software industry’s failure to settle on a single standard (as compared to the dominant ‘Wintel’ standard of the US and Europe) contributed towards its slow pace of innovation in the 1980s-1990s; see Tom Cottrell, ‘Fragmented Standards and the Development of Japan’s Microcomputer Software Industry’ (1994) 23 *Res Pol'y* 143.

¹⁰⁴ Carl Shapiro, ‘Injunctions, Hold-Up, and Patent Royalties’ (2010) 17 *ALER* 280.

¹⁰⁵ James D Ratliff and Daniel L Rubinfeld, ‘The Use and Threat of Injunctions in the RAND Context’ (2013) *J Comp. L & Econ* 1, 5 (‘[. . .] these parties find themselves in a prisoners’ dilemma-like strategic situation in which they are likely to be worse off unless SEP-holders can credibly commit *ex ante* to restrain their *ex post* opportunism’).

the standard, but instead focusing on producing products downstream. 'Assert IPR' refers to the strategy of attempting to 'capture' the upstream standard—by refusing to license SEPs over it (or to charge non-FRAND rates) once the standard is adopted—in order to prevent the standard's use by competitors or to raise their costs. As is clear in the payoff matrix, both companies would be better off not asserting their IPR—by 'sharing the standard'—(each then has positive payoff of 3; and the total social welfare is 6 (3+3=6, excluding spillovers); but both would like to avoid the 'sucker's payoff' of zero when the other company has a payoff of five. This game structure thus leads to 'Assert IPR' as the dominant strategy for both players, and hence the Nash Equilibrium of the game results in the sub-optimal [0,0] payoff.

The problem with having this prisoner's dilemma sitting on top of the coordination game is that its 'shadow'¹⁰⁶ is visible *ex ante* to all standard-setting participants, who may then refuse to engage in the cooperative standard-setting process *ab initio*, if they assess the risk of *ex post* opportunism as insufficiently managed. In short, the existence of the *ex post* prisoner's dilemma may work to destabilise the formation of cooperative standard-setting *ex ante*.

Because of this problem—recognised very early in the history of cooperative standard-setting¹⁰⁷—participants are required to give an *ex ante* 'commitment' not to engage in patent holdup or *ex post* opportunism. Such 'commitments' are a well-known solution to prisoner's dilemma problems, although the challenge is in making them 'credible',¹⁰⁸ as will be discussed in Section C below. The commitment usually includes a number of components designed to constrain 'defection', the most important of which are the duty to declare any intellectual property over the standard before it is adopted, and the duty to license the latter on FRAND terms.

In economic terms, the purpose of the above commitments have been understood as an attempt to confine the licensing fees of standards-essential patents to the 'value conferred by the patent itself as distinct from the additional value—the hold-up value—conferred by the patent's being designated as standard-essential'.¹⁰⁹ In short, FRAND attempts to ensure that the value of the SEP '*ex post*' remains roughly the same as its value '*ex ante*', stripped of any 'strategic value'.¹¹⁰ As will be further explained in Section C below, this commitment also attempts to strike a balance between ensuring sufficient incentives for companies to contribute their technology for inclusion in the standard while ensuring its *ex post* openness. From the per-

		Standard participant 1	
		Share standard	Assert IPR
Standard Participant 2	Share standard	3, 3	0, 5
	Assert IPR	5, 0	0, 0

Figure 2: The Prisoner's Dilemma (Cooperation Game).

¹⁰⁶ The 'shadow of the future' is a concept in game theory that explains how future expectations of strategic encounters can affect the strategies played in present games. It is normally used to explain how cooperation can occur in an iterated Prisoner's dilemma; however, here it is used to explain how a prospective future Prisoner's Dilemma can destabilise coordination in a current coordination game, unless adequately managed.

¹⁰⁷ See, eg, the first-reported SSO IPR policy (ANSI 1932) ('That as a general proposition patented design or methods not be incorporated in standards. However, each case should be considered on its own merits and if a patentee be willing to grant such rights as will avoid monopolistic tendencies, favorable consideration to the inclusion of such patented designs or methods in a standard might be given.'), as quoted in Rudi Bekkers and Andrew Updegrove, *A Study of IPR Policies and Practices of a Representative Group of Standards Setting Organizations Worldwide* (National Academies of Science 2012) 3.

¹⁰⁸ Jones (n 18) 6 ('[T]hese parties find themselves in a prisoners' dilemma-like strategic situation in which they are likely to be worse off unless SEP-holders can credibly commit *ex ante* to restrain their *ex post* opportunism').

¹⁰⁹ In the words of Richard Posner, as quoted in Joseph Kattan and Chris Wood, 'Standard-Essential Patents and the Problem of Hold-Up' (2013) <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2370113> accessed 4 January 2016.

¹¹⁰ For an opposing view on this position, cf. Damien Geradin, 'Pricing Abuses by Essential Patent Holders in a Standard-setting Context: A View from Europe' (2009) 76 ALJ 329, 342 ('[T]he implicit assumption in the *ex post* opportunism claim is that all of the additional value created by the standardization process *improperly* accrues to patent licensors [...] There is no reason to assign all of the rents to one or the other'). For a robust reply to this dissent, see Mark A Lemley and Carl Shapiro, 'A Simple Approach to Setting Reasonable Royalties for Standard-Essential Patents' (2013) 28 BTLJ 1135, 1148.

spective of SEP-owners, the bargain can be defined as trading some of their unilateral price-setting rights in exchange for greater licensing opportunities, once the standard is adopted.¹¹¹ Section C will provide a brief outline of the nature of the FRAND commitment as a 'creature' of law, including its status as a contract, as well as its more complicated relationship with competition law. It will also discuss how the legal character of FRAND attempts to make its status as a commitment 'credible', before setting the stage for Part IV. The latter will engage with the latest European case law on the topic of the availability of injunctions as part of the FRAND negotiation framework (Part IV, Section A), before focussing on the strategic components of the FRAND commitment in operation (Part IV, Section B).

C. Legal Analysis of FRAND Commitment

Before honing in on the legal analysis of the FRAND commitment, it is important to briefly zoom out to glimpse the infrastructural import of the commitment. As with other infrastructural assets, FRAND attempts to approximate an open access regime, but with one crucial caveat. Unlike traditional infrastructure, such as highways and the electricity grid, the technological infrastructure which FRAND attempts to 'regulate' only rarely involves public subsidisation, meaning that the intellectual property system has to 'pick up the slack' by ensuring the private recoupment of (at least) the investment in its development. Because technological infrastructure is by and large privately provisioned (see Part II, Section B), the FRAND commitment attempts to balance sufficient privately appropriability of the asset to the SEP-holders, while simultaneously ensuring 'access' to the standard implementers. In short, a FRAND commitment, such as the one embedded in the IPR policy of the European Telecommunications Standards Institute (ETSI), 'seeks a balance between the needs of standardisation for public use [...] and the rights of the owners of IPRs'.¹¹²

As mentioned in Section B (Part III), one of the key purposes of FRAND is to solve a 'commitment problem' which afflicts the standard-setting process: once a cooperatively-set standard is adopted the bargaining position of contributing companies to extract very high licensing fees is considerably improved ('surges')¹¹³ due to relation-specific investments and lock-in on the demand side. In order for the standard to be successful, standard-setting participants and implementers must assess the *ex ante* risk of *ex post* opportunism as low otherwise the whole endeavour might unravel. FRAND commitments function as an *ex ante* contractual commitment that contributing companies will not use their increased bargaining power to engage in *ex post* 'unfair', 'unreasonable' or 'discriminatory' licensing practices. However, in order to correctly do its job of preventing such behaviour, and thus ensuring the stability of cooperative standard setting, the FRAND commitment has to be legally 'credible' (enforceable). Part III, Section C(1) below will analyse the legal status of FRAND as both a contract, as well as its relationship with (EU) competition law. Section C(2) will then review the current understanding of its enforceability.

1. Contract or Competition Law Duty?

The legal form of the FRAND commitment is a contract between the IPR owner and the SSO (including its members, as third party beneficiaries).¹¹⁴ The commitment is normally embedded in an SSO's IPR policy, alongside other complementary duties, such as the obligation for technology submitters to disclose *ex ante* any SEPs reading onto the standard.¹¹⁵ The latter duty is included to control the risk of so-called 'patent ambush'. This occurs when a participant to cooperative standard-setting 'deceptively' allows an SSO to adopt a standard without declaring its SEPs. It then asserts its SEPs *ex post*, well after it is possible for the SSO to design around them, often demanding inflated royalties, such as in the EU case of *Rambus*.¹¹⁶

¹¹¹ *ibid* 1140 ('[...] the FRAND commitment is at its base an agreement not to exercise the full scope of the patentee's rights in exchange for having its technology adopted as an industry standard, likely resulting in increased licensing opportunities').

¹¹² See ETSI Policy (n 13) art 3(1).

¹¹³ See Judge Posner's decision in *Apple v Motorola*, No. 1:11-cv-08540 (N.D. Ill. June 22, 2012) (which argues that 'once a patent becomes essential to a standard, the patentee's bargaining power surges because a prospective licensee has no alternative to licensing the patent; he is at the patentee's mercy').

¹¹⁴ Roger G Brooks and Damien Geradin, 'Taking Contracts Seriously: The Meaning of the Voluntary Commitment to Licence Essential Patents on "Fair and Reasonable" Terms' in Steven Anderman and Ariel Ezrachi (eds), *Intellectual Property and Competition Law: New Frontiers* (OUP 2011).

¹¹⁵ ETSI Policy (n 13) art 4(2).

¹¹⁶ *Rambus* (Case COMP/38.636) Commission Decision [2009] OJ C-30/17.

From a contractual point of view, the FRAND commitment is incomplete.¹¹⁷ Except for some arguably unhelpful guidance from the EU Commission in its *Horizontal Guidelines* (which may be used in contract interpretation),¹¹⁸ there is very little to help parties determine when a licensing offer is non-FRAND. According to some,¹¹⁹ the incompleteness of the FRAND contract is a good thing. It is sufficiently capacious to incorporate the complexities of market bargaining, such as cross-licenses, portfolio licensing, and a number of contingencies which may only occur after the standard is adopted. These commentators argue that further *ex ante* specification over the meaning of FRAND terms introduces economic, business and legal complexities into the domain of standard-setting, when the latter should remain foremost a technical procedure. This may slow down the standard-setting process and vitiate its utility.

In contrast to those who favour the incompleteness of FRAND, other commentators, and some SSOs, take the position that this incompleteness makes the commitment lack credibility, which increases the risk of *ex post* opportunism in the form of patent holdup.¹²⁰ As already discussed, this lack of credibility can be argued to be visible *ex ante* to standard participants, who may then refuse to participate.

Scholars who criticise the contractual incompleteness of FRAND argue that SSOs should adopt policies that require SEP holders to declare their 'most restrictive licensing terms'¹²¹ before the standard is adopted. Then, companies that either fail to disclose their SEPs in a timely manner, or breach their own licensing commitments, should become subject to strong penalties.¹²² Despite the recent creation of an EU competition law 'safe harbour' for the inclusion of such terms, only a minority¹²³ of international SSOs have incorporated terms like the above into their IPR policies. Most SSOs seem content to live with the contractual incompleteness, and leave FRAND negotiations to the private parties.

By leaving the actual content of the FRAND commitment to the negotiation of the private parties themselves, SSOs have made at least three implicit institutional choices. First, that the normal process of market bargaining between parties can lead to a FRAND result. The game theoretical analysis in Section B (Part III) of the prisoner's dilemma, however, applies pressure to this as a possibility—although everything depends upon the nature of the 'negotiation framework', as will be discussed in Part IV. Second, that FRAND determinations should ultimately be made by the Courts in case of disputes.¹²⁴ Courts are good at a lot of things, but they are notoriously bad at price-setting, as will also be discussed in Part IV. Third (and very recently), at least one SSO—the ETSI—has also contemplated the role of the competition regulator in the determination and/or enforcement of FRAND by expressly involving the latter in its internal procedures for dealing with non-FRAND licenses.¹²⁵ This institutional choice implies that competition issues may indeed form part of the general understanding of FRAND.

Discussion of these three institutional choices: market bargaining, Courts, and competition law will be embedded in the following examination of FRAND 'enforcement', in Section C(2) below. The nerve of this section is to assess the respective role of each of these institutions in the determination of FRAND.

2. Enforcement Issues

As already mentioned, FRAND commitments take the legal form of a contract between the SEP-holder, the SSO, and the SSO Members, as third party beneficiaries. Given this starting point, scholars are divided on how the commitment should be enforced. Some commentators, including Damien Geradin and Roger Brooks,¹²⁶ argue that since FRAND is simply a contract, it should be enforced as such, before a court, utilising the

¹¹⁷ Joshua D Wright, 'SSOs, Frand, and Antitrust: Lessons From the Economics of Incomplete Contracts' (Center for the Protection of Intellectual Property, Arlington, 12 September 2013) <https://www.ftc.gov/sites/default/files/documents/public_statements/ssos-frand-and-antitrust-lessons-economics-incomplete-contracts/130912cip.pdf> accessed 4 January 2016.

¹¹⁸ Depending, of course, on the nature of member state contract laws.

¹¹⁹ See Wright (n 117) 2–3 ('[...] incomplete contracts were a predictable and efficient result given the costs associated with identifying all contingencies that might arise during the life of the contractual relationship').

¹²⁰ Maurits Dolmans, 'A Tale of Two Tragedies – A plea for open standards' (2010) 2 IFOSS L Rev 115.

¹²¹ Lemley, 'Standard Setting' (n 5).

¹²² Damien Geradin, 'What's Wrong with Royalties in High-Technology Industries?' in Geoffrey A Manne and Joshua D Wright (eds), *Competition Policy and Patent Law under Uncertainty* (CUP 2011).

¹²³ See eg IEEE Standards Association, 'IEEE Enhances Standards Patent Policy to Permit Fuller Disclosure on Licensing' (*BusinessWire*, 30 April 2007) <<http://www.businesswire.com/news/home/20070430006298/en/IEEE-Enhances-Standards-Patent-Policy-Permit-Fuller#.U7msxxYeVuY>> accessed 4 January 2016.

¹²⁴ Since very few SSOs have any mechanism for dispute resolution. Note ETSI as a recent exception.

¹²⁵ See ETSI Policy (n 13) art 8(2).

¹²⁶ Brooks and Geradin (n 114).

normal instruments of contract law. Others, including Phillippe Chapatte¹²⁷ and Maurits Dolmans,¹²⁸ argue that FRAND duties map directly to EU competition law obligations contained in Art 102 TFEU, and should be enforced by the EU competition regulator and Courts on competition law principles. Below, these two positions are dealt with in turn.

a) Contractual Approach

According to advocates of the contractual primacy of the FRAND commitment, its enforcement should be solely a question of contract law. If one party to the FRAND contract alleges that the other is in breach—for example, by demanding 'unreasonable' licensing terms—then it is entitled to bring an action for breach of contract before the Courts. It is then up to the Courts to adjudicate:

' [...] whether the terms offered, taking into account all of the specific circumstances between the parties and prevailing market conditions, fall outside the *range* of reasonableness contemplated by the FRAND commitment'.¹²⁹

This position holds that it is conceptual confusion to suggest that what is essentially a matter of civil law should be escalated to the level of competition law simply because both the FRAND commitment and Art 102 TFEU contain clauses related to setting 'fair prices'.¹³⁰ Treating the FRAND commitment as equivalent to Art 102 TFEU also introduces a logical problem of the following form. If FRAND is simply a restatement of competition law it makes the existence of a separate FRAND duty essentially redundant (at least in the European context),¹³¹ since it is already embedded in the duties under competition law. All companies which occupy a dominant position in the SEP would already be bound by the duties in Art 102 TFEU. However, if FRAND sets a higher standard of 'unfair prices' compared to the excessive pricing test under Art 102 TFEU, then a breach of FRAND would not lead to liability under Art 102 TFEU (since breaching the FRAND threshold might not yet amount to a breach of the Art 102 threshold) and would have to be enforced by contract anyway. Only in the case where the FRAND commitment is assessed as exactly the same as the duty under Art 102 TFEU would competition law be applicable, in which case the FRAND contract is entirely redundant. Moreover, the argument that the FRAND commitment merely reiterates Art 102 TFEU seems to go against a statement in the 2003 CFI (now 'General Court') case, *ARD v Commission*,¹³² where it was held that 'the [...] argument that the [FRAND] commitment is merely the reiteration of a legal obligation under Art 82 EC [now Art 102 TFEU] cannot be accepted'.¹³³ Although that case concerned a merger and did not involve an industry standard, it seems to suggest that a FRAND commitment is stricter than the duty not to engage in 'excessive pricing' under Art 102 TFEU. If so, then a breach of FRAND, would not necessarily always be a breach of Art 102 TFEU, although the distinction between the two was never formally elaborated in that case.

It should be noted that when Geradin and Brook's FRAND contractual primacy argument was published in 2010, neither SSO IPR policies nor the European Courts had yet made definitive statements about the legal nature of the commitment.¹³⁴ Since that date, (as already mentioned) at least one prominent SSO—ETSI—has recently modified (November 2014) its IPR policy to include internal procedures for dealing with non-FRAND licenses offered by ETSI members. Interestingly, the end point of the ETSI internal procedure includes the 'General Assembly [...] request[ing] the European Commission to see what further action may be appropriate [...]'.¹³⁵ This new approach seems to require ETSI members and SEP owners to contractually agree to the involvement of the European competition agency in the monitoring and enforcement of FRAND licenses. In addition to this SSO policy change, the recent CJEU decision in *Huawei* also places

¹²⁷ Phillippe Chapatte, 'FRAND Commitments – The Case for Antitrust Intervention' (2009) 5 ECJ 319.

¹²⁸ Dolmans (n 120).

¹²⁹ Brooks and Geradin (n 114).

¹³⁰ TFEU art 102(a) (reads 'directly or indirectly imposing unfair purchase or selling prices or other unfair trading conditions', which has similar wording to the 'Fair' component of the FRAND commitment).

¹³¹ For the difference in the EU and US approaches to 'excessive pricing', see Michal S Gal, 'Monopoly Pricing as an Antitrust Offense in the U.S. and the EC: Two Systems of Belief about Monopoly' (2004) 49 Antitrust Bull 343.

¹³² *ARD* (n 34).

¹³³ *ibid* para 242.

¹³⁴ In any case the contractual primacy of FRAND has never been accepted by German Courts; See Jones (n 18) (remarking that 'German courts have regularly held the FRAND licensing declarations do not give rise to contractual obligations, but are declaratory in nature and do not go beyond the competition law based obligation to grant licenses, see eg, *General Instrument Corp v Microsoft Deutschland GmbH* Regional Court of Mannheim, 2nd Civil Division, 2 May 2012, file no. 2 O 240/11').

¹³⁵ ETSI Policy (n 13) art 8(2)(v).

pressure on the argument that FRAND is simply a contract devoid of competition law relevance, as will be discussed in Part IV. Although these recent SSO IPR policy changes and the CJEU decision do not entirely destroy the FRAND contractual primacy argument, they do suggest that the FRAND commitment is now understood to be a duty with at least competition law relevance, if not enforcement.¹³⁶

For the sake of international comparison,¹³⁷ it should be noted *en passant* that in the US (an entirely different legal system than the EU) breaches of FRAND duties are routinely filed as breaches of contract,¹³⁸ in addition to the occasional 'patent misuse' claim.¹³⁹ Antitrust suits based upon the US 'anti-monopolization' provision of Section 2 Sherman Act (equivalent of Art 102 TFEU) are rarely pursued.¹⁴⁰

b) Competition Law Duty?

An alternative view on the nature of the FRAND commitment is that it is a creature of competition law, and should be enforced as such. Supporting commentators¹⁴¹ argue that the FRAND commitment maps to Art 102 TFEU, and that its breach should attract antitrust censure.¹⁴² The EU Commission's *Horizontal Guidelines* may be interpreted to support this view:

'[T]he assessment of whether fees imposed for patents in the standard-setting context are unfair or unreasonable, will be based on whether the fees bear a reasonable relationship to the economic value of the patents'.¹⁴³

The footnote to this sentence refers to *United Brands*,¹⁴⁴ an ECJ (now CJEU) case under Art 82 EC (now Art 102 TFEU), which forms part of the CJEU's 'excessive pricing' jurisprudence, and defines the latter as a price which 'has no reasonable relation to the economic value of the product'.¹⁴⁵ Not too much should be read into this small footnote in the *Horizontal Guidelines*. However, a plain reading would seem to suggest that the legal test for assessing 'reasonableness' under FRAND is identical to the test under EU competition law. This would mean that breach of a FRAND commitment would be tantamount to a breach of EU competition law, assuming that all the other elements required under Art 102 TFEU are also met.¹⁴⁶

Unfortunately, aside from the recent Commission statements in *Samsung* and *Motorola* and the AG's *Opinion* and CJEU judgment in *Huawei* that deal with the related issue of strategic negotiation for FRAND licenses (covered in Part IV), European case law to date has not managed to resolve these issues. Advocate General Wathelet in his *Opinion* in *Huawei* makes an oblique reference to the controversy over the legal status of FRAND, when he mentions, in passing:

'[T]he matters at issue in the dispute [...] stem largely from a lack of clarity as to what is meant by 'FRAND terms' and as to the requisite content of such terms, could not be adequately – if not better – *resolved in the context of other branches of law or by mechanisms other than the rules of competition law*'.¹⁴⁷

¹³⁶ Furthermore, and practically, bringing the enforcement of FRAND within the ambit of competition law may also help with ensuring a more-or-less uniform application of FRAND; something which would be entirely absent in the currently highly fragmented state of EU member state's contract laws.

¹³⁷ Additionally, the recently passed amendment to the Japanese Fair Trade Commission (JFTC) is roughly in-line with both the EU and US approach in terms of outcome. However, it differs in its approach, suggesting instead that using patents to block third parties from accessing technology is not 'within the rights' that a patent-holder is permitted to exercise; see JFTC, 'Guidelines for the Use of Intellectual Property Under the Antimonopoly Act' <<http://www.jftc.go.jp/en/pressreleases/yearly-2015/July/150708.files/Attachment1.pdf>> accessed 4 January 2016.

¹³⁸ Daryl Lim, 'Standard Essential Patents, Trolls and the Smartphone Wars: Triangulating the End Game' (2014) 119 Penn State Environ L Rev 41 ('The remedy for a breach of FRAND commitments is specific performance of the contract').

¹³⁹ *ibid* 106 ('Patent misuse or misuse-like concepts have been invoked in both pre- and post-standardization cases').

¹⁴⁰ Urska Petrovcić, 'Patent Hold-Up and the Limits of Common Law: A Trans-Atlantic Perspective' (2013) 50 CMLR 1363, 1375 ('Contrary to Article 102 TFEU, Section 2 of the Sherman Act has a very limited ability to address cases of patent hold-up. Unlike EU competition law, exploitative practices (including excessive fees) do not constitute an antitrust offence under US antitrust law').

¹⁴¹ Chapatte (n 127); Dolmans (n 120).

¹⁴² *ibid*.

¹⁴³ Commission, 'Guidelines on the Applicability of Article 101 of the Treaty on the Functioning of the European Union to Horizontal Co-operation Agreements' [2011] OJ C-11/1, para 289.

¹⁴⁴ Case 27/76 *United Brands Company and United Brands Continentaal BV v Commission of the European Communities* [1978] ECR 207.

¹⁴⁵ *ibid* para 250.

¹⁴⁶ eg such as occupying a dominant position on the relevant market; effect on inter-Member State trade; etc.

¹⁴⁷ Opinion of AG Wathelet (n 25) para 9 (*Emphasis added*).

The emphasised sentence suggests—tantalisingly—that other areas of law, or other mechanisms,¹⁴⁸ might be better suited to resolve these disputes. However, that *Opinion* and the subsequent CJEU judgment, which substantially affirmed it, were only indirectly concerned with the ‘requisite content’ of FRAND, *i.e.*, the meaning of, *inter alia*, ‘reasonableness’ in relation to licensing terms, focusing instead on the question of the use of injunctions during negotiations, as will be discussed in Part IV, Section A.

One relatively recent EU attempt at addressing the meaning of the ‘reasonableness’ criterion in FRAND issues arose in 2007 in a case involving *Qualcomm*’s licensing terms for its essential patents over the GSM/UMTS 3G standard.¹⁴⁹ In the 2005 US litigation over patents in the same patent family, *Qualcomm* argued that, despite its commitment to F(RAND) terms, ‘charging what the market can bear [...] is not anticompetitive or unreasonable’.¹⁵⁰ In Europe, the case was eventually dropped and no determination was made.¹⁵¹ Other SEP-related cases, such as the 2009 cases of *Rambus*¹⁵² and *IPCOM*,¹⁵³ turned on facts related to ‘deceptive conduct’ leading to ‘patent ambush’ and the transferability of the FRAND commitment, respectively. Unfortunately, neither case permitted the Commission or the European Courts to make a definitive statement on how to determine the ‘reasonableness’ element of FRAND.

In this regard, US courts have been more proactive. In the 2013 (breach of contract) District Court lawsuit between Microsoft and Motorola over the reasonableness of Motorola’s FRAND royalty requests on the H.264 video compression codec, Judge Robart set down some legal rules for determining the ‘reasonableness’ of a FRAND royalty. Robart referred to fifteen criteria contained in the well-known US 1970 case for determining ‘reasonable royalties’—*Georgia Pacific*¹⁵⁴—and simply went down the list, expanding or contracting the royalty in line with the various factors to take into account. In that case, the plaintiff (Motorola) requested a rate more than one hundred times the FRAND rate, according to Robart’s determination.¹⁵⁵

In most cases, the international consensus on FRAND determination appears to adopt the understanding that a ‘reasonable royalty rate’ should, coarsely put, reflect the ‘incremental contribution of the patent to the world’¹⁵⁶ (or at least the next best alternative technology).¹⁵⁷ Although a voluminous legal and economic literature has emerged which goes into the finer points of ‘reasonable royalty’ calculations¹⁵⁸ for the purposes of FRAND, further discussion of this topic is outside the scope of this paper (except for some brief observations in Part IV, Section B), as the EU case law is still undecided.

Rather than focus on the specific royalty rate of a FRAND committed SEP in relation to a specific technology, the European Commission and Courts have been more active in defining the legal contours of the framework in which the FRAND negotiation takes place. In particular, recent EU statements and decisions have focused on the issue as to whether the owner of an SEP may have recourse to injunctions during the negotiations over a FRAND license.

¹⁴⁸ Part IV, Section B argues that the adoption of a liability rule can operate as an ‘information-forcing mechanism’ to lead to better FRAND licenses.

¹⁴⁹ Commission, ‘Antitrust: Commission Initiates Formal Investigation against Qualcomm’ (1 October 2007) Press Release MEMO/07/389 <<http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/07/389>> accessed 4 January 2016. Although in the EU it was retracted in 2009, see Commission, ‘Antitrust: Commission Closes Formal Proceedings against Qualcomm’ (24 November 2009) Press Release MEMO/09/516 <http://europa.eu/rapid/press-release_MEMO-09-516_en.htm?locale=en> accessed 4 January 2016.

¹⁵⁰ Chapatte (n 127) 320.

¹⁵¹ More precisely: in July 2008, Nokia agreed to withdraw its complaint against Qualcomm in exchange for a 15-year licensing agreement and a payment to Nokia of more than USD 1 billion. This (together with another complainant dropping its claims) led the EU Commission to officially close its investigation in November 2009 and to address these issues through the 2010 Horizontal Guidelines. See Qualcomm, ‘Nokia and Qualcomm Enter into a New Agreement’ (24 June 2008) <<https://www.qualcomm.com/news/releases/2008/07/23/nokia-and-qualcomm-enter-new-agreement>> accessed 4 January 2016.

¹⁵² Commission, ‘Antitrust: Commission Accepts Commitments from Rambus Lowering Memory Chip Royalty Rates’ (9 December 2009) Press Release IP/09/1897 <http://europa.eu/rapid/press-release_IP-09-1897_en.htm> accessed 4 January 2016.

¹⁵³ Commission, ‘Antitrust: Commission Welcomes ICPCom’s Public FRAND Declaration’ (10 December 2009) Press Release MEMO/09/549 <http://europa.eu/rapid/press-release_MEMO-09-549_en.htm> accessed 4 January 2016.

¹⁵⁴ See *Georgia-Pacific Corp. v United States Plywood Corp.*, 318 F. Supp. 1116, 166 U.S.P.Q. (BNA) 235 (S.D.N.Y. 1970).

¹⁵⁵ Joseph Kattan, ‘FRAND Wars and Section 2’ (2013) 27 Antitrust 30, 31 (‘[I]n the only judicial decision to date to establish a F/RAND royalty rate, the SEP-holder sought a F/RAND rate that was 100 times the F/RAND rate that the court ultimately established for patents related to the Wi-Fi standard’).

¹⁵⁶ Mark A Lemley, ‘Response: Taking the Regulatory Nature of IP Seriously’ (2014) 92 Tex L Rev 107, 112.

¹⁵⁷ Lemley and Shapiro (n 110) 1148 (argue that ‘[T]he incremental value of the patented technology over and above the next-best alternative serves as an upper bound to the reasonable royalties’).

¹⁵⁸ To this end, the seminal paper of William J Baumol is of enduring relevance, see generally Daniel G Swanson and William J Baumol, ‘Reasonable and Nondiscriminatory (RAND) Royalties, Standards Selection, and Control of Market Power’ (2005) 73 ALJ 1.

The availability of the injunction remedy has significant consequences for the bargaining positions of parties in a FRAND negotiation.¹⁵⁹ As will be discussed further in Part IV, there are two schools of thought on the desirability of injunctions. Some commentators argue that the threat of injunctions are economically efficient since they enable SEP-holders to extract the 'full value' of their patents and therefore encourages both SSO participation and the continued investment in innovation.¹⁶⁰ Others argue that the threat of injunctions permit SEP-holders to 'hold up' standard implementers and extract 'strategic value' of the SEPs in addition to their market value,¹⁶¹ consistent with the prisoner's dilemma problem sketched in Section B (Part III).

In what follows, market bargaining for access to an SEP where injunctions are available is referred to as bargaining under a 'property rule', whereas bargaining for access where damages are the only remedy is referred to as bargaining under a 'liability rule'. As mentioned in Section C(1), the crucial question is whether the process of market bargaining, under property or liability rules, is able to deliver FRAND results which adequately control the risk of *ex post* opportunism (see Part III, Section B). An important component of assessing the outcomes of such bargains is whether the resulting FRAND license strikes the required balance (see Part III, Section C) between rewarding the SEP owner and ensuring open access to the technological infrastructure.

Consideration of these issues is the purpose of Part IV, which shall begin by an analysis of the recent CJEU and commission decisions (Section A), before turning to analyse the FRAND bargaining 'dynamics' under property and liability rules (Section B).

IV. The Dynamics of Bargaining under Property and Liability Rules

This section aims to review the nature of the FRAND commitment in operation, by assessing the process of FRAND bargaining under property and liability rules. Section A will begin by discussing the recent Commission statements and CJEU case law with respect to the availability of injunctions during FRAND negotiations. It will unpack and examine the economic rationale of the case law as well as offer a (limited) analysis of the applicable competition law theory of harm. Section B will then assess the economic incentives to reach a FRAND outcome under property and liability rule, by analysing the strategic context of the negotiations. It will conclude that the European Commission statements and CJEU judgment are economically robust, but according to different reasoning than that presented in those cases. Part V will then situate the Commission and CJEU decisions within the broader 'infrastructural approach' of this paper, and attempt to show how they fit into the existing European case law on *de facto* standards forming part of a unified concern to ensure the openness of technological infrastructure (Part V, Section A).

A. EU Position on Injunctions in FRAND Negotiations

In April 2014, the Commission adopted its decisions in the cases *Motorola* and *Samsung*. The cases concerned the two companies' separate injunction applications against Apple in the course of a FRAND negotiation about an SEP over the 3G/UMTS standard. The Commission's findings, shared between the cases, were that it is an abuse of a dominant position under Art 102 TFEU, when an SEP-holder applies for an injunction if: (i) it is in a standardisation context; and (ii) an SEP-holder has committed to license the SEP on FRAND terms; and (iii) the licensee is willing¹⁶² to take a license on FRAND terms. It is similarly an abuse of Art 102 TFEU to use the threat of injunctions in order to induce the licensee not to challenge the validity or essentiality of the SEP. Where the above 'exceptional circumstances' are met, the licensee enjoys a 'safe harbour' against injunctions and injunction threats. According to the Commission, 'the seeking of injunctions can distort licensing negotiations and lead to licensing terms with a negative impact on consumer choice and prices'.¹⁶³

In short, *Samsung* and *Motorola* stand for the rule that the SEP-holder is denied recourse to an injunction where a FRAND negotiation is ongoing with a 'willing' licensee. Under such conditions, the negotiation must therefore be carried out under the framework of a 'liability rule'. In case the parties are unable to agree

¹⁵⁹ Lemley and Shapiro (n 110) 1143 (concluding that '[i]ntroducing injunctions would drive negotiated royalty rates away from reasonable rates to artificially high ones reflecting the threat of holdup').

¹⁶⁰ Wright (n 117) 29 ('*Ex post* interpretation of F/RAND commitments to preclude injunctive relief can deprive the parties the benefit of their bargain, undercompensate patent holders relative to *ex ante* expectations, and reduce incentives to innovate and the commercialization of innovation').

¹⁶¹ Lemley and Shapiro (n 110) 1143.

¹⁶² Commission, 'Antitrust Decisions on Standard Essential Patents (SEPs) - Motorola Mobility and Samsung Electronics - Frequently Asked Questions' (29 April 2014) Press Release MEMO/14/322 <http://europa.eu/rapid/press-release_MEMO-14-322_en.htm> accessed 4 January 2016 ('i.e. companies which, in case of dispute, are willing to have FRAND terms determined by a court or arbitrators (if agreed between the parties) and to be bound by such a determination').

¹⁶³ *ibid.*

on a FRAND license, then the parties may submit, on the licensee's request, to third party determination of a FRAND rate by a Court or agreed arbiter.

In November 2014, the Advocate General Wathelet delivered his *Opinion* in the case of *Huawei v ZTE*. The facts were similar to that of *Samsung* and *Motorola*, with Huawei applying for an injunction against ZTE's use of an SEP reading onto the 4G/LTE standard after negotiations had reportedly 'broken down'. Wathelet's findings in that case were in substantial agreement with the Commission decisions, except greater detail was given as to what constitutes a 'willing licensee'. In order for injunction applications to amount to a competitive abuse, the licensee must have demonstrated itself to be 'objectively ready, willing and able to conclude a licensing agreement', while not behaving in a 'dilatory manner' in reaction to the SEP-holder's licensing offer. In addition, the SEP-holder must have failed to comply with at least one of the cumulative 'procedural requirements' of the FRAND commitment, such as ensuring to formally notify the licensee of its need to have a license, together with the complete licensing terms and royalty calculations.¹⁶⁴ The licensee is furthermore permitted to respond to the SEP-holder's FRAND offer with a reasonable counter-offer, as well as a request for third party FRAND determination, although the SEP-owner may in the latter case request a bank guarantee.¹⁶⁵

Though considerably more pithy and seeming sometimes to rely on equitable estoppel¹⁶⁶ principles rather than the strict application of competition law, the CJEU's July 2015 judgment in *Huawei*, essentially affirmed the findings of the Advocate General. One exception (perhaps only a matter of interpretation) is the licensee's unilateral right to request third party FRAND determination in case of continued disagreement over a FRAND rate. The CJEU judgment, in contrast to the AG's *Opinion*, seems to make this a matter requiring 'mutual agreement' rather than at the 'licensee's request'. However, if that were the case, one can imagine the potential for negotiations grinding to a halt if the parties continue to disagree over a FRAND rate, and if the SEP-holder (or licensee) refuses to submit to third party determination. In such case, however, it is likely that the dispute would enter the Courts—who would then probably be tasked with the role of such determination.¹⁶⁷

Aside from the small issue mentioned above, the current law of the EU with respect to this aspect of the enforcement of FRAND commitments can now be said to be definitive. FRAND negotiations must proceed under a liability rule rather than a property rule, so long as the licensee is objectively willing and serious in its intention to conclude a FRAND license. Failure to reach agreement in the above shall lead to third party FRAND determination.

These decisions of the Commission and CJEU are substantially inline with international practice, and there seems to be a growing transatlantic consensus on the point. Although not referring to competition law principles, a United States (US) policy document issued by the USDOJ and US Patent Office in January 2013, stated that:

'[I]n some circumstances, the remedy of an injunction or exclusion order may be inconsistent with the public interest. This concern is particularly acute in cases where an exclusion order based on a F/RAND-encumbered patent appears to be incompatible with the terms of a patent holder's existing F/RAND licensing commitment'.¹⁶⁸

This guidance was 'operationised' in August of 2013, when the (then) US trade representative Michael Froman, struck down (on the request of President Obama) a US International Trade Commission¹⁶⁹ exclusion order against Apple mobile products found to infringe Samsung's SEPs over the 3G standard. Although based on 'public interest' and equity arguments (also endorsed by the landmark US case of *eBay v MercExchange*)¹⁷⁰

¹⁶⁴ See Opinion AG Wathelet (n 25) para 103(2).

¹⁶⁵ *ibid* para 103(3)–(4).

¹⁶⁶ See *Huawei* (n 16) para 53 (The suspect wording is the phrase 'legitimate expectations' used. 'In those circumstances, and having regard to the fact that an undertaking to grant licenses on FRAND terms creates legitimate expectations on the part of third parties that the proprietor of the SEP will in fact grant licenses on such terms, a refusal by the proprietor of the SEP to grant a license on those terms may, in principle, constitute an abuse within the meaning of Article 102 TFEU'). The equitable estoppel approach has also been previously proposed by US scholars as a possible (non-competition law) means to enforce the FRAND commitment; See eg Robert P Merges and Jeffrey M Kuhn, 'An Estoppel Doctrine for Patented Standards' (2009) 97 Calif L Rev 1.

¹⁶⁷ Unless of course, it becomes a competition law issue, due to the SEP owner's meeting of the criteria contained in the case.

¹⁶⁸ US Department of Justice and US Patent & Trademark Office, 'Policy Statement on Remedies for Standards-Essential Patents Subject to Voluntary F/RAND Commitments' (8 January 2013) 6 <http://www.uspto.gov/about/offices/ogc/Final DOJ-PTO_Policy_Statement_on_FRAND_SEPs_1-8-13.pdf> accessed 4 January 2016.

¹⁶⁹ The ITC is a quasi-judicial body tasked with ruling on disputes over US imports.

¹⁷⁰ *eBay Inc. v MercExchange L.L.C.* (2006) 547 U.S. 388 (USSC).

rather than competition law principles, the effect is the same. The availability of injunctions during FRAND negotiations is severely circumscribed. Market bargaining over FRAND rates should occur in the shadow of a liability rule, as a property rule may lead to suboptimal (public interest, competition) outcomes.

On 3 November 2015, the first post-*Huawei* case law was decided, where the Court had the opportunity to apply the *Huawei* criteria. The German case of *SISVEL v Ruess*¹⁷¹ was the first EU case to apply the ratio of *Huawei* to the question of the availability of injunctions in FRAND negotiations. The case concerned the defendant's ('Haier')¹⁷² defence against SISVEL's injunction application for infringement of its SEPs over the 3G UMTS standard. Haier, using the same defence as ZTE in the *Huawei* case, argued that the SEP-owner's FRAND commitment disabled it from applying for an injunction. However, Haier's defence was rejected and SISVEL's injunction was granted, due to the dilatory behaviour of Haier in responding to SISVEL's FRAND offer. This case demonstrates that Courts (at least in Germany) do not view the *Huawei* decision as a 'get out of jail free card' for SEP-infringers, but will only deny injunctions if the conditions laid down in the *Huawei* 'safe harbour' are strictly adhered to. The consequences of this recent case will be discussed again briefly in Section B (Part IV).

Having now summarised the latest EU case law on the availability of injunctions during FRAND negotiations, the contours of the bargaining framework for reaching FRAND licenses are reasonably clear. However, the legal and economic rationales behind bargaining under a liability rule for FRAND remain underdeveloped. Moreover, the CJEU's theory of competition law harm seems poorly founded. In so far as it considered the matter at all, the CJEU appeared to base its theory of harm upon 'monopoly leveraging':

'[T]he fact that that patent has obtained SEP status means that its proprietor *can prevent products manufactured by competitors from appearing or remaining on the market and, thereby, reserve to itself the manufacture of the products in question* [...]'.¹⁷³

The emphasised language, particularly the phrase 'reserve to itself' in relation to a downstream market, is generally indicative of the application of a monopoly leveraging abuse. The difficulty of trying to impose a monopoly leveraging theory on the facts of *Huawei* (and SEP/injunction cases in general) is that it would require treating the injunction application as a 'refusal to license', as per the *de facto* standards line of cases like *Microsoft*. However, treating an injunction application as a 'refusal to supply' completely overlooks the strategic element of such applications in a FRAND negotiation that the injunction (or threat of one) is usually a complementary strategy in order to extract higher licensing fees, according to patent-holdup theory. It also glides over the fact that *Huawei*'s injunction application was lodged only *after* it had already made an offer to ZTE, which ZTE rejected. To consider these facts as amounting to a 'refusal to supply' would require *Huawei*'s initial offer to have amounted to a 'constructive refusal', by being so out of the orbit of what is reasonable that it was an effective denial of access.¹⁷⁴ However, no reasoning to this effect was present in the judgment.

Despite the possible 'monopoly leveraging' language of the CJEU quote, it might also be possible to sustain a theory of harm based on 'margin squeeze' where the injunction (either threat or application) functions as a complementary strategy to achieve the main strategy of raising the prices on ZTE's inputs (4G/LTE SEPs) in an attempt to exclude ZTE from the market.¹⁷⁵ However, the law around margin squeeze is currently in some disarray, given the recent *TeliaSonera* case¹⁷⁶ and the difficulty of integrating it with the *Guidance Paper on Art 82 EC*.¹⁷⁷ In addition, the required analysis of 'equally efficient competitor' was completely absent from the CJEU judgment.¹⁷⁸

¹⁷¹ Case 4a O (2015) 93/14 (DRC).

¹⁷² The German entity of Chinese *Qingdao Haier Group*.

¹⁷³ *Huawei* (n 16) para 52 (*Emphasis added*).

¹⁷⁴ See Commission Guidance on Enforcement of Art. 82 EC (n 10) para 79 ('Constructive refusal could, for example, take the form of [...] the imposition of unreasonable conditions in return for the supply').

¹⁷⁵ As discussed below, margin squeeze is treated as an 'exclusionary abuse' under EU competition law.

¹⁷⁶ Case C-52/09 *Konkurrensverket v TeliaSonera Sverige AB* [2011] ECR I-0527.

¹⁷⁷ Nicolas Petit, 'Theories of Self-Preferencing Under Article 102 TFEU: A Reply to Bo Vesterdorf' (2015) <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2592253> accessed 4 January 2016, 8 ('Since the adoption of *TeliaSonera*, antitrust experts have fretted over the interpretation of the judgment. A possible reading of the ruling of the CJEU in *TeliaSonera* is that once a dominant firm has *voluntarily* chosen to supply a customer, it can no longer refuse to deal, and this notwithstanding the fact that the restrictive conditions of the essential facilities doctrine may not be fulfilled [...]'. This post-*TeliaSonera* view conflicts with the old view, which treated margin squeeze analogously to refusal to supply, see Jones (n 18) (in which '[t]he Commission also treats margin squeeze analogously with refusal to deal in its Guidance Paper').

¹⁷⁸ Commission Guidance on Enforcement of Art. 82 EC (n 10) para 80 (arguing that 'a dominant undertaking may charge a price for the product on the upstream market which, compared to the price it charges on the downstream market, does not allow even an equally efficient competitor to trade profitably in the downstream market').

An alternative possibility which avoids the difficulties of trying to force the facts of *Huawei* into the shoes of existing case law is to zoom out from the specific legal rules of either 'monopoly leveraging' or 'margin squeeze' and focus on general principles. According to Alison Jones:

'[. . .] it might be preferable to rely on these lines of cases more generally as indicating that when identifying an abuse the EU courts look for evidence: (i) of whether the conduct at issue falls within the scope of competition on the merits; and, where it does not; (ii) of whether anticompetitive effects, actual or potential, can be demonstrated'.¹⁷⁹

This approach would effectively make the specific legal rules in *Huawei* amount to the identification of a *sui generis* abuse.¹⁸⁰ Given the difficulty in aligning *Huawei* with existing case law, this position has some support. However, it is the purpose of Part V to attempt to integrate the *Huawei* decision with the overall approach of the *de facto* standards case law, by delineating an 'infrastructural approach' to technological infrastructure.

Leaving further discussion of the competition law components of the *Huawei* decision to Part V, Section B (Part IV) below will now push on with the economic analysis. The key economic consequence of *Huawei* is on its effect on the bargaining framework for the FRAND negotiation, by removing the availability of injunctions when the licensee is within the defined 'safe harbour'. Section B and subsequent subsections will focus on analysing the effect of this by doing a comparative analysis of FRAND bargaining under property and liability rules. It will be shown that by removing injunctions from the negotiation toolbox of SEP-holders, the credibility of the FRAND commitment is strengthened. Introducing the 'threat' of third party FRAND determination may function to 'force' information from the SEP-holder about its true valuation of the SEP, helping to keep royalty rates 'reasonable'.¹⁸¹

B. Bargaining in the Shadow of Legal Rules: 'Property' v 'Liability' Rules

Below, the comparative 'information forcing' potential of injunctions and liability rules to allow parties to arrive at a FRAND rate is assessed. The analysis will conclude that while the threat of injunctions may lead to *supra*-FRAND licensing demands, a liability rule has the ability to force information from the parties to arrive at more accurate SEP valuations. It will be shown that the threat of 'outsourcing' the FRAND determination contingent on failure of the parties to agree may lead to more FRAND-like valuations.

1. FRAND Bargaining under Injunctions v Liability Rules

When companies bargain over the value of an SEP, the transaction cost at issue is that of 'private information'.¹⁸² Both the SEP-holder and the potential licensee have strategic incentives to hide their true valuation of the resource. SEP-holders would like to inflate the value of the SEP, while licensees wish to decrease it to the minimum amount possible. In a competitive or quasi-competitive market (such as does not usually exist in the context of SEPs), both sides of the transaction would be disciplined by possible substitution on the demand side (other buyers) and supply side (other sellers). The market acts as an information-forcing mechanism, revealing a valuation of the asset closer to its actual incremental value.¹⁸³ But where demand is inelastic as in the case of SEPs, there are few constraints to force the private information about value from the SEP-holder, and the value may reflect instead the 'strategic value', especially in the case where injunctions are available.

According to bargaining theory,¹⁸⁴ the availability of an injunction in this context may function as a 'threat point', enabling the SEP-holder to make the licensee internalise the potential losses of a successful injunction in its decision to accept the offered licensing fee ('patent holdup').¹⁸⁵ Commentators who argue against the avail-

¹⁷⁹ *ibid* 20.

¹⁸⁰ Petit, 'Self-Preferencing' (n 177) (an increasingly popular proposition is to view the seeking of injunctions for FRAND-pledged SEPs as a *sui generis* abuse, subject to a novel substantive standard').

¹⁸¹ Lemley and Shapiro (n 110) 1143 ('Explicitly ruling out injunctions will tend to steer bilateral negotiations towards a reasonable royalty rate').

¹⁸² Ian Ayres and Eric Talley, 'Solomonic Bargaining: Dividing a Legal Entitlement to Facilitate Coasean Trade' (1995) 104 *Yale LJ* 1030 ('Private information is a particularly pernicious form of transaction cost, especially in legal contexts [. . .] In such contexts, self-interested bargainers have a strong incentive to misrepresent their private valuations so as to capture a larger share of the bargaining "pie"').

¹⁸³ However, not all SEPs may have viable (*ex ante*) alternatives; See Geradin, 'Pricing Abuses' (n 110).

¹⁸⁴ Lemley and Shapiro (n 110) 1143 ('the outcome of bilateral negotiations is governed by the threat points of the two parties [. . .]').

¹⁸⁵ Shapiro (n 104) 283: ('The right to obtain an injunction thus gives the patent holder the power to hold up an infringing firm that has made specific investments to design, manufacture, and sell the infringing product [. . .]').

ability of injunctions during good faith FRAND negotiations often present a variation of the above argument that injunctions basically facilitate unilateral supply side price setting, which may be inefficient, as well as anti-competitive under EU law. But it is important to note that an argument *against* injunctions does not translate into an argument *for* a 'liability rule'. That would be to commit what Harold Demsetz elsewhere has called the 'Nirvana fallacy'.¹⁸⁶ What is required is a comparative analysis between bargaining in the shadow of injunctions against bargaining in the shadow of a liability rule. This is the purpose of the following sub-sections.

2. Bargaining in the Shadow of Injunctions: Dynamic Constraints?

There are at least two main arguments in favour of the availability of injunctions in a FRAND context against a willing licensee. First, that the problem of 'patent holdup' in FRAND licensing negotiations is significantly oversold. This argument states that there is no or little empirical evidence that 'patent holdup' is a problem and that taking away SEP-holders' rights to injunctions is an unnecessary solution to a non-existent problem.¹⁸⁷ The second argument for the continued availability of injunctions in FRAND negotiations is that SEP-holders are in fact constrained in important ways from exploiting the inelasticity on the demand side, by engaging in patent holdup.

Taking the arguments in order, it is true that the empirical literature is undecided on the problem of patent holdup. Some commentators remark wryly that 'if patent holdup is slowing innovation, it is slowing it down to perhaps the fastest rate in human history'.¹⁸⁸ High technology markets characterised by high patent concentrations and standards, which are candidate industries for patent holdup problems, have witnessed dramatic and continued price declines and rapid innovation rates. However, as patent holdup naysayers admit,¹⁸⁹ even if the above is true, such a finding cannot support the thesis that patent holdup does not have an adverse effect on innovation, because the counterfactual remains unobserved. One can still argue innovation rates and price decreases would have been faster *but for* patent holdup. Patent holdup is difficult to empirically assess because it tends to operate in the opaque negotiating rooms of private bargaining, and only enters the Courts on the margin. Given this empirical problem, it is not possible to take this argument much further. Instead, one must resort to economic analysis of the private incentives to engage in patent holdup. This is the second argument of patent holdup naysayers: that SEP-holders are dynamically constrained from engaging in patent holdup.

One important dynamic constraint that has been argued to operate in the domain of standard-setting comes in the form of 'reputational effects' in the technological trajectory of standards:

'[b]ecause standards evolve over time, and many high technology standards pass through multiple versions, any unreasonable pricing or abuse of market power can be punished in future iterations of the standard'.¹⁹⁰

This argument suggests that standard-setting participants treat the standard-setting process as a 'repeated prisoner's dilemma game', rather than the 'single shot' game outlined in Section B (Part III). The argument runs: players have the ability to 'punish' patent holdup behaviour in subsequent rounds by refusing to include the technology of those 'behaving badly' in subsequent generations of the standard. To advocates of this view, the 'threat point' of a patent injunction would only rarely be utilised, as SEP-holders have incentives to set licensing fees at rates acceptable to licensees in order to avoid punishment in later standard-setting rounds.

But this 'dynamic constraint' argument is vulnerable to a number of attacks. First, unlike the case of showing that patent holdup has or has not a negative effect on innovation, this argument makes an empirical claim which is easily rebutted. One simply needs to show that there are cases where parties cannot agree on a FRAND license.¹⁹¹ There are many examples of the latter, including the cases cited involving Apple, Samsung, Motorola, Microsoft, Qualcomm – most of the big players in high technology markets today.

¹⁸⁶ Harold Demsetz, 'Information and Efficiency: Another Viewpoint' (1969) 12 JLE 1.

¹⁸⁷ J Gregory Sidak, 'Holdup, Royalty Stacking, and the Presumption of Injunctive Relief for Patent Infringement: A Reply to Lemley and Shapiro' (2007) 92 Minn L Rev 714.

¹⁸⁸ Alexander Galetovic, Stephen Haber and Ross Levine 'Patent Holdup: Do Patent Holders Holdup Innovation?' (2014) Hoover IP² Working Paper Series No 14011 <<http://hooverip2.org/wp-content/uploads/ip2-wp14011-paper.pdf>> accessed 4 January 2016.

¹⁸⁹ *ibid*.

¹⁹⁰ Damien Geradin, 'Abusive Pricing in an IP Licensing Context: An EC Competition Law Analysis' (12th Annual Competition Law and Policy Workshop, Florence, June 2007) 20–21.

¹⁹¹ Of course, this could also be due to the licensees being systematically 'unreasonable' as opposed to the SEP-holder.

An additional point against the effectiveness of 'reputational effects' in constraining licensing behaviour takes stock of the number of players in the standard-setting 'game', which may have a dilutive effect on the constraint. The standard-setting game is one with often hundreds of participants. For example, the 3G Partnership Project (3GPP)—the telecoms SSO 'mothership' uniting six SSOs under its umbrella—has more than 400 individual members.¹⁹² It is difficult to see how SEP-holders' selective patent holdup of a few competitor companies might have really negative reputational effects sufficient to constrain behaviour.

Finally, one may also challenge the underlying premise of the argument that the standard-setting process is in fact a repeated game. Although it is impossible to challenge the fact that standards do require repeated interactions between participants, it is often the case in technological standards that succeeding generations of a standard build on the platform of previous generations, and often require backward compatibility¹⁹³ (see Part II, Section B). This may mean that SEPs in one generation continue to 'read on' to succeeding ones, although the overall share in SEPs owned by any one company may rise or fall.¹⁹⁴ This would mean that even if SEP-owners have acquired a 'bad reputation', it would be extremely difficult, if not impossible, to remove their SEPs from the technology without jeopardising the integrity of the standard. Furthermore, it might also be the case that repeat offenders may simply have the best technology, meaning that isolating them from engaging in standardisation would lead to inferior standards. For example, Qualcomm has been involved in a number of FRAND-based litigations, but nevertheless remains in the top two¹⁹⁵ contributors of SEPs to wireless standards. Although none of these arguments kill the dynamic constraint argument, they do serve to weaken the disciplining effect of reputation in the standard-setting process.

Having now addressed the arguments of empirical poverty and dynamic constraints that are generally deployed by those in favour of retaining the availability of injunctions in FRAND negotiations, we turn to assess the arguments for and against adopting a liability rule.

3. Bargaining in the Shadow of a Liability Rule or Third Party Determination

By removing the availability of injunctions in negotiations with an 'objectively willing' licensee in a FRAND context, the usual 'property rule' underlying patents is replaced by what amounts to a 'liability rule'. According to the recent *Huawei*, *Samsung* and *Motorola* decisions, when negotiating parties cannot agree on FRAND terms, they will generally have the option to submit to a neutral third party to determine the FRAND rate.¹⁹⁶ Following the CJEU *Huawei* decision, if they cannot agree on a third party arbiter, it is likely the dispute would be submitted to the Courts. Another way of viewing the above is that the parties are forced to negotiate a FRAND license in the shadow of third party FRAND determination, as will be discussed in Section B(3)(a).

There are at least two economic¹⁹⁷ arguments against such a curtailment of the SEP-holder's IP rights. First, that negotiating in the shadow of a liability rule (or third party determination) may lead to reverse holdup, (otherwise known as 'hold-out'), where the licensee gains *too much* bargaining power. This may lead to licenses which are non-FRAND because they are *too cheap*, thus harming dynamic efficiency. Second, that even if injunctions may lead to 'excessive pricing', outsourcing price determination to a 'market mimicking' mechanism such as the Courts or a neutral third party, will lead to inefficient and inaccurate pricing, perhaps meaning that the 'cure is worse than the disease'.

a) Problems of Reverse Holdup; Information-Forcing under a Liability Rule

In order to assess whether reverse holdup may be a problem under a liability rule, it is necessary to review the strategic position of the licensee in such a negotiation. Failure of the negotiating parties to agree on a FRAND rate will most likely lead to third party rate determination. This means that the licensee's 'threat

¹⁹² See the 3PP Membership List <http://webapp.etsi.org/3gppmembership/Results.asp?Member=ALL_PARTNERS> accessed 4 January 2016.

¹⁹³ For further detailed discussion on other ways SEP-holders may evade dynamic constraints, see Maurits Dolmans, 'Standard Setting – The Interplay with IP and Competition Laws' in Hugh C Hansen (ed), *Intellectual Property Law and Policy* (vol 11, Hart Publishing 2010).

¹⁹⁴ For example, Qualcomm has less SEPs over the 4G LTE standard (as a percentage of the total) than it had over the 3G/UMTS, see 'Why Qualcomm's Royalty Rate Will Continue To Decline' (*Forbes*, 10 June 2014) <<http://www.forbes.com/sites/greatspeculations/2014/06/10/why-qualcomms-royalty-revenue-will-continue-to-decline/>> accessed 4 January 2016.

¹⁹⁵ Just behind LG Electronics for 4G/LTE SEPs, see 'Identifying The Tech Leaders In LTE Wireless Patents' (*Forbes*, 21 September 2011) <<http://www.forbes.com/sites/elizabethwoyke/2011/09/21/identifying-the-tech-leaders-in-lte-wireless-patents/>> accessed 4 January 2016

¹⁹⁶ In practical terms, such an adjudication process may be essentially indistinguishable from damage assessment following infringement.

¹⁹⁷ There are also legal arguments—as reviewed in *Huawei*—which turn on the right to property, and access to the Courts.

'point' is one of relegating FRAND determination to a third party.¹⁹⁸ In most cases, there would be significant legal costs (not to mention wasted time) associated with this eventuality. There would also be significant transaction costs associated with the uncertainty of such a process. However, it is likely that both the legal and transaction costs would be apportioned *symmetrically* across the bargaining parties: both parties would have to retain counsel and neither would be able to predict the outcome of the FRAND determination process in advance. Furthermore, as the recent German case of *SISVEL v Ruess* demonstrates, Courts may still grant injunctions to SEP-owners in circumstances where the *Huawei* conditions are not fulfilled. It would therefore be unreasonable to argue that the *Huawei* rule is somehow licensee-friendly, as the licensee's obligations under *Huawei* seem to be interpreted narrowly. In conclusion, the threat point available to a licensee under a liability rule would most likely be insufficient to negatively affect the SEP-holder's interests in a FRAND negotiation.

Moving on to the second argument about the inefficiency of third party FRAND determination, it is true that non-market mechanisms are notoriously poor at simulating market price setting. This is because 'price' is a signal that results from the interaction of a vast array of different factors, summarised by economists as 'demand' and 'supply'. Such factors constitute 'information', which is extremely costly to procure and difficult to integrate by non-market entities. Because of this, non-market price-setting is generally avoided by the Courts and spurned by the private sector, unless no market-based price-setting mechanism is available. However, the poverty of market-mimicking mechanisms can be leveraged to reach efficient outcomes under a liability rule, as explained below.

Since both parties to a FRAND negotiation have an interest in avoiding the uncertainty of third party adjudication, they each have incentives to reveal their true valuations during negotiations. Under the threat of third party determination in case of failure to agree on a FRAND rate (and the resulting extra costs, time, and unpredictability), rational bargainers may choose to shed their 'strategic valuations' and make offers closer to the actual incremental value of the SEP. This is because both parties will attempt to simulate the price-setting behaviour of a hypothetical third party arbiter in their own valuations, and each would attempt to make offers of the (respective) maximum and minimum amounts that could be accepted by the other party.¹⁹⁹ The SEP-owner may have extra incentives to offer a 'reasonable' FRAND rate, as third party determination would then limit its flexibility in negotiations with other parties.²⁰⁰ By shedding strategic valuations and moving closer to what the parties can reasonably accept, the parties can be said to be revealing their 'private information' over the true valuation of the asset.

According to the work of a number of scholars including Mark Lemley,²⁰¹ Ian Ayres²⁰² and Rochelle Dreyfuss,²⁰³ the transaction costs associated with the uncertainty of third party price determinations may actually (in fact, admittedly perversely)²⁰⁴ function as information-forcing mechanisms, and the latter may gain in efficiency as the transaction costs are perceived to increase. When the price-setting body is perceived as particularly unpredictable, costly and slow,²⁰⁵ parties have even stronger incentives²⁰⁶ to reveal their 'true' valuations in order to avoid submitting to such a process.

¹⁹⁸ Jones (n 18) 25 ('the removal of an unfettered right to seek an injunction does not automatically create a risk of Type 1 errors and mean that implementers are free to infringe SEPs with impunity and hold-out against patentees. If the parties cannot agree on FRAND terms, having reached an "impasse", the patentee may request a court (or arbiter) to order the infringer to pay damages in respect of past infringement and/or to pay an on-going royalty for future licensed use').

¹⁹⁹ Ayres and Talley (n 182) 1032: ('Under a liability rule regime, a nominal entitlement owner has an incentive to reveal truthfully whether her valuation is above or below the damage amount').

²⁰⁰ Although the particular determination by an arbiter or Court in a bilateral FRAND negotiation would not necessarily be binding on future FRAND negotiations with different parties, the onus would likely be on the SEP-owner to distinguish the cases.

²⁰¹ Mark A Lemley, 'Contracting Around Liability Rules' (2012) Stanford Law and Economics Olin Working Paper No 415, 113 <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1910284#%23> accessed 4 January 2016 (stating that '[f]ar from discouraging bargaining, if anything, the denial of an injunction in a patent case appears more conducive to settlement than its grant').

²⁰² Ian Ayres and Paul Klemperer, 'Limiting Patentees' Market Power Without Reducing Innovation Incentives: The Perverse Benefits of Uncertainty and Non-Injunctive Remedies' (1999) Yale Faculty Scholarship Series Paper 1256 <http://digitalcommons.law.yale.edu/fss_papers/1256/> accessed 4 January 2016.

²⁰³ Rochelle C Dreyfuss, 'Varying the Course in Patenting Genetic Material: A Counter-Proposal to Richard Epstein's Steady Course' in F Scott Kieff (ed) *Perspectives on Properties of the Human Genome Project* (Elsevier 2003).

²⁰⁴ See Lemley, 'Liability Rules' (n 201) 474–475.

²⁰⁵ *ibid* 475 ('the uncertainty of outcome is enough to cause risk-averse parties to settle rather than chance a bad outcome').

²⁰⁶ See Ayres and Talley (n 182) 1026–1027 ('Indeed, the inability of a court to tailor a damages award and the existence of litigation costs can often improve the ability of the parties to reach a consensual, efficient agreement on their own terms, not those dictated by the underlying liability rule [...]']).

Empirical data on settlements in the shadow of liability rules compared to property rules, show that the former often have a higher number of settlements.²⁰⁷ Though the empirical data is not so far conclusive, it does lend weight to the information-forcing character of bargains conducted in the shadow of liability rules, and suggests that FRAND rates may be more forthcoming under a liability rule (and third party determination) compared to a property rule. As Lemley and Shapiro put it: '[s]o long as the arbitration procedure itself is unbiased, bargaining in the shadow of binding arbitration will tend to lead to reasonable rates'.²⁰⁸

Now to sum up. It has been argued above that FRAND bargaining under a liability rule has distinct advantages over bargaining in the shadow of an injunction. These advantages include reducing incentives for *ex post* opportunism due to the information-forcing potential of the threat of third party price-setting. These incentives may furthermore increase as the unpredictability, cost, and time for such a procedure increase.

By removing injunctions from the negotiation toolbox of SEP-holders, the EU Commission and Courts have recognised that market bargaining under a property rule may lead to sub-optimal results when the asset at stake is an essential infrastructural asset, such as a FRAND-committed SEP. By removing the availability of injunctions in such cases, the FRAND commitment gains credibility as the risk of *ex post* opportunism is reduced. This result may help to encourage the process of cooperative standard-setting since the prisoner's dilemma of *ex post* patent holdup would be perceived as credibly controlled (see Part III, Section B).

V. Integrating the Infrastructural Approach

This section sets out to integrate the key arguments and insights generated in the previous sections of this paper. Section A takes a closer look at the EU *de facto* and *de jure* standards case law, and attempts to harmonise the overall reasoning of the cases to reveal the underlying infrastructural approach. Section B then offers some concluding remarks.

A. Integrating the Case Law on Technological Infrastructure

It is well established in EU competition law that antitrust concerns can trump the exclusivity of an intellectual property right only in 'exceptional circumstances' and where the alleged anticompetitive use of the right is not 'objectively justified'. The 1968 case of *Parke & Davis v Probel*²⁰⁹ established the principle that the 'special protection' given by a patent is not an infringement of competition law unless its exercise 'degenerates' into an abuse of that protection. The 'very subject matter' of the 'special protection' was later defined in the 1988 case of *Volvo v Veng*²¹⁰ to be the right to exclude 'third parties from manufacturing and selling or importing, without its consent [...]', though it left the door open for a finding of abuse in case of the 'arbitrary refusal to supply' or excessive pricing. In line with this early case law, the Commission's Guidance on the enforcement of Article 82 EC (now 102 TFEU), starts from the position that dominant undertakings 'should have the right to choose its trading partners and to dispose freely of its property'.²¹¹ A series of more recent CJEU and General Court cases have elaborated on the 'exceptional circumstances' required to motivate a finding of 'refusal to supply' in relation to an intellectual property right, culminating in the 2007 *Microsoft* decision of the General Court. In that case, which substantially endorsed the framework established in the earlier cases of *IMS* and *Magill*, the following cumulative conditions were considered sufficient (but not necessary)²¹² to justify a finding of a 'refusal to supply' and abuse of dominant position in relation to IP: first, that the refusal relates to a product or service indispensable to an activity on a secondary market; second, that it prevents the emergence of a new product or technical development²¹³ for which there is potential consumer demand; third, that it is such as to exclude any effective²¹⁴ competition on a secondary market; and fourth, that it is not objectively justified.²¹⁵

Since this test has been substantially used to motivate compulsory licenses and open access to IP covering *de facto* standards, it would have seemed to be the natural competition law approach to cooperatively-set

²⁰⁷ Lemley, 'Liability Rules'(n 201) 475 ('Far from discouraging bargaining, if anything, the denial of an injunction in a patent case appears more conducive to settlement than its grant.'). Lemley also quotes empirical data that 31.25% of cases under liability rule cases settle compared to 16% under an injunction.

²⁰⁸ Lemley and Shapiro (n 110) 1148.

²⁰⁹ Case 24/67 *Parke, Duvis & Company v Probel and others* [1968] ECR 55.

²¹⁰ Case 238/87 *AB Volvo v Erik Veng (UK) Ltd* [1988] ECR 6211.

²¹¹ See Commission Guidance on Enforcement of Art. 82 EC (n 10) para 75.

²¹² 'Sufficient' but not 'necessary', since the case states that the 'exceptional circumstances' were not exhaustive.

²¹³ *Microsoft* (n 8) para 665.

²¹⁴ *ibid.*

²¹⁵ *ibid* para 139.

standards as well. However, both the AG Wathelet and the CJEU were careful to distinguish the *de facto* standards cases from the *de jure* standard case at issue in *Huawei*:

'[I]t must be pointed out, as the Advocate General has observed in point 70 of his Opinion, that the particular circumstances of the case in the main proceedings *distinguish that case from the [de facto standards] cases which gave rise to the case-law [. . .] by the fact that the patent at issue is essential to a standard established by a standardisation body [. . .]'.²¹⁶*

The AG and the CJEU were also careful to distinguish the German case law of *Orange Book*,²¹⁷ which the referring Court considered relevant on the same grounds.²¹⁸ In distinguishing the cases, the AG made the observation that 'it is only natural that, in those circumstances [of a *de facto* standard], the patent owner will have greater negotiating power than in the case of an SEP the owner'.²¹⁹

It is submitted that the CJEU was correct to support a distinction between *de jure* and *de facto* standards. However, it is argued that the ground for the distinction can be more precisely defined. To briefly preview the argument below, the nub of the distinction should derive from the greater difficulty and uncertainty in identifying essential technological infrastructure in *de facto* standards cases compared to *de jure* standards cases. Using Easterbrook's 'error-cost framework' (see Part II, Section B), the increased likelihood of committing type 1 errors in relation to *de facto* standards should demand a more robust and exhaustive 'infrastructural screening' test than that of *de jure* standards. However, once qualified as essential technological infrastructure, then the application of an open access rule should follow unless there are very good reasons to counsel against. The underlying logic of the infrastructural approach can thus be summarised as 'if infrastructure, then open access'. This approach can be decomposed into two steps, including (i) an 'infrastructural screening test', followed by (ii) an assessment of the appropriateness of an open access rule, as will be discussed in detail below in relation to *de facto* and *de jure* standards.

In the case of the purely 'bottom up' technological infrastructure of *de facto* standards, the 'essential facilities' test was used to 'screen' for the infrastructural character of the asset and assess the merits of an open access rule, and can be divided into two parts. First, the 'essentiality' and *sine quo non* status for effective competition can be said to go towards determining whether the asset is truly infrastructural. This is a *factual* inquiry. Only if the asset cannot be reproduced and if denying access to it would seriously harm effective competition can it be considered 'infrastructural'. Its attributes of being non-rival, intermediate and generic (see Part II, Section A) are implied by its function as an input; however the 'non-rivalry' assessment may also sound in the second part of this analysis: assessing the merits and conditions of applying an open access rule given the asset has been found to be infrastructural. The IP-specific test of the 'new product' or 'technical development' can be seen to form part of the assessment of whether an open access rule is appropriate: it is only in cases where denial of access would harm dynamic efficiency (the emergence of a new product or technical development) that an open access rule would be a principled approach. Otherwise, the Schumpeterian arguments (summarised in Part II, Section A) in favour of strong, exclusive intellectual property protection would likely tip the balance against an open access rule. Finally, an open access rule may also be challenged by 'objective justifications', such as where, for example, the infrastructural asset is not truly non-rival and sharing access may lead to *e.g.* congestion problems.²²⁰ From a competition law perspective, the consumer harm of 'monopoly leveraging' in a *de facto* standards case is identified as the loss of the 'new product'/technical development', referred to in *Microsoft* as loss of 'consumer choice'.²²¹

In the case of *de jure* technological infrastructure, the infrastructural status of the SEPs need not go through the exhaustive 'essential facilities' style 'infrastructural 'screening test', since the 'quasi-top-down'²²² and cooperative approach of *de jure* standard-setting raises fewer risks of misidentifying essential infrastructure. Compared to *de facto* standards, the risk of type 1 errors is less in relation to *de jure* standards. *De jure* standards are considered technological infrastructure (almost) by definition, as they create a 'relationship

²¹⁶ *Huawei* (n 16) para 48 (*Emphasis added*).

²¹⁷ *Orange Book Case* (2009) KZR 39/06 (GFCJ).

²¹⁸ *Huawei* (n 16) para 48.

²¹⁹ *ibid*.

²²⁰ Also referred to as a 'dirty public good', such as highways or some telecom networks. In cases of pure IP (as information) resources, however, such as SEPs, these arguments would not bite.

²²¹ The reduction in 'product choice' due to monopoly leveraging was the identified 'consumer harm' in *Microsoft* (n 8).

²²² Quasi top down because the standards do not 'emerge' from the market via competition, but are agreed *before* the products hit the market.

of dependence between the intellectual property right holder [...] and other undertakings'.²²³ The legal analysis in *Huawei* can be seen to focus purely on the equivalent of the second part of the 'essential facilities' analysis:²²⁴ *i.e.* the conditions under which the application of an open access rule is appropriate. Since the basis of the open access rule was the *ex ante* FRAND contractual commitment, and since SEPs only attained their infrastructural status by virtue of this commitment,²²⁵ it is the bargaining conditions around this duty which are the Court's focus. As explained earlier, the nub of the Court's decision on this point was that an open access rule to SEPs should apply unless the licensee's approach to the negotiation is not 'objectively willing', or otherwise in bad faith. Where these elements are absent, then the parties must conduct their negotiation under the shadow of a liability rule, which amounts to the application of an open access rule. The 'essential facilities'-style 'objective justification' as a means to challenge the application of open access would not be available in a *de jure* standards case, as such considerations should have been internalised before the SEP-holder committed to a FRAND contract. The consumer harm in the case of *de jure* standards under the *sui generis* *Huawei* test seems to be dual: that there will be harm in patent hold up risk (leading to exclusion of competitors, and loss of consumer choice),²²⁶ and also that the 'risk that confidence in the standard setting process will be undermined'.²²⁷ This second element of harm links to the strategic considerations of standard-setting developed in Sections A and B (Part III), and the fact that the risk of patent holdup can cause the coordination conditions for *de jure* standards to unravel,²²⁸ due to the frustration of the 'legitimate expectation' of FRAND licensing.²²⁹

A useful way of summarising the 'infrastructural approach' outlined above is contained in **Figure 3**. As shown there, the approach is characterised by two main steps: 'an infrastructural screening test', followed by an assessment of the appropriateness of an open access rule. In the third box on the right, the suggested theory of harm motivating the competition law intervention is also included.

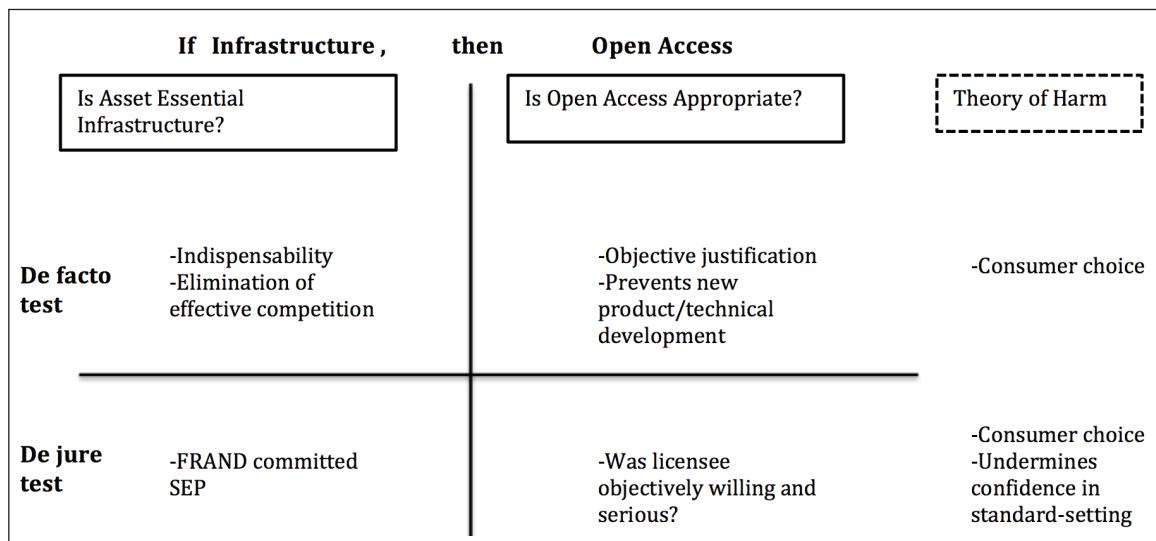


Figure 3: The Two Stage Infrastructural Approach.

²²³ *Huawei* (n 16) para 71.

²²⁴ However, AG Wathelet emphasised in his *Opinion* that a SEP-holder cannot be simply assumed to occupy a dominant position for the purposes of Art 102 TFEU. Therefore, this will need to be shown before it can be assumed that an alleged SEP is indeed 'infrastructural'; *Opinion* AG Wathelet (n 25) para 57 ('[...] the fact that an undertaking owns an SEP does not necessarily mean that it holds a dominant position within the meaning of Article 102 TFEU, and that it is for the national court to determine, on a case-by-case basis').

²²⁵ *Huawei* (n 16) para 51 ('[...] the patent at issue obtained SEP status only in return for the proprietor's irrevocable undertaking, given to the standardisation body in question, that it is prepared to grant licences on FRAND terms').

²²⁶ *ibid* para 52.

²²⁷ Jones (n 18) 26.

²²⁸ See Part III, Sections A–B and the argument about the 'shadow' of the Prisoner's Dilemma being visible to coordinating companies in *de jure* standard setting.

²²⁹ *Huawei* (n 16) para 53 ('an undertaking to grant licenses on FRAND terms creates legitimate expectations on the part of third parties that the proprietor of the SEP will in fact grant licenses on such terms').

Now to sum up. The *de jure* and *de facto* standards cases are unified by an infrastructural approach to the underlying technological infrastructure, of the default form 'if infrastructure, then open access'.²³⁰ In *de facto* standards cases (such as *Microsoft*) the risk of type 1 errors counsels for a robust 'infrastructural' screening test before the application of an open access rule. However 'objective justifications' (e.g. congestion) and 'dynamic efficiency' (absence of a new product/technical development) arguments may still be recruited to defend against application of an open access rule. In *de jure* standard cases, the 'infrastructural screening test' is foregone due to the inherently essential infrastructural nature of cooperatively-set standards. The analysis instead focuses on the 'open access' conditions. To this end, an open access rule is applied by default unless the licensee is shown to not be objectively willing, or otherwise behaves in bad faith during the FRAND negotiation.

Viewed in the above way, the 'essential facilities' test can be seen as just one legal approach to ensuring the open access of essential technological infrastructure—and one which is tuned to the difficulties of mandating access to purely 'bottom up' technological infrastructure. The *de jure* standards test is another, perhaps *sui generis*, test (see Part IV, Section A) to the same problem, although tuned to the issues of cooperative standard-setting. Both tests are unified by the overall two stage 'infrastructural approach'.

B. Concluding Remarks

As high technology markets have become central to economic production, modern economies have undergone a profound shift in the provisioning systems of essential infrastructure. While traditional infrastructures retain their crucial importance for scaffolding social value creation, technological infrastructures in the form of real and virtual networks have arisen via bottom-up and industry-coordinated processes to take centre stage. As these technological infrastructures swell to include greater proportions of social activity, the trade-offs between their private ownership and the public interest in their 'open access' and management are sharpening. The regulatory attention attracted by such companies as Google,²³¹ Facebook,²³² Microsoft²³³ and Intel²³⁴ is symptomatic of the increasing tension between these companies' private ownership of key technological infrastructures and the latters' inherently public role.

It is submitted that the infrastructural approach endorsed by this paper may have some role to play in helping to identify the nerve centres of the debates over private ownership and public interest. The two stage approach of first 'screening' for infrastructure, then assessing the utility of the open access rule can be used to assess whether exclusive private control over an essential technological infrastructure is justified. The infrastructural approach²³⁵ may then go on to craft legal *sui generis* rules (such as, arguably, in *Huawei*) that recognise the importance of continued private investment, while bringing the interests of social welfare into the mix, and attempting to tune the legal tests to the uncertainties of market intervention.

By mandating 'open access' over essential technological infrastructure in certain well-defined cases, competition law is merely reinstating the 'lost message' of the early case law, that antitrust law should not discard beneficial synergies that require sharing'.²³⁶ Although today's high technology markets generate new and interesting *facts*, the *principle* that privately held 'conveniences affected with the public interest'²³⁷ may be restrained from taking 'arbitrary or excessive duties' has very deep roots within the law. Taking privately

²³⁰ Frischmann, 'Commons Management' (n 24) 923 ('if a resource can be classified as infrastructure [...] then there are strong economic arguments that the resource should be managed in an openly accessible manner').

²³¹ See Commission, 'Antitrust: Commission Sends Statement of Objections to Google on Comparison Shopping Service' (15 April 2015) Press Release MEMO/15/4781 <http://europa.eu/rapid/press-release_MEMO-15-4781_en.htm> accessed 4 January 2016.

²³² See Gibbs (n 33).

²³³ *Microsoft* (n 8).

²³⁴ *Intel* (n 31).

²³⁵ It should be noted that some scholars strongly disagree with identifying eg companies like Google as being treated as 'essential facilities'. As should be clear, the approach endorsed by this paper does not depend on the application of the essential facilities directly, but on the wider 'infrastructural approach'. In any case, see Bo Vesterdorf, 'Theories of Self-Preference and Duty to Deal – Two Sides of the Same Coin?' (2015) 1 Comp L Pol'y Debate 4, 8 ('Google's position is not comparable with that of an infrastructure service, such as a port or telecommunications utility that represents a necessary access point to the market for which there is no alternative'). However, Vesterdorf's position that the essential facilities doctrine is inapplicable to Google is robustly challenged by Nicholas Petit. He argues that Vesterdorf's view is unduly narrow and cannot be sustained by the case law; see Petit, 'Self-Preference' (n 177) 10–15.

²³⁶ Maurer and Scotchmer (n 85) 250 ('The lost message is that antitrust interventions must not discard beneficial synergies that require sharing. This common thread goes a long distance to unifying the cases on both sides of the Atlantic. We anticipate that the doctrine will gain renewed importance, since the digital economy is a new source of synergies').

²³⁷ Hamilton (n 26) 1093 (reads 'a man who "for his own private advantage" sets up a wharf or a crane "may take what rates he and his customers may agree," but at a wharf unto which all persons must come to unlade or lade their goods "there cannot be taken arbitrary or excessive duties," but "the duties must be reasonable and moderate." The reason is that "now the wharf and the crane and other conveniences are affected with a publick interest, and they cease to be *juris privati* only"').

owned technological infrastructure seriously as 'infrastructure' sits firmly in this legal tradition, as well as representing a step towards greater openness, dispersion of unjustified control, and competition in today's high technology markets.

Competing Interests

The author declares that they have no competing interests.

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