WORKING PAPER NO. 07-20
INTELLECTUAL PROPERTY RIGHTS AND STANDARD SETTING IN FINANCIAL SERVICES: THE CASE OF THE SINGLE EUROPEAN PAYMENTS AREA

Robert M. Hunt
Federal Reserve Bank of Philadelphia

Samuli Simojoki
Attorneys at Law Borenius & Kemppinen

Tuomas Takalo
Bank of Finland

First Draft: March 2007

This Draft: August 2007

RESEARCH DEPARTMENT, FEDERAL RESERVE BANK OF PHILADELPHIA
Ten Independence Mall, Philadelphia, PA 19106-1574 • www.philadelphiafed.org/econ/index.html

WORKING PAPER NO. 07-20
INTELLECTUAL PROPERTY RIGHTS AND STANDARD SETTING IN FINANCIAL SERVICES: THE CASE OF THE SINGLE EUROPEAN PAYMENTS AREA[*]

Robert M. Hunt

Federal Reserve Bank of Philadelphia

Samuli Simojoki

Attorneys at Law Borenius & Kemppinen

Tuomas Takalo

Bank of Finland

First Draft: March 2007

This Draft: August 2007

[*] We thank Päivi Heikkinen, Ari Hyytinen, Kari Kemppainen, Pekka Sääskilahti, seminar participants at the Bank of Finland, and three anonymous referees for useful comments The opinions expressed, as well as any errors, are our own and not those of the institutions with which we are affiliated. This paper is available free of charge at www.philadelphiafed.org/econ/wps/index.html.

INTELLECTUAL PROPERTY RIGHTS AND STANDARD SETTING IN FINANCIAL SERVICES: THE CASE OF THE SINGLE EUROPEAN PAYMENTS AREA

Robert M. Hunt, Samuli Simojoki, and Tuomas Takalo

Abstract

For many reasons, payment systems are subject to strong network effects; one of those is the necessity of interoperability among participants. This is often accomplished via standard-setting organizations. The goal of the Single European Payments Area (SEPA) is to establish modern cross-boarder consumer payment systems for Europe. This too will require a standard-setting arrangement. But patents are also becoming an important feature of electronic payment systems and thus standard setting under SEPA should incorporate a policy to address the ownership and licensing of essential intellectual property. Using examples from the experience of European mobile telephony and financial patenting in the United States, we argue that the lack of a well-developed IP policy creates significant risks for participants in the new SEPA payment systems.

JEL Codes: O31, O34, G20

KeyWords: SEPA, business method patents, electronic payments, standard setting, licensing

1. Introduction

Intellectual property is widely regarded as the main policy tool of modern societies for molding private incentives to innovate and to diffuse innovations.[1] Alan Greenspan has frequently (e.g., April 3, 2003, and February 27, 2004) pondered the question: "If our objective is to maximize economic growth, are we striking the right balance in our protection of intellectual property rights?" This is a difficult question for economists to answer in general. It is especially difficult to address this question in the context of financial services, including payment systems.[2]

One special feature of financial services is that, until recently, patents have only rarely been used to protect financial innovations as such (Tufano 2003, Frankel and White 2004). In most other industries patents are common, providing their owners with strong and relatively broad protection of their technological innovations. But in the United States, at least, financial patents became commonplace after the landmark 1998 decision in *State Street Bank & Trust Co. v. Signature Financial Group*.[3] This decision made it clear that computer-implemented methods of doing business, including those involving finance, were indeed patentable subject matter (Hunt 2001, Lerner 2002).

The use of formal intellectual property rights to protect financial innovations is more limited in Europe than in the U.S. But most contemporary financial services rely on information technology. Unlike business methods per se, there is no doubt about the patentability of such technology.[4] Indeed, the information and communication technology

[1] We use the term intellectual property generically. The issues raised are relevant to patents and other industrial rights, such as utility models and protection of topographies of semiconductor products. Sometimes, they also have a bearing on copyright and related rights, especially database rights. In contrast, trademarks, which differ in function and purpose, are not discussed.

[2] See Hunt (2007) for a discussion of the measurement problem in the context of financial services in the U.S.

[3] 149 F.3d 1368. See also the decision in *AT&T v. Excel Communications*, 172 F.3d 1352.

[4] In other words, computer-implemented methods of doing business are more likely to satisfy the European Patent Office's "technical effect" requirement of patentable subject matter than business methods in general.

(ICT) industries (e.g., computers, communications, and electronics) are some of the most patent-intensive sectors of the economy (Bessen and Hunt 2007).

Intellectual property has already found its way to the European financial services sector in recent years, and it is likely to become ubiquitous in the future. Today, its role is often underappreciated by the management of financial companies and the staff of the government agencies that regulate them. In this paper we argue that intellectual property is now an important facet of any effort in standard setting in financial services. Indeed, disputes over intellectual property pose a risk to the development of the Single European Payments Area (SEPA) and subsequent innovations in banking and retail payment media in Europe. This risk should be evaluated and carefully managed.

SEPA is a major public policy initiative to standardize non-cash payment methods in the euro area (see, e.g., England 2006, and Kemppainen and Salo 2006).[5] The payments industry is a *network* industry, and, as such, it entails very large gains associated with standardization. Without standardization, many of the potential consumer benefits from the creation of the euro will not be realized. These benefits include, among other things, lower transactions costs, faster settlement, reduced risk, more transparency, and increased price competition. As part of the development of the European payment systems, a new Directive on Payment Services (PSD) is currently being prepared in the EU for providing a modern and comprehensive set of rules applicable to all electronic payment services in the European Union and the necessary legal platform for SEPA.[6]

A conservative estimate of the direct cost savings achieved under full implementation of SEPA exceeds €20 billion a year (European Commission, 2006). Two important sources of

[5] As with the term intellectual property (cf. footnote 1), we use the term SEPA generically. Our specific interest lies in the new pan-European payment instruments, infrastructures, regulation, and other standards that will make SEPA a reality, not in the concept of SEPA itself.

[6] As of the writing of this paper, the Directive on Payment Services (PSD) has been approved by the European Parliament and is waiting for final formal approval. It is expected that the deadline for the implementation of the directive will be November 1, 2009. See Council of the European Union (2007).

cost savings include the scale economies that can be attained by consolidating payment networks that currently operate at the national level and the substitution of electronic payments for paper transactions as the differences in their relative cost and convenience increase (Bolt and Humphrey 2007). But obtaining these benefits will require substantial investment. The cost to banks of implementing SEPA over its first five years is estimated to be in the range of €5-10 billion (Schmiedel 2007).

The intersection of standard setting and intellectual property rights is complicated and sometimes contentious. There is almost an inherent tension between the two: the goal of intellectual property is to stimulate the incentive to innovate by giving its owner a right to exclude others from using the innovation, whereas the goal of standardization is to stimulate the use of innovations adopted as a standard. Standard-setting organizations (SSOs) must negotiate a compromise that is reasonably attractive for each of these constituencies.

This is not always an easy task, as a number of scholars have recently documented (Shapiro 2001, Lemley 2002, and Chiao et al. 2006). It is particularly difficult for industries where interoperability standards are required to make products or services compatible with each other in order to maximize the benefits of network externalities. It is further complicated by the potential for opportunistic behavior by participants who own patents on a technology essential to the standard. There is a risk that without sufficient transparency and sufficiently strong mutual interests, network participants could make large investments to implement a standard only to be held up by a firm threatening to withhold a key piece of technology. In all likelihood some kind of agreement would be reached, but on terms substantially worse than the participants initially expected. Indeed, the risk of such an outcome may discourage firms from adopting a standard or even participating in the standard-setting process. In other instances, awareness of a key blocking patent might lead to the adoption of a standard that poses less risk to participants but which is also technologically inferior.

These externalities can also work in the opposite direction. If a financial standard-setting organization is sufficiently influential in coordinating the decisions of its member financial institutions and is able to require the sharing of technology at concessionary prices, the incentive to invest in these technologies could be significantly impaired. While financial institutions would be able to adopt a standard, the underlying technology would again be inferior when compared to a regime that offers better incentives for developers of new technologies.

Often SSOs have specific policies designed to mitigate these risks. But designing these policies and obtaining the acceptance of the relevant participants can be challenging. A well-designed IP policy should simultaneously provide incentives for firms to participate in the standard-setting process and encourage new innovations that would eventually lead to a better standard. The policy should also specify the rights enjoyed by owners of the relevant intellectual property and the licensing terms to be used. Often, these policies call for "reasonable" royalties and access to the key technologies for all participants (e.g., open or non-discriminatory licensing).[7] Of course, these terms must be acceptable to owners of the intellectual property, since their participation in a standard is typically voluntary. The difficulties in establishing a successful IP policy for a standard should not be discounted.

There are numerous historical examples of licensing disputes and allegations of hold-ups related to standards (see, e.g., Bekkers et al. 2002, Blind et al. 2002, and Lemley 2002).[8] By one estimate, patents covering an industry standard are 13 times more likely to be litigated than other U.S. patents (Lemley 2007). This experience is relevant to the case of standard setting in financial services and to electronic payments in particular.

[7] In addition, a binding policy could, for example, stipulate that while a patent owner retains the right to obtain royalties, it has, under a binding contract, committed to forgo injunctive remedies or treble damages under patent law (Lemley 2007). Such terms would significantly reduce risks for the users of the patented technology, but they may not be acceptable to owners of that technology.

[8] It should be noted, however, that the literature does not provide much in the way of concrete estimates of the social losses arising from these problems.

An additional complicating factor for SEPA is that legal treatment of financial innovations is evolving. In addition, modern payment systems rely extensively on ICT. The ownership of the relevant intellectual property is spread over many companies located in many countries. As result, there can be considerable variation in the IP strategies of these firms, which are influenced, in turn, by the historical and legal traditions of their home countries.

Each of these factors suggests that the development of SEPA should include a well-articulated IP policy. This is especially important given SEPA's objective of "creating open and common standards that overcome technical and commercial barriers" for cashless payment services within the euro area. All electronic payments should "migrate to common interoperable formats and processes." SEPA should also be a "forward-looking" process, "both embracing and enabling the realisation of new technological opportunities."[9]

The remainder of the paper is organized as follows. We first review the law and economics of intellectual property in financial services and standard setting (Section 2). Our definition of financial innovation is broad, including technological innovations that facilitate financial services. We point out that such innovations are patentable in Europe and can also sometimes be protected through copyright and database rights. Based on the literature we explain why a well-defined intellectual property policy is a key to successful standard setting in network industries.

In Section 3 we present some examples from the communications industry where IP disputes have jeopardized some standards, despite rigorous efforts to avoid them. We think the experience of the communications industry is relevant for payment media, and we explain why: despite differences in the underlying technologies, the legal and economic problems are almost identical. We also point to the pattern of financial patenting and litigation in the U.S.

In Section 4 we argue that the lack of a proper intellectual property policy may seriously hamper adoption of the new SEPA payment instruments and subsequent innovation in the European payment media industry. In particular, it seems likely that some patents encompassing future standards in SEPA payment methods will be owned by third-party suppliers rather than by European financial participants. This could make standardization more complex and increase the risk of hold-up problems. Concluding remarks and policy recommendations are collected in Section 5.

2. The Law and Economics of Intellectual Property in Financial Services and in Standard-Setting Organizations

2.1 Intellectual Property and Innovations in Financial Services

It is widely believed that innovations in the European financial services industry are protected primarily by copyrights and trade secrets. The definition of financial innovation is often interpreted narrowly to encompass new financial market instruments or structures, such as collateralized debt obligations or hedge funds (see, e.g., Tufano, 2003). Financial formulas and methods are thought to be beyond the scope of patentable subject matter in Europe. Indeed, Article 52 of the European Patent Convention is typically interpreted to prohibit patents on methods of doing business, including financial ones, as such. This stands in contrast to the practice observed not only in the U.S. (Hunt 2001, 2007) but also in other countries, including Australia, Japan, and South Korea.

But this view of the situation in Europe is not particularly accurate and is becoming less accurate every day. If we think about financial innovation more broadly, it certainly includes the inventions that enable new payment media to function. These would include

[9] The quotations are taken from the European Commission's and the European Central Bank's joint statement

features such as electronic record-keeping for bank and credit data, electronic communication and settlement of transactions, and their security solutions. They might also include enhancements of existing systems, such as improved ATM and ACH technologies, or mobile payments. Such inventions are surely technological in nature and hence have always been patentable in Europe and elsewhere.[10]

Moreover, while the European law, as it stands, makes obtaining a patent on a business method more difficult than in the U.S., it is hardly impossible. As the study by Wagner (2004) shows, business methods can be and are patented in Europe: the European Patent Office and national patent offices can legally award patents on financial and other business methods if these methods make a technical contribution; i.e., they add something new to a technical field. For example, an apparatus for carrying out a financial method is not excluded from patentability. Similarly, a financial method is not excluded from patentability if the invention is not an abstract method *as such* but relates to technical means, such as computer networks, to carry out the method and the invention solves a technical problem in a non-obvious way.

Skillful patent lawyers can draft patent applications on "softer" financial and business methods to emphasize their technical contribution. Sometimes a patent applicant adds a technical feature to a "softer" financial method to render it patentable.[11] In this respect writing applications for business methods patents in Europe today is similar to the way that software patents were drafted during the 1980s and early 1990s (Hunt 2001). Partially for these reasons, the European Patent Office recently changed its patent classification system to

---

May 4, 2006 (EC/ECB 2006) and the European Payment Council (2007).

[10] For example, the first U.S. patent on financial inventions was granted on March 19, 1799, for an invention for detecting counterfeit notes (USPTO 2000).

[11] A famous example is Amazon's “one-click” shopping method patent, which was granted in the U.S. in 1999 (USPTO patent no. 5960511). As it turned out, in Europe the invention was not patentable, but a one-click shopping method with a gift option was patentable (EPO patent no. EP0927945).

include a separate class (ECLA Class G06Q) for business methods with subclasses for payment schemes, architectures, or protocols (G06Q20); commerce, e.g., marketing, shopping, billing, auctions, or e-commerce (G06Q40); and financial methods, e.g., banking, investment, or tax processing (G06Q40).

The technical infrastructure of the payment industry is an extremely complex information technology system comprising a range of fields, including security technologies, data communications, and data management (Evans and Schmalensee 2005). Many advanced solutions in the aforementioned fields are indeed patented, given the intense use of patents in the closely related fields of ICT on which these solutions rely.

Since one goal of the SEPA process is to promote technologically advanced standards for the European payment industry, it is likely that these standards will encompass one or more patented technologies.[12] Some of these patents may be essential for SEPA-compliant systems. For other patents, as long as the patent claims are known in advance, SEPA's standards could be designed to avoid infringement. In either case, it is clear that intellectual property is likely to influence the design and implementation of SEPA standards and it would be best to take this into account early in the planning stages.

2.2. The Impact of Interoperability Standards in Network Industries

It has been recognized at least since the seminal article by Katz and Shapiro (1985) that in network industries, coordination through interoperability standards offers substantial economic benefits.[13] These include larger markets with greater economies of scale and the greater ability to sell complementary goods. Simply agreeing on a standard has social value, irrespective of whether it is the best one. At the level of an individual company, being

[12] See the joint the statement by the European Commission and the European Central Bank, May 4, 2006.

[13] A network industry is one in which the value of a good or service to a consumer is an increasing function of the number of other consumers that use the same or a compatible product.

included or excluded from use of an interoperability standard can play a pivotal role in the company's fortunes.

Standards can be divided into two distinct varieties: *de facto* and *de jure* standards. De facto standards are not promulgated by a particular body but arise spontaneously in open markets. De facto standards are common in many network industries. That is because network effects often lead to "market tipping," where most users adopt a dominant solution (as soon as one emerges) and most competing solutions disappear from the market. For example, Microsoft's operating system emerged as a de facto standard in the 1990s. IBM abandoned its competing operating system, and the market share of Apple Computers fell precipitously. Apple was able to recover only when it made its operating system more compatible with applications designed for the Microsoft operating system.

When a firm's technology becomes a de facto standard, it often obtains a dominant position in the industry and may enjoy supra-normal profits.[14] In addition, the firm may enjoy significant influence over the technological development in the market, and this may in turn lead to significant strategic advantages.[15] Of course, competition law can, and is, used to address questions about exercises of market power by the owners of a de facto standard.

Formal, i.e., de jure, standardization usually occurs when there is a perceived market failure that is preventing the emergence of a de facto standard (Blind et al. 2002). Although governments sometimes establish de jure interoperability standards, it is uncommon for these to be compulsory. Again, the market tipping effect for network industries typically makes such coercion unnecessary. But we will examine one counter-example — the mandatory

[14] But this is not always the case. Some standards may commoditize a firm's product, causing margins to shrink.

[15] For example, Intel's ability to control the development of the standard for the USB interface in order to facilitate the market for ever-faster micro processors.

technical standard for the global system for mobile communications (GSM) — later in this paper.[16]

The European Commission examined the question of mandatory standards in the early 1990s and recommended that they reflect a consensus based on the views of all interested parties and that such standards should be available to all interested parties subject to the mandatory obligations (European Commission 1992). In short, the commission strongly recommended the use of formalized standard setting in which all relevant parties could participate and an intellectual property policy that would ensure open access to the standard. Today, mandatory standards within the European Union framework are often used as common reference standards.

"Standard setting" is by definition a domain of de jure standardization, where a standard is explicitly specified by an SSO or among a group of market participants. Since the SEPA initiative is an example of de jure standardization, we focus on de jure standardization and especially on the challenges SSOs encounter. The standards developed under SEPA also fall into the category of mandatory technical standards (like GSM), since participation in the common market for the payment industry will require compliance with the standards developed under SEPA. These distinctions may be important when thinking about the role of intellectual property in the SEPA process.

2.3The Role of Intellectual Property in Standard Setting

While there is a tension between standardization and intellectual property, designing *optimal* intellectual property laws and standard-setting policies involves common objectives. Economic theory suggests that an optimal intellectual property law strikes a balance between the interests of inventors and creators on the one hand and the interests of consumers and

[16] The technical standard was mandatory in the sense that licenses for the radio frequencies used by the mobile

other users of innovations on the other hand (Nordhaus 1969). Similarly, the optimal standard-setting policy must balance the interests of innovators and users. In other words, a good intellectual property law and standard-setting policy both try to promote the use of innovations without stifling the incentive to make them in the first place.

Several factors explain the interaction between property rights and standard setting. First, intellectual property typically gives its owner an exclusive right to determine how it will be used. An SSO developing a standard that will rely on a patented technology must obtain the consent of the patent holder on terms that are agreeable to the likely users of the standard. In the process, the SSO may create substantial network effects that significantly increase the value of the patented technology, at least relative to an environment where no standard exists.[17] The question then is, who captures these benefits: the owners or the users of the technology and in what proportions?

Second, standard setting is designed to coordinate the adoption of particular technological solutions or processes. As a result, it tends to restrict the paths for future technological development and thus tends to concentrate the R&D efforts of active participants. Thus, over time, standardization is likely to increase the degree of technological overlap between firms. At the same time, so long as many firms remain active in their R&D, there can be a tendency for increased fragmentation of intellectual property rights (Rahnasto 2003, Ziedonis 2004, Kultti et al. 2006). This fragmentation of intellectual property rights, in turn, can complicate the implementation of better standards in the future.

Third, the standard-setting process is time-consuming and involves decisions subject to uncertainty and asymmetric information. It typically takes a long time to develop the consensus necessary to make the standard a commercial success. Some participants may have

networks were conditioned on the requirement that equipment using those frequencies must be compliant.

[17] As an example, Rambus was able to charge a royalty on patents included in an industry standard that was more than four times larger than the royalty charged for its other patents. See Patterson (2003).

private information about the efficacy of a particular solution and the current or future owners of the relevant technology are not always known. These characteristics of the standard-setting environment create at least the potential for strategic behavior for both users and owners of potentially relevant technologies. They also complicate the design of contracts or rules to prevent such behavior.

For example, disclosing a pending patent application for a technology being contemplated for a standard may not be in the strategic interest of the firm seeking the patent. Other firms may anticipate the outcome of the standard-setting process and apply for patents that would be infringed by users conforming to the standard.[18] With incomplete disclosure of pending applications, technology users may underestimate the costs of complying with the standard, increasing the likelihood that they will agree to adopt the standard.

If compliance with the standard necessitates making significant fixed investments at an early stage, these participants may be "locked in" to the standard. In other words, firms may object to paying royalties that are higher than they contemplated but choose to do so because the alternative would require making additional fixed investments that are even more costly. Understanding this, the owner of the intellectual property may insist on higher royalties. This is the basis for a potential "hold-up" problem (see, e.g., Williamson 1985, Hart 1995, Shapiro 2006, Lemley and Shapiro 2007). Indeed, the risk of a potential hold-up may dissuade participants from adopting the standard in the first place. That is why SSOs work hard to mitigate such risks.

The potential for strategic use of intellectual property is arguably one of the most challenging problems confronted by SSOs. This risk was described in academic papers decades ago, but a number of concrete examples have recently materialized (Iversen 1999).

[18] In the U.S. this strategy is facilitated by the use of *continuations*, which offer applicants a good deal of flexibility to amend their claims as the parameters of a proposed standard become more clear (Lemley 2007). The USPTO recently proposed a rule to limit continuations.

These include disputes arising from the GSM standard (Blind et al. 2002), recipes for clean burning gasoline (Mueller 2002), PC architecture (Shapiro 2001), and standards for computer memory chips, digital images, and standards for HTML specifications (Chiao et al. 2006, Soininen, 2007).

The economic theory suggests that the ability to avoid hold-ups in standard setting hinges on the disclosure and licensing policies adopted by SSOs (Shapiro 2001, Lemley 2002, and Chiao et al 2006). In the appendix we present a simple model of a monopoly SSO that summarizes the main results from the literature that are important for the case of SEPA. In this model, the SSO has two margins it can influence. The first is the "quality" of the standard in the sense that a better standard will attract more users and hence generate larger network effects. These are the rents the SSO can use to induce users and IP owners to participate. The second margin is the terms by which essential intellectual property is obtained from its owners. The model also takes into account the relative bargaining power of the relevant constituents—users of the standard and the IP owners who provide at least some of the technology that makes the standard attractive in the first place.

Analysis of the model shows that, all else equal, an SSO where users of the standard (rather than owners of the relevant technology) have relatively more bargaining power will choose lower royalty rates and more open (e.g., non-discriminatory) licensing terms. But SSOs generally seek to establish standards of the highest quality, in other words, ones that contribute to products and services that consumers really value. In that case, the SSO will be able to offer better terms to IP holders, since the large network effects will attract many users despite the higher prices implied by higher royalties. Indeed, if the high quality of the standard results from the contribution of high-value intellectual property, the SSO may have an incentive to offer attractive terms in order to obtain it

Chiao et al. (2006) also study disclosure policies adopted by SSOs. In practice, a disclosure policy means that SSOs can require their participants to notify others of the intellectual property that is relevant to a given standardization effort. This may conflict with the interests of intellectual property owners and so it can be difficult to form a consensus in favor of a strong disclosure policy. In addition, SSOs have no legal force against third parties who are not participants in the standard-setting process. But this raises a related problem that SSOs encounter: the success of a standard depends on the ability to attract broad participation by parties who own technologies relevant to the standard. The disclosure and licensing policies of the SSO are likely to influence the willingness of these stakeholders to participate.

Outright hold-ups are less common than disputes over the terms of licensing intellectual property relevant to a standard. Often SSOs require patents to be licensed under fair, reasonable, and non-discriminatory terms ("FRAND or RAND terms"). In other words, SSOs usually seek a system of cross-licenses or royalty payments that are not too costly for users of the standards and which apply equally to all potential users. SSOs typically eschew *exclusive* licenses, which might limit the number of potential users according to the terms specified by the patent owners. To the extent that an SSO is successful in obtaining licenses on RAND terms, the result is a standard that is more "open," since ownership of the underlying technology is not a precondition for participating in the standard.

But contracts in the standard-setting environment are almost inherently incomplete. Views on what constitutes RAND terms can vary substantially. Furthermore, the enforceability of such terms can prove to be difficult: who can file a complaint and under what regulations? Against whom should the complaint be filed if the patent has been assigned to a new owner who has not participated in the standard setting? Nevertheless, the scope for disagreements is likely to be smaller if the SSO has a well-crafted policy on intellectual property.

Even where an SSO has no intellectual property policy, other law and regulation may constrain strategic use of intellectual property in standard setting. For example, the U.S. patent law recognizes the *doctrine of estoppel* and the *doctrine of laches*, which aim at punishing a patent holder who delayed enforcing her patent (Carpentier 2006). The *doctrine of "implied license"* in turn covers situations when a firm discloses its patent portfolio but then fails to comply with the restrictions on licensing with which it had concurred (Lemley 2002). In a recent decision, two patents owned by Qualcomm were found unenforceable due to waiver when a jury determined that the company had participated in the JVT standard-setting body without disclosing the pending patents.[19]

In the U.S., claims under antitrust law have usually been unsuccessful in cases involving allegations of patent hold-ups in standardization (Mueller 2002). Suits alleging unfair or deceptive trade practices have also been generally unsuccessful in these cases. But there are exceptions, including the recent Federal Trade Commission (FTC) decision in the Rambus case, which involved standard setting for computer memory chips at JEDEC.[20] Other potential remedies against patent hold-ups in standardization in the U.S. include fraud,[21] compulsory licensing, eminent domain, and patent misuse doctrine (Mueller 2002).

There is no case law in Europe related to patent exploitation in standard setting, and this limits the repertoire of legal remedies available for users and SSOs in instances of hold-ups. In the domain of competition law, in the recent IMS Health case (following the landmark

[19] See *Qualcomm Inc., v. Broadcom Corp*. 05-CV-1958-B (2007), decided by the U.S. District Court for the Southern District of California. This case arose because Qualcomm sued Broadcom for infringement of the patents.

[20] The FTC is requiring that Rambus offer non-discriminatory licenses and has specified the maximum royalties that may be charged. See the decision on remedies on February 5, 2007 at http://www.ftc.gov/os/adjpro/d9302/ (accessed February 20, 2007). The JEDEC Solid State Technology Association (once known as the Joint Electron Device Engineering Council) is the semiconductor engineering standardization body of the Electronic Industries Alliance (EIA), a trade association that represents all areas of the electronics industry. See www.jedec.org.

[21] See *Rambus Inc. v. Infineon Tech., Inc.* CIV.A. No. 3:00cv524 (E.D. Va. May 9, 2001)

case of Magill[22]) the European Court of Justice concluded that in exceptional circumstances a dominant firm may be forced to license its intellectual property if it is attempting to monopolize a downstream market by refusing to license.[23] The prerequisite of market power, however, limits its applicability in standard setting, since companies holding essential patents are not automatically assumed to enjoy market power.[24]

At present, there are no decisions involving the application of EC competition law to disputes over patents in the context of standard setting, but this could change in the near future: Nokia, Ericsson, and several other mobile wireless technology companies have filed a complaint against Qualcomm's licensing practices with the European Commission. In particular, they allege Qualcomm is not complying with an agreement to license certain patents essential to the WCDMA standard under RAND terms (Soininen 2007).[25] And in an unrelated decision, the European Commission required that Microsoft disclose, again on RAND terms, information necessary to ensuring the interoperability of certain kinds of third-party software applications with its operating systems.[26].

In summary, intellectual property has long been important to financial services if for no other reason than it is embedded in the technology it uses. More recently, financial services firms have been acquiring patent portfolios of their own. The financial services sector is also standards intensive and all the more so as it has become increasingly reliant on ICT. For a variety of reasons, adoption of standards increases the value of products and services (e.g., network effects, scale economies, liquidity). But a high-quality standard is

[22] Decision ECJ 4/6/95

[23] Case C-418/01, IMS Health v. NDC Health

[24] But some scholars have argued in favor of such a presumption (Näcke 1995).

[25] WCDMA stands for Wideband Code Division Multiple Access, a feature of next-generation (3G) mobile networks.

[26] COMP/C-3/37.792 (2004)

likely to rely on patented technology owned by a number of financial institutions and quite likely firms located outside the industry.

A successful standard-setting process is a careful balancing act, coordinating both users and producers of the relevant technology. The intellectual property policy of an SSO typically requires the disclosure of any patents on technologies proposed for adoption in the standard and may also specify the licensing terms to be used by participants. These terms should be sufficiently generous to owners of the technology to induce them to disclose their patents and, quite often, to agree to licensing them on non-discriminatory terms. They should also be adequate to reward firms for their risky investments in R&D. On the other hand, excessively high royalty payments or other licensing restrictions may discourage potential users of the technology from adopting the standard.

While standard setting can significantly increase the size and value of a market, it can also create opportunities for hold-up problems. This can occur when adopting a standard entails significant irreversible investments by participants, which essentially locks them into a particular set of technologies. An opportunistic owner of a patented technology included in the standard may be able to exploit this lock-in effect to extract supra-normal rents from adopters of the standard. This is a difficult risk to mitigate, since most standard-setting arrangements lack the power to compel participation by technology providers or to dictate the terms of licenses on patents that were not voluntarily pledged to the standard during the deliberations.

Because of these risks, it is important that standard-setting organizations establish a consensus that enjoys the considerable good will of both users and producers and of patented technologies. Establishing a clear intellectual property policy is a necessary ingredient in building such a consensus.

3. The Experience of Intellectual Property Rights in Standard Setting in Network and Financial Services Industries

3.1. The Communications Industry

Network industries, where standardization has played a pivotal role in the development of the market, include electronics, computing, and telecommunications. All of these industries require interoperability. In the field of electronics and computing, public authorities have generally refrained from de jure standardization, leaving companies and company alliances to compete in the formation of the industry standard.[27] In striking contrast, in the telecommunications industry, public authorities have actively participated in standard setting, using formal organizations. The history of the GSM standard serves as an example of the challenges posed by intellectual property rights in standard setting. Like the SEPA process, it involves European public authorities promoting a European interoperability standard for a network industry dominated by national incumbents.

In Europe, at least, a reliance on de jure standard setting in telecommunications was due in part to the industrial organization of the industry. Until recent years, the European telecommunications market was dominated by national monopolies. These incumbents had to ensure conformity and coordination across their own networks, but they had little incentive to increase the interoperability of their networks. In the absence of robust private competition that could have created (de facto) standards, the European Conference of Postal and Telecommunications Administrations (CEPT) was established in 1959. Its original members were the monopoly-holding postal and telecommunications administrations. CEPT's activities included cooperation on commercial, operational, regulatory, and technical standardization issues.

The gradual deregulation of European telecommunications, together with the introduction of new digital technologies, led to a restructuring of the standard-setting process for the industry.[28] CEPT was replaced by a new organization, the European Telecommunications Standards Institute (ETSI). One reason for the establishment of ETSI was the perception that CEPT, which accepted only network operators as members, could not accommodate all of the relevant new actors in the market (Cunningham 2005). There was also a concern that strategic use of intellectual property in standard setting might impede liberalization of the market (Prins and Schiessl, 1993).

The responsibility for the GSM standard was transferred to ETSI in 1988. By then it was clear that several patented technologies were essential for the implementation of the GSM standard. Motorola owned the largest number of these patents (Bekkers et al. 2002). Other patent holders indicated their willingness to license under RAND terms, but Motorola declined. It also continued to patent GSM-related technology extensively.

One plausible explanation for Motorola's different strategy was likely its experience in the U.S., where patent litigation was much more common in the industry. In contrast, Bekkers et al. (2002) describe how the European companies involved in the standardization process believed that there was a "gentleman's agreement" not to patent their contributions to the standard. A similar convention had been used successfully in the implementation of the prevailing NMT standard in the Nordic countries. Motorola also suspected that, as a U.S. company, it would receive few contracts to produce equipment for the European market and thus expected patent licensing to become its main source of income from its GSM technology.

---

[27] Famous examples include the video cassette recorder (VCR), the compact disk (CD-ROM), and many different aspects of the design of personal computers (Grindley 1995).

[28] For an early proposal for deregulation, see the European Commission (1987). For subsequent developments, see Nihoul and Rodford (2004).

Motorola was able to license its GSM patents, but the practical result was not an open standard. By the end of 1993 Motorola had entered into cross-licensing agreements with four companies: Siemens, Alcatel, Nokia, and Ericsson. For several other companies Motorola's patents created a barrier for market entry. For example, a Danish manufacturer Dancall and all Japanese suppliers were left out of the market because the license fees for necessary patents were too high (Bekkers et al. 2002).[29]

A separate dispute emerged in the mid-1990s when the company InterDigital began to assert a number of its patents after the GSM standard had already been widely adopted. In litigation in the U.S., nearly all of InterDigital's patent claims were eventually rejected on obviousness grounds and no infringement was found for the remaining ones.[30] Nevertheless, the firm had been successful in obtaining licensing income from these patents (Bekkers et al. 2006).

ETSI attempted to mitigate these conflicts with limited success, since it developed an intellectual property policy only after the problems had become apparent. The first draft of the policy was forwarded by ETSI's Intellectual Property Right Committee in 1989, but an actual policy was put in place only in March 1993, only to be replaced by a new policy in November 1994. The original proposal called for compulsory licensing of essential intellectual property, but opposition from U.S. companies and authorities forced ETSI to adopt a more modest policy simply requiring the disclosure of essential patents (Iversen 1999).[31]

[29] It appears that these companies were at a disadvantage because they could not offer licenses to patents that Motorola found sufficeintly appealing.

[30] See *Motorola, Inc. v. InterDigital Technology Corp*., 121 F.3d 1461 (1997). InterDigital has been more successful in obtaining licensing revenues from other patents related to GSM technology.

[31] ETSI's intellectual property right policy has been evolving since 1994 and has been subject to intense debate ever since. In 2005 the European Commission examined ETSI's new intellectual property right policy in light of competition regulations and concluded that the policy is in accordance with the regulations and underlined the importance of avoiding "patent ambushes."

There is little doubt that the GSM standard has been highly a successful one. But the success of its IP policy was, at best, qualified. ETSI's goal was to establish an open, but not a royalty-free, standard available for all parties to use. This objective was not realized, since many companies were unable to obtain a license for the essential patents. In addition, some firms were exposed to potential liability for infringement after making substantial commitments to the GSM standard.

3.2 Financial Services in the U.S.

Seven years after the *State Street* decision, American financial services firms are adapting to the existence of business method patents. Many firms have added in-house patent counsel, developed internal processes for documenting their own innovations, and are regularly filing for patents. Financial patents are now commonplace in the U.S. At least 1500 patents are now granted for financial innovations annually (Figure 1).[32] The number of applications for new business methods and financial patents is approaching 10,000 a year (Figure 2). The majority of these patents are obtained by firms in industries outside financial services. Many are obtained by computer and electronics manufacturers that are important suppliers of information technology to the industry.

Some firms have aggressively asserted their patents and have had some notable successes in obtaining licensing revenues. Demand letters are regularly sent, and dozens of financial institutions, including several Federal Reserve Banks, have been sued (Decker and Matthews 2007). A number of financial institutions have reached settlements, with significant licensing payments changing hands.

[32] Figure 1 presents two counts of these patents. The broader definition counts all patents classified as computer-implemented business methods, while the more narrow one counts only patents in sub-classes clearly related to financial services.

Lerner (2006) presents some preliminary evidence on the litigation experience of U.S. financial patents. He finds that they are litigated at a rate 27 times higher than for U.S. patents as a whole. According to Lerner, litigated financial patents tend to be ones granted to individuals or smaller firms. But these owners are often not the plaintiffs in these cases; instead, the suits tend to be initiated by patent-holding companies. Financial patents acquired by foreigners are much less likely to be litigated. The defendants in these suits are typically larger financial firms or exchanges.

There are several notable examples of successful patent-licensing campaigns affecting U.S. financial services firms. The first is Ronald A. Katz Technology Licensing, which, among other things, owns a portfolio of patents related to the technology used by telephone call centers. To date, Katz has struck approximately 150 licensing agreements. These include many large financial institutions and their processors, such as American Express, Bank of America, Capital One, Equifax, First Data Corporation, Merrill Lynch, Nationwide, OppenheimerFunds, Prudential Financial, T. Rowe Price, Vanguard Group, Wachovia Corporation, and Wells Fargo.

A second leading example is that of DataTreasury Corporation, which owns at least six patents related to creating, processing, and storing digital images of paper checks. Check imaging and exchange technologies are especially important in the U.S. at this time. Banks are in the process of eliminating the physical transportation of paper checks, which is generally required under the traditional law for these financial instruments. The Check Clearing for the 21st Century Act of 2003 permits banks to process check transactions without physically presenting the original check to the issuing bank, so long as certain

standards are satisfied.[33] Financial institutions are currently making large information technology investments in order to take advantage of the efficiencies afforded by this reform.

In January 2006, DataTreasury sued 57 banks and other companies that participate in the check-image clearing process.[34] It has also sued the Clearing House Payments Co., which operates a check-image exchange network. In earlier years, it had sued a number of institutions and obtained licensing agreements with firms such as JP Morgan Chase, Merrill Lynch, and ATM manufacturer NCR Corporation. More recently, the ATM manufacturer Diebold struck a licensing agreement with DataTreasury, in part to assuage bank customers who have grown increasingly concerned about their potential liability for patent infringement Bills (2007).

But the DataTreasury patents are not without controversy. In December 2006, the patent office invalidated 43 patent claims in a re-examination requested by a defendant firm—First Data Corporation. This is only the first step in a process that can take several years, but it is reminiscent of the patent dispute between Research in Motion (RIM), developer of the Blackberry, and NTP, a patent-holding company. In that case, RIM agreed to a $612 million settlement under threat of a court injunction after being found to infringe several NTP patents. Yet, prior to the announcement of this settlement, a patent office re-examination requested by RIM resulted in the preliminary rejection of every NTP patent relevant to the case.

In another case, LML Payment Systems sued First Data, U.S. Bancorp subsidiary Nova, and the Electronic Clearing House for infringing its patent on a process for converting checks into ACH transactions at the point of sale. The firms reached a settlement in 2006

[33] Public Law 108-100, 12 U.S.C. 5001. If the issuing bank desires, it may insist on presentment of a "substitute" check, an image of the original carrying certain information and satisfying standards set by the Board of Governors of the Federal Reserve System. Substitute checks can be sent electronically and then printed. Substitute checks are the legal equivalent of the original check.

[34] *DataTreasury Corporation v. Wells Fargo & Co*., E.D. Texas, No. No. 2:06-cv-00072-DF,

Bills (2006). A number of other suits have involved several American financial exchanges and other firms developing advanced systems for trading stocks, bonds, and derivatives (Hunt 2007).

To summarize, financial patents are now commonplace in the U.S. Some of these patents are being litigated and significant licensing revenues generated. There is some preliminary evidence that patents in this sector are relatively more prone to litigation than patents in general. The typical plaintiff is not a financial services firm, but the typical defendant is. There are already examples of litigation related to payment innovations and in particular ones that require significant coordination in order to ensure interoperability (e.g., check imaging).

4. Setting Standards for SEPA: The Role of Intellectual Property

Since the introduction of euro banknotes and coins in 2002, citizens of the euro area have been able to make cash payments within all 13 countries from a single purse, as easily as with the previous national banknotes and coins. Yet, what is now reality for cash payments remains an aspiration for cashless payments, since these retail payment methods continue to vary from one country to another. Indeed, removing the national currencies from circulation proved to be a much easier task than establishing the legal, technical, and economic infrastructure required for a modern, efficient cross-national consumer electronic payment network.

But efforts to create a fully unified payment area for the euro countries, i.e., SEPA, have intensified over recent years (see, e.g., Kemppainen and Salo 2006). A major step toward SEPA was Regulation 2560/2001 on cross-border payments in the euro area, adopted in December 2001. The regulation eliminated the difference in price between cross-border and national payments. After adoption of the regulation, the payment service provider sector (mainly the banking sector) established an SSO, the European Payments Council (EPC), to

foster the development of SEPA. In 2002, the EPC published a white paper outlining a number of steps toward attaining SEPA. EPC expressed its conviction that a critical mass of transactions will have migrated to the SEPA payment instruments by 2010.

Another step forward will be the approval of the Directive on Payment Services (PSD) that will, among other things, establish licensing requirements for new payment institutions (which need not be banks) and provides for certain protections for consumers. Under the proposed PSD, these new payment institutions would enjoy certain rights of access to payment systems.[35] But those provisions do not address the question of access to the relevant intellectual property or technology.

But there are diverging views on how and when the goal of a unified (electronic) euro payment area will be achieved. Despite some progress in the preparatory work, the fruition of SEPA appears to be a long way off. In particular, there is still no harmonization of standards in cashless retail payments, which remain predominantly based on national payment schemes, and consequently, national retail payment clearing and settlement infrastructures remain segmented by country. While many national retail payment systems function efficiently, this is not the case in cross-border retail payment systems. Improved cross-border payment systems would contribute to the process of deepening financial integration in the whole euro area. Some changes are required even in the most efficient national systems of today, since, by nature, the whole process is dynamic and forward-looking.

As made clear in Sections 2-3, we think that a crucial ingredient for the successful implementation of SEPA is policies that will assist in the management of any intellectual property essential to the interoperability standards adopted. To summarize the implications of the economic theory, we start with the observation that the EPC's members consist exclusively of banks and banks are service providers in the retail market of payment media.

[35] See Article 23 of the PSD directive proposal.

The basic economics, as outlined in Section 2.2, suggests that an SSO controlled by service providers without a strong intellectual property portfolio of their own have an incentive to implement an explicit but tough intellectual property policy toward technology vendors.

But the GSM experience suggests a number of obvious concerns about the SEPA process. In that case, while involvement by public authorities prevented a standards war between two competing industry alliances, it did not succeed in establishing a truly open standard, since not all participants were able to license the essential patents. Public authorities have so far been unwilling to intervene in the standardization process by requiring compulsory licensing or other legal instruments.[36] Second, European companies can be vulnerable to the foreign companies conditioned by a different culture of intellectual property.

Also, agreeing on effective intellectual property policies in standard setting is not easy. Since compliance with an SSO's intellectual property policy is almost always voluntary, these policies must be designed in order to obtain the consent of the relevant patent owners. The design of such policies is further complicated by the possibility that patents essential to compliance with the standard may be obtained by third parties who were not participants in the standard-setting process. In any case, the GSM experience underlies the importance of designing an intellectual property policy early in the process rather than late, before the intellectual property problems become acute.

The experience of the U.S. financial services sector suggests there are risks of potential hold-up problems and litigation is not uncommon. It would be particularly disappointing if costly patent disputes retard the migration away from more costly paper-based systems and toward more efficient forms of electronic payments. It is already apparent

[36] Mueller (2002) proposes that in government-mandated technology standards, entities holding patent rights in the subject matter should be required to license all users at reasonable commercial terms. Furthermore, in the case where the patent owner declines to comply, the government should exercise the principle of eminent domain, i.e., the state's right under U.S. law in certain cases to seize private property for public uses.

that the extension of patentable subject matter to financial methods has induced changes in the management of intellectual property in the U.S. financial services sector. In particular, many large firms have added IP counsel to their in-house legal staff, and they are now regularly applying for their own patents.

There are also lessons common to both examples. In each instance, patentable inventions in ICT play an important role, and this suggests that a given standard may implicate dozens or even hundreds of patents. Similarly, in each instance, a significant share of the intellectual property is owned by firms in other industries—e.g., by technology vendors serving the downstream industry. In addition, the ownership of ICT patents is cosmopolitan—licensing negotiations could involve firms headquartered around the world. Finally, while financial instruments themselves tend to be discrete, the systems and processes that make them work typically consist of many components (software and hardware) that are the product of cumulative innovation. It can be difficult to determine the contribution of a single patented component to the total value created by these new systems. Each of these factors suggests that obtaining the mutual consent of the essential parties may be complicated and time-consuming.

It is thus rather surprising to observe that the EPC has yet to publicly articulate an intellectual property policy.[37] The EPC, the European Commission, and the European Central Bank have clearly indicated that the objective is to create an open standard.[38] For example, the opening paragraphs of the Eurosystem's vision statement (SEPA, The Singe Euro Payment Area: An Introduction, 26.10.2006) states that "by creating open and common

[37] The EPC's website (www.europeanpaymentscouncil.eu), visited frequently from June 2006 to March 2007, includes no mention of an intellectual property policy nor do the experts on SEPA at the Bank of Finland we have interviewed have knowledge that the EPC would have an intellectual property policy.

[38] The precise meaning of open standard is not specified in the context of SEPA. It is usually defined as a standard fulfilling the following criteria: persons who are directly and materially affected by the activity in question are free to participate in the standard setting, and the standard is available for anyone to use (Caplan 2003).

standards that overcome technological and commercial barriers and by fostering competition and improving payments services, SEPA will lead to a more efficient and competitive payments industry."

But other SEPA documents suggest the intention to have the intellectual property related to SEPA payment schemes owned by a legal body established by the EPC:

> "SEPA payment schemes/frameworks should be under the governance of a multi-scheme or a single scheme not-for-profit bank-owned vehicle to be further defined. Such vehicle(s) should be open to all banks and would have the *role of safeguarding intellectual property* and providing rule-making and change management procedures." (EPC Roadmap 2004-2010, p. 10, italics added).

In our view the idea of a bank-owned and -controlled organization owning all intellectual property related to the payment schemes is not realistic, since a significant share of the relevant IP is likely to be owned by companies that are not financial institutions.[39] And while the question has not been expressly discussed in any of the SEPA material we have consulted, some documents seem to suggest that the objective is to develop a standard unencumbered by any patent royalty payments. But sending such a message to potential patent holders could be a road to disaster, since it would discourage them from disclosing relevant patents to the EPC.

The apparent lack of attention to intellectual property in the SEPA process is somewhat puzzling, especially given the European Commission's prior experience with these issues in matters involving standardization. We can think of four potential explanations for the omission, but none are convincing. The first may be that EPC assumes that SEPA relies on technologies not covered by patents. It is true that many of the technologies envisioned under SEPA are already in use. However, it would be unwise to assume this implies the technology does not enjoy at least some patent protection. Given the number of patents in the

financial sector and the relevant ICT sectors, such a conclusion should only follow from a thorough analysis of the adopted technologies. It does not appear that such an analysis has been undertaken.

A second explanation is that the banks, or their associations, do not own essential intellectual property or do not think they will own such an intellectual property in the future.[40] But, if this were the case, it would be in the EPC's interest to make an explicit and strict intellectual property policy obligating extensive disclosures and free or RAND licenses for the relevant patents, perhaps after inviting major technology manufacturers to participate in the standard setting.

The third explanation is that the EPC has an intellectual property policy but it is not public. If this were the case, the EPC could plan to have a tough intellectual property policy toward patent holders but is not willing to announce it at this stage when political deliberations about SEPA are ongoing. An announcement now could induce an outcry from the public and technology manufacturers calling for a more lenient intellectual property policy.

Finally, it is possible that the issue of intellectual property policy has simply been neglected. Given that patenting in the European financial services industry is a relatively new phenomenon, it is possible that the intellectual property policy design has not been a priority of the EPC or the public authorities. This also seems implausible, but nonetheless, it is our preferred explanation.

The ultimate explanation for the absence of an intellectual property policy does not matter, however. The fact that there is no public intellectual property policy is worrying in

[39] It is possible that this is merely a reference to ownership of trademarks and not other intellectual property. But this point is not elaborated in other EPC documentation.

[40] In the communications industry, for example, the essential intellectual property is not always owned by telecommunications operators (service providers) but rather by technology vendors such as manufacturers of network equipment and handsets.

light of the examples from the previous section. It is possible that before or after SEPA enters into force, a party will emerge claiming to own an essential intellectual property to an interoperability standard that is a part of SEPA.

Although the design of an intellectual property policy for the EPC is beyond the scope of this study, we briefly summarize the key lessons from economic theory and empirical evidence from other network industries. The ultimate challenge of an SSO is to create a policy that simultaneously encourages innovation, disclosure of relevant patents, and participation in the standard setting while ensuring access to the relevant intellectual property under acceptable terms, usually RAND terms. To reach this objective, SSOs should implement policies that would encourage disclosure of relevant intellectual property and participation in the standard setting. This is achieved through guaranteeing a reasonable remuneration for the patents and participation through attractive licensing schemes or other licensing practices. It appears that the EPC's approach has been to the contrary: the EPC documentation suggests a royalty-free standard owned by the EPC-established entity. No wonder patent holders have not lined up for the standard-setting process.

5. Conclusion

In this article we make three points. First, we argue that innovations related to financial services and payment media can be patented in Europe, although not as easily as in the U.S. and other countries. Second, we review the law and economics literature and the actual experience of the telecommunications and the U.S. financial services industries. This examination suggests that a well-designed intellectual property policy is critical for successful standard setting in network industries such as payment media. Finally, we review the intellectual property policy of the EPC, SEPA's standard-setting body. To our surprise, we find that they have none.

While it is difficult to imagine a convincing reason for the absence of the intellectual property concerns in the SEPA project, one explanation might be that the European incumbents and policymakers in the financial services sector are relatively inexperienced in intellectual property management. Such a situation prevailed in the GSM standardization process in the communications industry. The GSM experience taught the European Commission and the European communications business and public authorities a lesson about the relevance of intellectual property management. We hope history does not repeat itself in the SEPA project.

References

Bekkers, R., Iversen, E and Blind, K. (2006) "Patent Pools and Non-assertion Agreements: Coordination Mechanisms for Multi-party IPR Holders in Standardization," Paper for the EASST 2006 Conference, Lausanne, Switzerland, August 23-26 2006.

Bekkers, R., Verspagen, B., and Smits, J. (2002) "Intellectual Property Rights and Standardization: The Case of GSM," *Telecommunications Policy*, Vol. 26, pp. 171-188.

Bessen, J., and Hunt, R.M. (2007) "An Empirical Look at Software Patents," *Journal of Economics and Management Strategy*, Vol. 16, pp. 157–189.

Bills, S. (2006) "First Data, 2 Others Settle with Holder of POP Patent," *American Banker*, Vol. 12, (April 5).

Bills, S. (2007) "Diebold Bids to Lift Image ATMs with Patent Deal," *American Banker*, Vol. 13, (January 24).

Blind, K., R. Bierhals, N. Thumm, K. Hossain, J. Sillwood, E. Iverser, R. van Reekum, and B. Rixius (2002) "Study on the Interaction between Standardisation and Intellectual Property Rights," *EC Contract No. G6MA-CT-2000-02001.*

Bolt, W. and D. Humphrey (2007) “Payment Network Scale Economies, SEPA, and Cash Replacement,” mimeo, Florida State University.

Caplan, P. (2003) "Patents and Open Standards," White Paper prepared for the National Information Standards Organization.

Carpentier, X. (2006) *Essays on the Law and Economics of Intellectual Property*, Helsinki School of Economics, Acta Universitatis Oeconomicae Helsingiensis, A-282.

Chiao, B., Lerner, J., and Tirole, J. (2006) "The Rules of Standard Setting Organizations: An Empirical Analysis," forthcoming in *Rand Journal of Economics.*

Council of the European Union (2007) “Proposal for a Directive of the European Parliament and of the Council on Payment Services in The Internal Market and Amending Directives 97/7/EC, 2000/12/EC and 2002/65/EC – Outcome of the European Parliament's First Reading,” available at http://register.consilium.europa.eu/pdf/en/07/st08/st08718.en07.pdf.

Cunningham, A. (2005) "Telecommunications, Intellectual Property, and Standards," in Walden, I., and Angel, J. (eds.) *Tele-communications Law and Regulation*, Oxford University Press.

Decker, S. and Matthews, S. (2007) “Fiserv, Federal Reserve Banks Face Fraud Patent Suit,” *Bloomberg News Wire* (January 23).

England, A. (2006) "SEPA – An Update on Its Progress and Implications for Profitability in the European Payments Business," forthcoming in *Journal of Payment Strategy & Systems*.

European Commission (1987) “Towards a Dynamic European Economy - Green Paper on the Development of the Common Market for Telecommunication Services and Equipment,” COM(87)290final.

European Commission (1992) "Intellectual Property Rights and Standardization," Communication from the Commission COM (92)445.

European Commission (2006) “Consultative Paper on SEPA Incentives,” European Commission Internal Market and Services DG, February 13, 2006.

European Commission and the European Central Bank (2006) “Single Euro Payments Area,” Joint Statement May 4, 2006. Available at http://www.ecb.int/press/pr/date/2006/html/pr0605041.en.html

European Payment Council (2007): “Making SEPA a Reality – Implementing the Single Euro Payments Area,” available at http://www.europeanpaymentscouncil.eu/documents/EPC066_06%20SEPA%20Overview%20v1.4.pdf.

Evans, D. S. and Schmalensee, R. (2005) *Paying with Plastic* (2nd Edition), MIT Press, Cambridge, MA.

Frankel, W.S. and White, L. J. (2004) "Empirical Studies of Financial Innovations: Lots of Talk, Little Action?" *Journal of Economic Literature*, Vol. 47, pp.116-144.

Grindley, Peter (1995) *Standards, Strategy and Policy*. Oxford University Press.

Hart, O. (1995) *Firm, Contracts, and Financial Structure*, Oxford, Oxford University Press.

Hunt, R. M. (2001) "You Can Patent That? Are Patents on Computer Programs and Business Methods Good for the New Economy?" Federal Reserve Bank of Philadelphia *Business Review* 2001, pp. 5-15.

Hunt, R. M. (2007) “Business Method Patents for U.S. Financial Services,” Federal Reserve Bank of Philadelphia Working Paper 07-21.

Iversen, E. J. (1999) “Standardization and Intellectual Property Rights: ETSI’s Controversial Search for New IPR Procedures," Proceedings of the 1999 SIIT conference, Aachen, Germany.

Katz, M. and Shapiro, C. (1985) "Network Externalities, Competition and Compatibility," *American Economic Review*, Vol. 75, pp. 424-44.

Katz, M and Shapiro, C. (1994) "Systems Competition and Network Effects,” *Journal of Economic Perspectives*, Vol. 8, pp. 93-115.

Kemppainen, K. and Salo, S. (2006) "Promoting Integration of European Retail Payment Systems: Role of Competition, Cooperation and Regulation," in "The Adoption of the Euro, Choice of Currency Regime and Integration of Payment Systems,” SUERF Studies 2006/5.

Kultti, K., Takalo, T. and Toikka, J. (2006) "Simultaneous Model of Innovation, Secrecy, and Patent Policy," *American Economic Review, Papers & Proceedings*, Vol. 96, pp. 82-86.

Lemley, M. A. (2002) “Intellectual Property Rights and Standard Setting Organizations,” *California Law Review*, Vol. 90, pp. 1889-1980.

Lemley, M. A. (2007) “Ten Things to Do about Patent Hold-up of Standards (and One Not to),” *Boston College Law Review*, Vol. 48, pp. 149-68.

Lemley, M. A. and C. Shapiro (2007) “Patent Hold-Up and Royalty Stacking,” mimeo University of California at Berkeley.

Lerner, J. (2002) “Where Does State Street Lead? A First Look at Finance Patents 1971-2000,” *Journal of Finance*, Vol. 57, pp. 901-930.

Lerner, J. (2006) “Trolls on State Street? An Analysis of Financial Litigation, 1976-2005,” unpublished manuscript, Harvard University.

Merges, R. P. (2003) "The Uninvited Guest: Patents of Wall Street," *Federal Reserve Bank of Atlanta Economic Review*, Vol. 88, pp. 1-14.

Mueller, J.M. (2002) "Patent Misuse Through the Capture of Industry Standards," *Berkeley Technology Journal* 17, pp. 623-84.

Näcke, T. (1995) "Abuse of Dominant Positions," paper presented at the Symposium on Competition Policy in a Global Economy (Taipei) available at http://ec.europa.eu/comm/competition/speeches/text/sp1995_025_en.html

Nihoul, P. and Rodford, P. (2004) *EU Electronic Communications Law. Competition and Regulation in the European Telecommunications Market*, Oxford University Press, Oxford.

Nordhaus, W. (1969) "Invention, Growth, and Welfare: A Theoretical Treatment of Technological Change," MIT Press, Cambridge, MA.

Park, K.-S., Kim Y.-T., and Sohn, H. (1998) "Disputes over the Intellectual Property Rights of Telecommunications Standardization," *ETRI Journal*, Vol. 20, March 1998.

Patterson, M. R. (2003) "Antitrust and the Costs of Standard Setting," *Minnesota Law Review*, Vol. 87, pp. 1995-2017

Prins, C., and Schiessl, M. (1993) "The New European Telecommunications Standards Policy: Conflicts between Standardization and Intellectual Property Rights," EIPR, Vol. 8, pp. 263-266.

Rahnasto, I. (2003) *Intellectual Property Rights, External Effects, and Anti-trust Law: Leveraging IPRs in the Communications Industry*, Oxford University Press, Oxford.

Schmiedel, H. (2007) "The Economic Impact of the Single Euro Payments Area," European Central Bank Occasional Paper No. 71.

Shapiro, C. (2001) "Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting," in Jaffe, A., Lerner, J. and Stern, S. (eds.) *Innovation Policy and the Economy*, Vol.1, pp. 119-150, MIT Press, Cambridge, MA.

Shapiro, C. (2006) "Injunctions, Hold-Up, and Patent Royalties," mimeo, University of California at Berkeley.

Soininen, A. (2007) "Patents in the Information and Communications Technology Sector – Development Trends, Problem Areas and Pressures for Change," Acta Universitatis Lappeenrantaensis 262. Lappeenranta, Finland.

Tufano, P. (2003) "Financial Innovation," in Constantinides, G.M., Harris, M., and Stulz, R.M. (eds.) *Handbook of Corporate Finance*, Vol. 1A, pp.307-331, Elsevier, North Holland, Amsterdam.

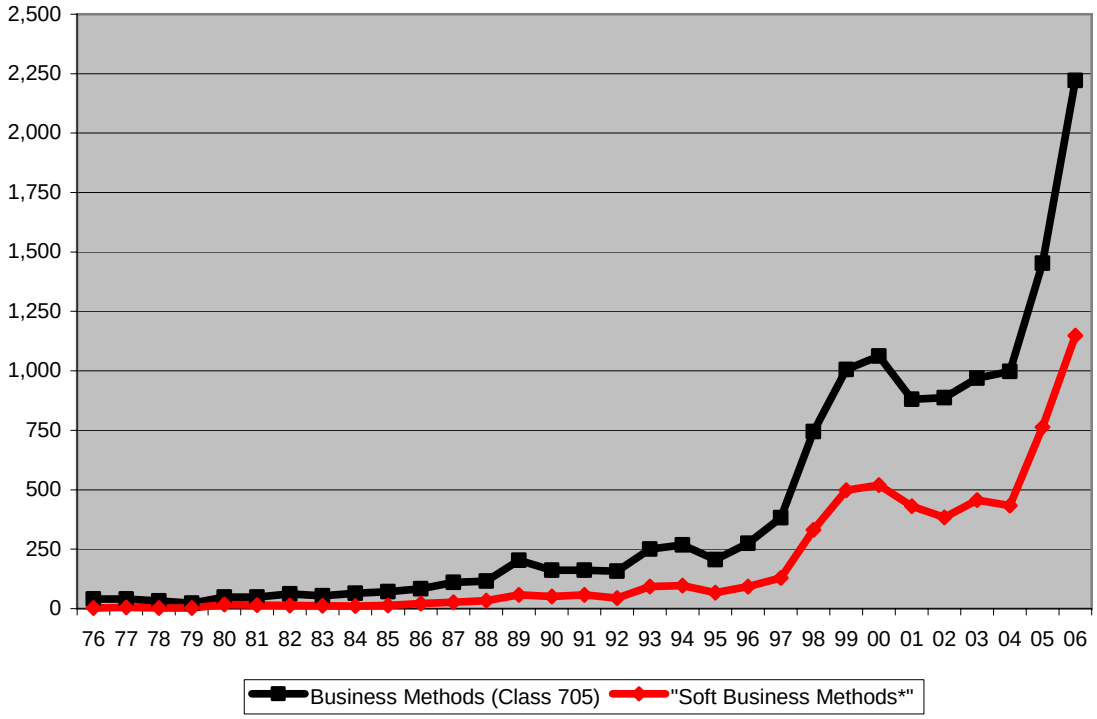
U.S. Patent and Trademark Office (2000) "Automated Financial or Management Data Processing Methods (Business Methods), A White Paper," (http://www.uspto.gov/web/menu/busmethp/index.html).

Wagner, S. (2004) "Business Method Patents in Europe and Their Strategic Use – Evidence from Franking Device Manufacturers," forthcoming in *Economics of Innovation and New Technology.*

Williamson, O.E. (1985) *Economic Institutions of Capitalism*, New York, The Free Press.

Ziedonis, Rosemarie. 2004. "Don't Fence Me In: Fragmented Markets for Technology and the Patent Acquisition Strategies of Firms," *Management Science,* Vol. 50, pp. 804-20.

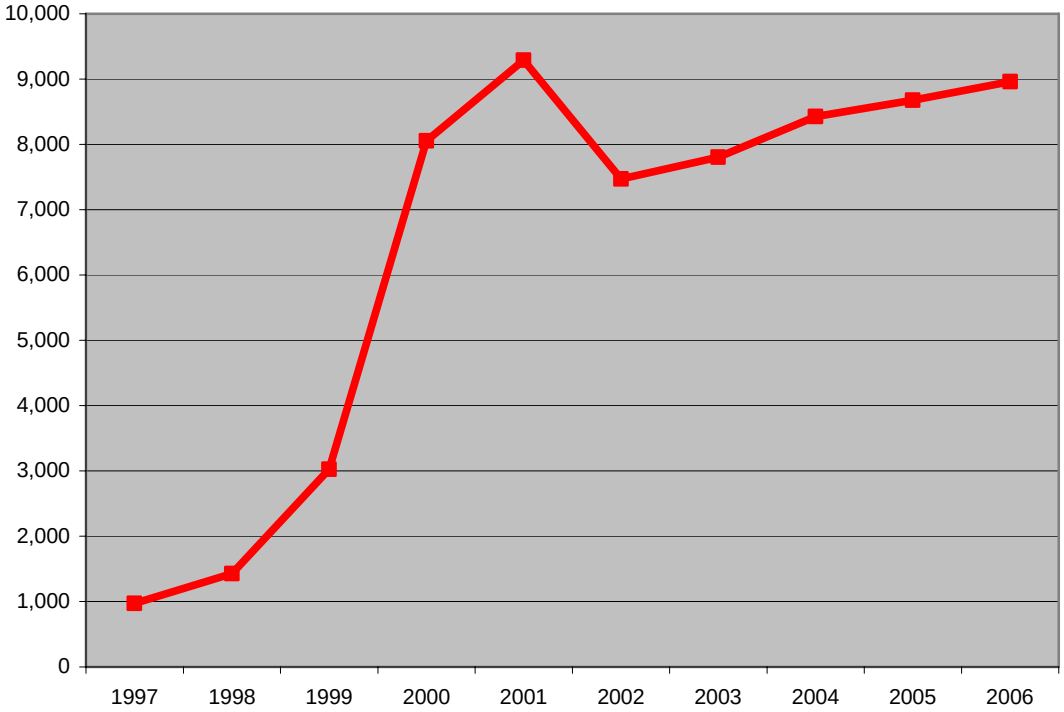
Figure 1: Patents on Computer-Implemented Methods of Doing Business in the U.S. (by calendar grant year)



Source: U.S. Patent and Trademark Office and authors' calculations

* "Soft Business Methods" counts only patents in the sub-classes of 705 that are most closely associated with financial services and which contain a smaller share of patents on mechanical inventions. These classifications were identified with the assistance of CHI Research.

Figure 2: Applications for Business Method Patents*



Source: U.S. Patent and Trademark Office
* Counts by fiscal year.

Appendix. A Model of a Monopoly SSO

To summarize some of the main results from the literature that have implications for the case of SEPA, we consider a simple model of a monopoly SSO. Let us denote the quality of the standard by q and the SSO's intellectual property policy by α. The higher α is, the tougher is the intellectual property policy toward the parties that do not own essential intellectual property, such as service providers, users, and consumers. For example, a high α means that the price for a license is higher or that licensing contracts include more restrictions. Obviously, tougher intellectual property policy means that there will be less demand for the standard. The quality of the standard affects both users and intellectual property holders positively. More formally, denoting the users' gross utility by $u(\alpha,q)$ and the IP holders' profits by $\pi(\alpha,q)$, it is natural to think that $u_\alpha<0$, $u_q>0$, and $\pi_q>0$, where subscripts denote the partial derivatives with respect to α and q. We may further think that $\pi_\alpha(0,q)>0$ but that $\pi_\alpha<0$ for some α sufficiently high (so that $\pi_{\alpha\alpha}<0$). In other words, the intellectual property holders' profits are initially increasing in the toughness of the SSO's intellectual property policy, but since a tough IP policy restricts the use of the standard, an overly tough intellectual property policy will be harmful from the intellectual property holder's point of view.

Following Chiao et al. (2006), let us assume that the SSO chooses the intellectual property policy to maximize

(1) $$\Pi(\alpha)=\lambda u(\alpha,q)+(1-\lambda)\pi(\alpha,q),$$

putting weight λ on the users' utility. In other words, 1-λ measures the extent to which the SSO is captured by the holders of the essential IP. If λ=0, the SSO does not care about users at all, whereas if λ=1, the SSO behaves as if it would only maximize the users' benefits.

The SSO's optimal intellectual property policy is then implicitly given by

(2) $$\lambda u_\alpha(\alpha^*,q)+(1-\lambda)\pi_\alpha(\alpha^*,q)\le 0\,.$$

From (2) we immediately see that for high enough λ, we may have a corner solution where the optimal intellectual property policy is as lenient as possible ($\alpha^* \to 0$), whereas otherwise we have an interior solution (recall that $\pi_{\alpha\alpha}<0$). If we focus on the interior solution, a simple comparative-static exercise shows that

(3) $$\frac{d\alpha^*}{d\lambda} = -\frac{u_\alpha - \pi_\alpha}{\lambda u_{\alpha\alpha} + (1-\lambda)\pi_{\alpha\alpha}} < 0 .$$

The sign follows from the second order condition for the interior solution, which makes the denominator negative, and from the fact that at the interior solution $\pi_\alpha(\alpha^*,q)>0$. Clearly, the more power the users have in the decision making of an SSO, the more lenient its intellectual property policy. Similarly,

(4) $$\frac{d\alpha^*}{dq} = -\frac{\lambda u_q + (1-\lambda)\pi_q}{\lambda u_{\alpha\alpha} + (1-\lambda)\pi_{\alpha\alpha}} > 0 .$$

In other words, the higher the quality of the standard, the tougher the intellectual property policy. If the standard quality will be high, there will be demand for the standard despite a tough intellectual property policy.