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978-1-107-04710-5 - Patent Markets in the Global Knowledge Economy: Theory, Empirics
and Public Policy Implications

Edited by Thierry Madiès, Dominique Guellec and Jean-Claude Prager

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Introduction

DOMINIQUE GUELLEC, THIERRY MADIÈS
AND JEAN-CLAUDE PRAGER

Patents are particular goods, resulting from a legal construction. They guarantee temporary exclusivity rights to the use of an invention to their holder. By offering rights and incentives to investors and inventors, a patent ensures, in a market economy, the decentralization of innovative investment decisions. The cost for society is the temporary exclusion of third parties from the use of the protected invention. Because it restricts both industrial and intellectual use, this social cost is higher when innovation processes are cumulative, i.e. when inventions pile on top of each other.

Patent markets facilitate transfers of this hybrid right and allow us to circumvent the traditional arbitrage between, on one hand, the exclusivity guarantee given to the inventor to encourage investment and, on the other hand, the need of not excluding (and even including) potential users of this invention. When markets function efficiently they can improve the availability of inventions for those that can use them to create value. Furthermore, efficient markets can increase the range of opportunities for these inventions, and finally reduce costs to access such inventions. Consequently, we observe an increase in market transactions on patents and their underlying inventions.

Markets are encouraging this trend. They allow inventions to circulate better between economic agents and their price to be determined, which improves the allocation of inventions in the economy, under certain conditions. The facilitated diffusion of technologies is of great importance. Indeed, technologies can increase productivity by allowing companies to be more efficient, which is particularly important in inventive activities. Improvements in technology diffusion can take the following channels: a deeper division of research, a facilitated access to sources of knowledge to practice the so-called ‘open’ modes

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of innovation, and, finally, the emergence of new funding methods for investment in research, i.e. capital may be placed directly in creative assets, valued separately from the other assets of the companies.

The present book analyses the current state of knowledge available to assess the importance of patent markets and to identify the patent strategies of firms and public research organizations.

Chapter 1, 'The market for patents: actors, workings and recent trends', by D. Guellec and Y. Ménière, describes the current state of the market for patents (in the form of licenses or asset transfers), and highlights the principal characteristics of these markets and their actors. The rapid development of patent exchanges in recent years reflects the development of the knowledge economy in general. The separation between proper inventions and assets that allow their economic implementation (physical capital, commercial infrastructure, etc.) is indeed a major trend of the beginning of the twenty-first century. The authors highlight the variety of patent practices regarding the licensing or sale of patents. They oppose in particular 'ex post' enforcement practices (simply aiming at regularizing, through negotiation or litigation, the exploitation of the patented invention by third parties) and the 'ex ante' commercialization of the patented inventions with a view to enabling their exploitation by third parties.

They show that transaction costs associated with these purely private exchange types, on a case-by-case basis and over the counter, constitute an important brake on development of these exchange types. In this context, some innovating instruments have recently been suggested to reduce the costs of these transfers, by operating them at a greater scale and in a more structured fashion. Numerous operators thus try to find economies of scale to ensure the capture of a portion of those productivity gains. This chapter provides a taxonomy of the principal market types (transaction and intermediary types) and presents the principal actors currently involved in them.

Chapter 2, 'Strategic intelligence on patents', by F. Caillaud and Y. Ménière, focuses on new tools for mapping patents and assessing their quality. The search for prior art in patent databases is a necessary yet difficult task for all firms and public research organizations engaged in R&D activities. During the last decades, the growing volume of patents has made this task even more challenging. At the same time, the transition towards the open innovation paradigm has further reinforced innovators' needs for strategic intelligence about

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their rivals and potential partners' R&D activities. These developments put traditional methods for analysing patent information under strong pressure: the human resources and time they require are hardly compatible with the ever-increasing amount of information to be processed. Against this background, new methodologies enabling the statistical exploitation of patent data on a very large scale offer increasingly relevant solutions, thereby paving the way for a deep renewal of the way in which firms elaborate their R&D strategies. In this chapter, the authors use various examples to illustrate how such innovative instruments can produce critical strategic intelligence by enabling the visualization and quality assessment of entire patent portfolios at both the macro (country, sector) and micro (firm or researcher) levels. Besides searching for prior art, they make it possible to quickly assess the strengths and weaknesses of any firm's intellectual property portfolio, anticipate rivals' strategic R&D orientations and identify infringers or potential partners for technology transfers. Accordingly, they confer significant strategic advantages to the few actors who can already afford to use them. In the coming years, their widespread use is likely to bring about major developments in the innovation ecosystem, by introducing transparency in what still remains one of the more complex and opaque facets of the economy.

Chapter 3, 'Microeconomic foundations of patent markets: the role of intermediaries, auctions and centralized markets', by A. Perrot and A. Yvrande-Billon, relies on recent developments in the literature on market design, auction and transaction costs to explain the various institutional arrangements that coexist for technology transfer, the latter ranging from negotiations over the counter to auctions through hybrid mechanisms, such as joint ventures or cross-licensing. The introduction of market mechanisms to coordinate patents exchanges has not eradicated the other modes of knowledge exchange. While most of the companies surveyed report a strong growth in revenues generated by patent trading and licensing, the majority also highlights the inadequacy of their licensing activity relative to their expectations. By the same token, the few experiments of patent auctions that have recently been organized proved not to be very successful. These facts suggest that market transactions on such particular goods as patents are far from being a 'one-size-fits-all' solution. Does it mean that patents do not easily lend themselves to market exchanges? Or is

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it due to failures of the existing modes of market coordination? In other words, what are the institutional and structural obstacles to the development of markets for patents? The purpose of this chapter is precisely to provide some answers to these questions using the most recent developments in microeconomic theory.

Chapter 4, 'Structuring the market for intellectual property rights: lessons from financial markets', by O. Gassmann, M.A. Bader and F. Liegler, illustrates how intellectual property rights (IPR) have become a valuable economic commodity in the knowledge economy, gaining in importance as a strategic competitive advantage. Access to IPR is crucial for companies that wish to develop or expand their product range. This raises the question of the optimal allocation of IPR. Today, companies and research organizations already trade and license patents. The sale or licensing of patents to third parties increases innovation and technology transfer, generates economic value and provides access to capital. However, the market lacks transparency, and uncertainty as to the quality and value of patents and technology drives up transaction costs. Trading IPR in a more formal way could facilitate a more efficient allocation process through improved transparency and more accurate pricing mechanisms, thereby affording the greater transactional certainty that the market needs. In order to move towards a more efficient, organized IPR market, and in the interests of fostering trade and engaging with investors, the chapter conceptualizes a market model and identifies potential products to be traded.

In Chapter 5, 'Valuation and rating methods for patents and patent portfolios', M. Baudry deals with valuation and rating methods for patents and patent portfolios. Valuation and rating methods for patents are intended to make it easier for economic agents to discriminate efficiently among a large set of patents and to early detect the more valuable ones. The econometric literature proposes indirect assessment methods based on observable and objectively measurable characteristics of patents, referred to as patent metrics. These metrics are assumed to condition the rent that may be extracted from patents. Assessment methods are said to be indirect in the sense that the level of the rent is not observed but inferred from surveys, observed behaviours or economic results. Most of these methods were initially designed to characterize the overall distribution of values within a population of patents rather than to assess values at the patent level. Indeed, they initially aimed at getting some insights into the pace of innovation

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at a macroeconomic or sector level and from a more qualitative point of view than simple patent counts. This chapter reviews research articles that adapt them for the purpose of valuation of individual patents or of a portfolio of patents. It is argued that none of the three types of methods described in this chapter is perfect. Methods of the first type, stated value approaches based on an econometric treatment of survey data, are costly to implement and to update and may potentially be subject to declaration biases. As regards the second type, methods based on the valuation by stock markets and more specifically Tobin's Q studies, criticism is based on a background note: in essence, no additional information compared to that available to financiers is produced. Resulting patent scorings cannot therefore be thought of as tools that can help other economic agents than the patent holder to discriminate better among patents. For their part, methods of the third type do not account for the strategic component of the value of patents. Patent renewal methods are particularly illustrative of this third type that gathers revealed value approaches. For the time being, none of the described methods is able to convincingly address the distinction between embodied patents and disembodied patents. Similarly, none of the described methods currently tackles the valuation of a portfolio of patents, though some of them could theoretically do so. Nevertheless, a striking feature of these different methods is that they all point to the same cautious conclusion as regards the feasibility of an automated patent scoring. Indeed, they all conclude that some patent metrics, and more specifically forward citations, have a significant impact on patent value but that the role of patent metrics in explaining the total variance of patents value is rather too limited compared to that of unobserved sources of heterogeneity.

In Chapter 6, 'Dysfunctions of the patent system and their effects on competition', D. Encaoua and T. Madiès argue that the contemporary tensions between patents and competition no longer reside in the traditional trade-off between the exclusionary right given to an inventor to encourage innovation, and the welfare loss induced by the market power associated to this right. Instead, they argue that the three following distortions of the patent system create important conflicts between patents and competition. The first distortion is due to the existence of weak patents. Many patents are granted to applications of bad quality that do not satisfy the usual patentability criteria. This situation increases the uncertainty attached to patents, reduces the

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credibility of the system and challenges the justification of the patent as a protective mechanism. Second, patents being originally designed in the context of isolated innovations, they are not adapted to the context of sequential or intergenerational innovations, in which an innovation relies on earlier patented inventions. Sequential innovations call for fine delimitations between the rights of successive patent holders, with the patent system operating smoothly as long as each of the successive rights are well defined. However, due in particular to the strategic use of patents to preserve and expand the exclusionary rights by blocking further improvements or unanticipated usage, the patent holders' opportunistic behaviour becomes unavoidable. As in many other circumstances, this opportunistic behaviour is exacerbated by the large extension of the patentable subject matters that appeared in the United States during the 1980s and 1990s. Third, the emergence of complex technologies, corresponding to activities in which the use of a large number of patents from different owners is necessary to create a new product, implies that patent holders will act in a coordinated way. The potential entrants in these complex technologies are then struck by the coordinated behaviour of the patent holders. Examples of such behaviour include the pooling of complementary patents and the licensing of essential patents by the members of a standard setting organization. Often, patents serve to create ambushes or to capture unjustified rents through excessive licence fees, which in turn create barriers to entry for new competitors in the innovation market. Two important consequences of these distortions are derived. First, the resolution of the conflicts between competition and patents cannot rely exclusively on the application of antitrust law. Even if these distortions affect competition in the product, technology and innovation markets, antitrust rules are unable to counter the specific effects rising from distortions of the contemporary patent system. The second consequence is that the existence of these distortions leads to a very expensive judicial implementation of the patent system. The multiplication of conflicts due to a strategic use of patents, particularly in the information and communication technologies, biotechnology and medicine sectors, raises the question whether the legal status of patents is adapted to contemporary technological developments.

In Chapter 7, 'Valorization of public research results and patents: elements of international comparison', R. Lallement underlines the growing concern worldwide about the capacity of publicly funded research institutions to contribute effectively to wealth creation by

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transferring their results to the business sphere. If this debate is legitimate, several misunderstandings need to be dispelled. The first concerns the notion itself, as a frequent conception of valorization is focused too heavily on the commercialization of IPRs through patenting and licensing. However, it is more realistic to adopt a broader approach which, as reflected by the actual practices of most technology transfer offices (TTOs), corresponds to a much greater variety of tasks, ranging from invention disclosures to contract agreements and creation of spin-offs. Concerning these various activities, the available data tend to be misleading at first glance, suggesting that the USA outperforms other industrialized countries for almost all criteria. But a more cautious international comparison leads to more mixed results, showing that the only indicator for which the USA has a clear leadership in relative terms is the value of licensing revenue. Moreover, structural and institutional factors explain a large part of the performance gaps. Hence, public policies concerning technology transfer and valorization cannot follow a general pattern and must reflect the diversity of missions assigned to different research organizations in question. Yet several general lessons can be learned from the economic analysis and from the experience of diverse countries. One of them is that patent and licensing play a crucial role as incentives in this matter, notably to promote the involvement of academic researchers in close and often long-lasting science–industry partnerships. But they are of varying importance depending on the technological domain considered. Moreover, licensing income varies a lot in time and space according to many factors such as chance or the profile of the respective research organizations. Apart from few exceptions, the vast majority of cases correspond to unprofitable valorization activities, at the level of TTOs. Another result is that size (scientific and human resources) and experience play a major role in explaining a high level of performance. This is why countries like Germany and France have recently created patent and valorization agencies at the regional level. But the idea that these agencies could be self-financing seems illusory. If valorization activities are considered by many experts as a net source of income and therefore as a way to finance academic research, they are in fact a cost factor in most cases. In terms of public welfare, the true rationale of valorization activity should be for governments to promote a wide utilization of results stemming from publicly funded research, not to maximize any financial return, all the more

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as an excessive commercialism tends to impede public research by undermining the ethics of ‘open science’. Where necessary, the need to limit some of these possible negative impacts justifies exploring alternative approaches to practices focusing on systematic patenting, high royalty rates and exclusive licenses.

In Chapter 8, ‘Openness, open innovation à la Chesbrough and intellectual property rights’, R. Carraz, I. Nakayama and Y. Harayama show that the rise of the open innovation paradigm, a model where the division of innovative labour is widely dispersed, has attracted considerable attention both in academia and in the policy sphere. Indeed, this model entails some considerable changes in the management of innovative activities; in particular, the creation of value requires setting up a business model where firms need to integrate and monetize internal and external knowledge to their organization. In that respect, firms have to build a strategic (intellectual property) management to operate efficiently in this business model. The openness here puts emphasis on the distributive nature of innovation among a wide range of heterogeneous stakeholders rather than an uncontrolled access to it, which may generate new perception and use of IPRs. In contrast to the ‘open science’ and ‘open source software’ regimes, the diffusion of knowledge is not unrestricted or uncontrolled but rather its access can be controlled by each stakeholder depending on the strategic goals of the firms, leading to targeted knowledge disclosure. While conventional wisdom puts a focus on exclusivity of a patent right, open innovation *à la* Chesbrough urges company managers to reconsider the role of patents and use them as vehicles for technology transfer in IP markets. It makes it clear that patents are tradable property rights. Keeping it in mind, policy-makers should carefully revisit the institutional design to make sure that technology transfer through IP markets contributes effectively to accelerate innovation and is not obstructed by institutions that have no intention of exploiting patented inventions (the extreme case being ‘patent trolls’ who aggressively enforce patents against alleged infringers with no intention of manufacturing or marketing the patented invention). Overall, firms need to develop practices to deal with external knowledge flows and to build strategies of knowledge integration tailored to different partners and level of openness. Depending on the circumstances and partners, firms should diffuse their knowledge on an unrestricted basis, build long-term cooperation with different actors, such as universities, or monetize their inventions on IP markets and networks.

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1 *Markets for patents: actors, workings and recent trends*

DOMINIQUE GUELLEC AND YANN MÉNIÈRE

1.1 Introduction

The growing importance of knowledge flows is strongly backed by anecdotal evidence and widely recognized by practitioners and economists. The apparent expansion of the trade of intellectual property (IP) in general and patents (or titles to patents) in particular is part of this broader trend. It is illustrated by growing volumes, growing stakes, new actors of various types, new policy issues and controversies.

Although companies increasingly seek to divest or acquire patents strategically to strengthen their business, the trade in IP remains inhibited by significant transaction costs. In many cases, patent holders do not have the resources, skills or relationships to identify interested buyers. Moreover, most of them have difficulty in ascertaining the value of their patents. Similarly, most willing patent acquirers do not have enough of the resources and know-how needed to identify the key patents and their proper market prices, to launch and facilitate the negotiations with owners of target patents appropriately and to conclude contracts successfully. For such companies, IP specialist firms now provide various services to support and facilitate patent transactions.

This expansion of patent markets has elicited two opposite views. The first one refers to the trade in IP as trade of technology, which is good as it improves the allocation of knowledge across the economy, hence increasing overall productive efficiency and innovative performance. The second view claims that the trade in patents is often predatory,

This text is largely based on: (1) CAE report (2010) 'Les marchés de brevets dans l'économie de la connaissance'; (2) EC Report (2012) 'Options for an EU Instrument for Patent Valorisation', Report of the Expert Group set up by the European Commission; (3) Guellec, D. and Yanagizawa, T. (2009) 'The Emerging Patent Marketplace', OECD Working Paper. The opinions expressed in this chapter are the sole responsibility of the authors and do not necessarily reflect those of the organizations they work for or that commissioned the aforementioned documents.

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a purely legalistic activity, disconnected from real innovation, and thus aimed at capturing rents at the expense of real innovators.

This chapter claims that both views are partly true: patent markets can generate both value creation and rent seeking. As they allow the mobilization of technical knowledge they represent a major opportunity for developed economies, but a number of conditions (notably of a regulatory nature) need to be met for the positive side to dominate. This chapter will not examine in depth what these conditions are, but this double nature of patent markets is an essential conclusion of the following analysis.

The first section will describe patent-based transactions, the second will assess their quantitative importance, and the third will examine market intermediaries.

1.2 Trading patents: conceptual issues

1.2.1 Patent markets encompass a large variety of transactions

Transactions based on patents are of different types. First, the patent itself may be fully transferred by its original owner to a new acquirer. Second, licensing contracts may give the right to use a patented invention under certain conditions. They usually restrict the use of the invention to specific geographic areas or periods of time. The license may also be exclusive (so that the single licensee has a monopoly on the exploitation of the invention) or not (inducing competition between several licensees). Most licensing contracts also include for instance specific conditions for the payment of royalty fees (e.g. the licensee pays the licensor a fixed amount plus a percentage of revenues generated by the patent). ‘Cross-licensing’ contracts are sometimes an exception in this respect. They aim at enabling the contracting parties to exploit each other’s patents in a particular field, and are thus especially frequent in sectors where products embody large numbers of patented components (e.g. information and communications technology (ICT) and car industries). Third and finally, patents may be subject to financial transactions (e.g. securitizations), which allow the holder to monetize his invention without losing control (see Box 1.1).

From an economic perspective, it is insightful to sort these transactions according to whether or not they induce an actual technology transfer between the seller and the acquirer. Technology