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*Proprietary and non-proprietary intellectual
property marketplaces:
Their functioning and efficiency as experienced
by UK software firms*

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The Intellectual Property Rights (IPR) elements of the DIME Network currently focus on research in the area of patents, copyrights and related rights. DIME's IPR research is at the forefront as it addresses and debates current political and controversial IPR issues that affect businesses, nations and societies today. These issues challenge state of the art thinking and the existing analytical frameworks that dominate theoretical IPR literature in the fields of economics, management, politics, law and regulation-theory.

**Proprietary and non-proprietary intellectual property marketplaces:
Their functioning and efficiency as experienced by UK software firms**

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ABSTRACT

By exploring the patterns of engagement in several intellectual property (IP) marketplaces on the part of a sample of software firms based in the UK, the article attempts to shed light on the strategic reasons which induce firms to participate in different IP marketplaces and governance structures, often at the same time. The scope of the analysis includes not only the conventional proprietary marketplaces (patents and copyright) but also non-proprietary marketplaces (open source and trade in non-patented technology). Marketplaces are viewed as institutions that allow firms to realize strategic value but which, due to institutional inefficiencies, may fail to deliver firms the benefits they seek. Therefore, the obstacles that prevent IP marketplaces from functioning smoothly and efficiently are also investigated.

The analysis suggests that different marketplaces and governance forms contribute to the realization of specific forms of value for firms, and suffer from specific failures. In-depth investigation and comparison of IP marketplaces and governance forms is therefore a promising and useful area for policy-relevant research.

Key words: Patents, copyright, open source, non-patent protection, Intellectual Property (IP), marketplaces, strategic benefits, software industry.

JEL: O34 - Intellectual Property Rights; O31 - Innovation and Invention: Processes and Incentives; O32 - Management of Technological Innovation and R&D

1. Introduction

Intellectual Property (IP) governance in the software industry today challenges the mainstream view that knowledge privatization, normally attached to a patent, is necessary in order to remedy the market failure connected to the inherently public nature of knowledge, since it utilizes or experiments with IP marketplaces associated with a variety of IP, including both proprietary IP (patents, copyrights) and non-proprietary IP (open source, IP with no formal protection). The extent to which IP policy shall embrace non-proprietary IP in the software industry, or mainly focus on extending laws and regulation for patents, was intensively discussed during the EU software hearing in the European Parliament in Brussels 2002-2005, although no decision was taken and therefore no change in law, which allow a continuation of strong policy support for proprietary IP.

The terms ‘proprietary’ and ‘non-proprietary’ became first well known in relation to software. Proprietary software is software with restrictions on using, sharing, copying and modifying it as enforced by the proprietor; such restrictions are achieved by either legal means (via patent and copyright law) and/or technical means (e.g. by releasing machine-readable binaries to users and withholding the human-readable source code). In non-proprietary software (e.g. open source software, freeware, shareware etc.) all or some of those IPR restrictions are relaxed.

In essence, this article deals with the issue of understanding Intellectual Property (IP) marketplaces as institutions. We will in particular address why IP marketplaces exist, with respect to the incentives for firms to participate in them. The first focus of this article is therefore to outline the strategic benefits and the value creation processes that firms seek in the market. It is a well recognized stylized fact that firms do not patent or copyright mainly to cover R&D expenditures, as suggested

in mainstream IPR theory, but that their incentives are related to various types of strategic value they can obtain through licensing markets or via buying and selling such rights (Cohen, Nelson and Walsh, 2000; Levin, Klevorick, Nelson and Winter, 1987; Mansfield, 1986).

Despite the existence of such research which points at the IPR marketplace (whether buying or selling IPRs or licensing markets) as the platform for value creation, the theoretical or empirical IPR literature have focused very little, if at all, on the functioning and efficiency of the IPR marketplace per se.

This article also addresses the conditions for IP marketplaces to work efficiently and be sustainable in the long run. While mainstream economics argues that knowledge privatization is necessary in order to remedy the market failure connected to the inherently public nature of knowledge (what has been termed the ‘tragedy of commons’), this article addresses a different kind of market failure: the failure of institutions to ensure the efficient functioning of the markets for knowledge-based goods (what we can term a ‘tragedy of institutions’).

This approach is in line with the tradition of institutional economics where it is argued that markets are platforms of social relations (and cannot be reduced to simple supply and demand curves). For trade to take place, these social relations need to be underpinned by trust and similar expectations (in relation to prices, contracts and other aspects) between buyer and seller (Hodgson 1988, 1999). The second focus of the article is therefore to address the problems or obstacles firms face in IP marketplaces during their value creation process in order to reach their strategic benefits. Throughout this article, we refer to the notion of ‘marketplaces’ to denote the space, actual or metaphorical, in which a market operates, and hence to emphasize

the web of social relationship and institutions that are required for processes of exchange to take place.

By researching the functioning and efficiency of IP marketplaces, we are able to look in more detail at markets as institutions for value creation and at the potential sources of institutional failure.

The empirical analysis presented in this article is based upon survey data on a sample of UK Software firms collected between October 2008 and March 2009. It draws upon the UKNOW-survey database comprising data collected from German Pharmaceutical firms, UK software firms and UK universities. The information collected through this survey concerns IP market activities and the strategic benefits organizations seek from such, experienced IP market obstacles, and information on the bargaining process in the IP market place with respect to price-setting and the perceived 'value vs. Price' relationship¹. Further details on the sample and on the data collection process are presented in Section 3.

The article is structured as follows. Section 2 sets the general analytical framework, by outlining proprietary and non-proprietary IP marketplaces, what they are and how they work. It also reviews very broadly the strategic benefits which firms may seek from their IP during their value creation processes in various IP marketplaces, and it reviews the institutional obstacles which they may face during these activities, and which may affect their individual performance as well as the performance of entire IP systems. Section 3 outlines the data on which the empirical analysis is based. Section 4 discusses the results of the empirical analysis, and Section 5 presents some concluding remarks on the performance and efficiency of IP

¹ The database was developed at Birkbeck College (under the coordination of Birgitte Andersen) under Work Package 3.2: "An IPR Regime in Support of a Knowledge Based Economy", as part of the UKNOW (*Understanding the Relationship between Knowledge and Competitiveness in the Enlarging EU*) project of the EU 6th Framework Programme.

marketplaces as experienced by the set of survey respondents in the UK Software industry.

The analysis presented in this article on IP and IPR systems for value creation extends the existing literature in several ways. Firstly, it builds upon ‘productive systems’ theory, which argues that the requirements for operational and dynamic efficiencies, and hence system performance, depends upon the ability to secure effective cooperation among stakeholders within the system during the processes of creating and distributing value (Wilkinson, 1983, Wilkinson, 2002 and Birecree et al., 1997). In doing so, it incorporates the theoretical framework for *the productive potential of IPRs* (set out in Andersen and Konzelmann, 2008) where the focus is on the ‘institutional environment’ and the ‘institutions of governance’, and the interaction of the two, in influencing value creation and value distribution from IP.

Secondly, as mentioned above, the article also challenges the mainstream-view (mentioned in the beginning of the Introduction) that knowledge privatization, normally attached to a patent, is necessary in order to remedy the market failure connected to the inherently public nature of knowledge, since it researches IP marketplaces associated with various forms of intellectual property, including both proprietary IP (patents, copyrights) and non-proprietary IP (open source, IP with no formal protection). Moreover, the article applies the concept of institutional failure, as introduced by institutional economists (see e.g. Hodgson 1988, 1999), to IP marketplaces when such markets do not work or underperform, and it researches the possible sources of such failures.

Thirdly, the article also introduces an original approach to the analysis of IP transactions by considering a broad range of IP marketplaces (considering both proprietary and non-proprietary ones). Previously, patent studies have dominated this

research field. Finally, the governance forms within each IP marketplace are also researched in relation to the performance of IP markets, and this has not previously been considered to our knowledge.

Overall, the results of the empirical analysis shed new light on the relationship between the firms' objectives (in terms of value seeking) and their choice of marketplaces and governance forms for the transaction of IP, thus enhancing our understanding of the rationale for these institutions to exist. They also focus on the obstacles that prevent IP marketplaces to function smoothly, pointing to some critical issues that policymakers need to be aware of, if such obstacles are to be removed.

2. What we need to know about proprietary and non-proprietary IP marketplaces

The institutional economics literature (Hodgson 1988, 1999) argues that there is not only one market (as the standard textbook theory theorize) but that there are many different types of markets (for example auction markets, price tag markets, medieval type regional street markets, black or unauthorized markets), and that these markets are enforced by different norms and bargaining forms. This article is in line with this approach, in that it addresses many forms of IP marketplaces underpinned by different social relations.

In relation to proprietary IP marketplaces - patent and copyright - Andersen and Konzermann (2008) outline different forms of market platforms where patents and copyright can be exchanged. They also explain how these markets are embedded in various social relations as defined by different IPR governance structures, ranging from simple arrangements (buying and selling, licensing in and out) to more complex ones such as cross-licensing and pooling of IPRs. Such forms of patent and copyright

interactions are not expected to be exclusive; rather, most firms would presumably participate in several different forms.

The article also addresses the non-proprietary models of value generation from IPR through the IP marketplace. Today, the most common non-proprietary model is the open source software development method. It can be compared to what used to be called the free software. Free Software and Open Source software are concerned with users' freedom to run, copy, distribute, study, change and improve the software². The open source licensing strategy often takes the form of 'GNU General Public License (GPL)'. Whereas IPR law, in its current form, provides the right to exclude anyone to use, modify and redistribute copies of an author's work as well as a right to withhold the source-code, a GPL license transfers these rights to the commons in order to ensure access, i.e. to ensure that every person who receives a copy of a work has the same rights to study, use, modify, and also redistribute both the work, and derived versions of the work. Such licenses also require that the same license terms apply to all redistributed versions of the work. Therefore, it is about changing the IPR terms from 'All Rights Reserved' to 'Some Rights Reserved': the rights which are not reserved move into the 'public domain' or commons. Relaxing some of the restrictions of the IPR system is also becoming more common in other sectors than software, and it is usually linked to an open innovation strategy of the firms. Examples include 'Creative Commons' in the creative industries; 'Wikipedia' and 'Wiki' in publishing; Open source in media ('Open Source Journalism' such as Weblogs, Messageboards, and Open Document; 'Open Source Movie Production'; 'Open Source Documentary'; 'Open Source Filmmaking'); Open source in education

² In this sense, the concept 'Free' or 'Open' may be associated with the concept of 'freedom' or liberty. It does not mean getting something for free in terms of zero price (<http://www.gnu.org/>). For a full detailed definition, see the website of the free Software Community: <http://www.gnu.org/philosophy/free-sw.html#exportcontrol>.

and scientific research (e.g. Science Commons); and Open source health care and medicine, such as the Tropical Disease Initiative, and the not-for-profit “virtual pharmas” such as the Institute for One World Health and the Drugs for Neglected Diseases Initiative (Andersen, 2008).

Many firms exchange non-protected technology in the marketplace. Thus, although many (such as the Free Software and Open Source communities and the Foundation for Free Information Infrastructure) do not advocate putting non-protected technology into the public domain, because they believe that this would allow uncooperative people and firms to convert the openly-developed inventions into proprietary technology, many firms still do. A reason could be that the patent system is too resource-demanding in terms of application costs, search costs in order to avoid duplication of invention, and enforcement costs regarding possible court cases. Or, the technological solution is not at the forefront from a technical point of view (so it does not satisfy the novelty criteria for patent protection), but it is still very productive for industry and therefore traded in the market. The reason could also be that it is difficult to understand and imitate, or that it is so client-based so it has no wider interest of other firms. Finally, it could be due to the fact that the technology product life-cycle is so short, so it makes sense to launch the unprotected technology on the market. The latter would indicate that it does not matter if the technology is protected (that is, the inventor or innovator faces first-mover advantage), or simply that the patent system is too slow compared to the short product life-cycles that many firms face.

In order to understand the performance of the IP marketplaces it is necessary to identify who the stakeholders are that participate in the various marketplaces, as

well as what their respective interests might be. This leads to the first Research Question (denoted as RQ) of the article:

RQ1: Which IP marketplaces do firms participate in? (considering four main marketplaces: patents, open source, copyright, non patented technology)

Secondly, the article investigates what are the reasons for firms to engage in different types of IP marketplaces and for using specific IP governance structures. Andersen and Konzelmann (2008) suggest that the choice of governance structure underpinning an IP marketplace is not random, but rather, it depends upon the type of financial and non-financial *value* that the stakeholders seek to realize: in other words, they suggest that there is a relationship between the choice of a certain IP governance institution within a specific IP marketplace, and the value or benefit firms seek to realize from the transaction.

Building upon the relevant literature on the use of IP marketplaces, in the analysis we particularly explore four main categories of strategic value to be realized through participation in IP marketplaces, which capture the most widely debated reasons for firm to engage in the exchange of IP:

- Benefits relating to innovation, in that the trade of IP should facilitate innovation diffusion (Arrow 1962; Rivera-Batiz and Romer 1991, Arora et al, 2001; Gans and Stern) and enhance innovation processes, often in a social process of interaction with other individuals and organization, and thereby also enable the development of better technology or enable the standardization and technological compatibility (see e.g. Merges and Nelson 1990, 1994; Winter 1993; Plant 1934 in the case of patents).

- Benefits relating to market positioning, related to the ability to gain or maintain market share thanks to the exclusive access to certain IP (see e.g. Rivette and Kline 2000; Cohen et al. 2000; Granstrand 1999 in the case of patents).
- Benefits relating to financial gain in terms of ability to derive income from transactions in proprietary marketplaces and conversely to cut costs by forsaking IPR protection, and even in terms of increased ability to raise capital thanks to the trade of IP as strategic assets (see e.g. Coriat and Orsi 2002; Rivette and Kline 2000 in the case of patents).
- Benefits relating to the building of strategic relationships with or within industry (see e.g. Jaffe, Trajtenberg and Henderson 1993; Teece 1986 in the case of patents).

The full range of benefits investigated through the survey is listed in section 3.

This leads to the following research questions:

RQ2: What are the various types of strategic benefits or value that firms seek when exchanging IP in the marketplaces?

RQ3: Is there a relationship between benefit seeking and the choice of governance forms?

As mentioned in the Introduction, the performance or efficiency of markets depends on the nature of stakeholder interaction. To explore the performance of IP markets we have decided to consult the full range of mechanisms within or outside the IP marketplace which define how stakeholder interests are prioritised and the influence that this might have on their ability to exploit IP in the marketplace. Institutional economics tends to focus on asymmetric relationships with respect to bargaining power and information and knowledge (Akerlof, 1970). Trust is also an important factor in market interaction (Bachmann, 2006). But there are also other

institutional aspects of markets as platforms of social relations, which could affect the sustainability of the system. For example, a recent report from the software industry (IBM, 2006), especially focused on patent rights, suggested that firms encountered problems relating to (i) inflexibility (impossibility to bargain a deal), (ii) no transparency (difficulty to identify the owner, uncertainly as to what the right price is, impossibility to make sense of text and diagrams in patent documents), (iii) no integrity (poor behaviour and unjust court cases), and (iv) low quality (too many similar patents with no inventive step), and other obstacles. To understand the obstacles that firms encounter when engaging in IP marketplaces, which can lead to institutional failure, we investigated several main categories of obstacles derived from the literature, namely problems relating to difficulties in search, lack of transparency, contract design and enforcement issues and regulation issues. The range of obstacles investigated through the survey is listed in section 3.

This leads us to the following research question:

RQ4: What are the various types of obstacles experienced by firms which prevent them from reaching the value they are seeking when exchanging IP in the marketplace?

3. Data

As mentioned in the introduction, this study emerges out of the EU 6th Framework Programme: UKNOW (Understanding the Relationship between Knowledge and Competitiveness in the Enlarging EU'). Thus, the data used is extracted from the UKNOW data-base, and it contains information relating to: the *market activities* of firms with respect to different kinds of IP exchanges; the *strategic benefits* that firms derive from different kinds of IP exchanges; and the *obstacles* which hinder the efficient performance of different kinds of IP exchanges.

The analysis uses a sample of UK software firms which was considered under UKNOW. When building the dataset containing the UK software firms, information was drawn from the FAME (Financial Analysis Made Easy) database, a comprehensive financial database containing information on 3.4 million companies in the UK and in Ireland. Firms have been extracted according to geographic location (England, Wales, Scotland and Northern Ireland), size (≥ 1 employee) and NACE rev. 1 codes. The codes used for the extraction are 7221 (software publishing) 3002 (manufacturing of computers and other information processing equipment), code 322 (manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy), 323 (manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods). These codes identify companies producing both software and hardware, which are likely to be dealing with software patents and other forms of software IP. For simplicity, we refer to the firms in this sample as ‘software firms’.

From the initial population of 1754 firms, the removal of double entries, of companies that are no longer in business and of companies whose main activity is not relevant to this survey (for example, because FAME reported wrong or outdated NACE codes) has allowed us to reduce the size of the relevant population to 980 firms.

The survey was conducted telephonically with the aid of an online questionnaire³. All firms were contacted by telephone with the purpose to identify knowledgeable respondents within the firm, who were then asked to fill in the online questionnaire. Field work was carried out by Birkbeck College in the period between October 2008 and April 2009.

³ Available at the following web address: <http://www.iwh-halle.de/ipr> (last accessed 19 August 2009).

The questions in the survey referred, separately, to four proprietary and non-proprietary marketplaces governing the exchange of IP: patents, copyright, open source and non-patented technology. In turn, for each marketplace, the questions in the survey referred to different governance structures, as detailed in the following table.

Table 1. Marketplaces and governance forms investigated through the UKNOW survey

IP marketplaces	Governance structures
<u>Patents</u> as a tool for the protection of novel ideas	Selling patents
	Buying patents
	Out-licensing patents
	In-licensing patents
	Cross licensing patents
	Participation in patent pools
	Buying university-owned patents
	Licensing university-owned patents
<u>Open source</u> IP as a tool for the protection of original ideas and creative expressions	Participating in open source software development
	Participating in open source pharmaceutical projects
	Participating in other open source communities
<u>Non patented</u> ideas	Releasing not patented product or process innovations to the public
	Releasing not patented product or process innovations to private firms
	Using not patented product or process innovations
	Collaborating with universities without patent restrictions
<u>Copyright</u> as a tool for the protection of original creative expressions	Selling copyright
	Buying copyright
	Out-licensing copyright
	In licensing copyright
	Buying university-owned copyright
	Licensing university-owned copyright

The main variables constructed by means of the survey are listed in Tables 2 to 4 below. The ‘√’ symbol in a cell of the table indicates that the information requested in the corresponding row is relevant to the marketplace indicated in the corresponding column, and an empty shaded cell means that it has no relevance to that marketplace.

A set of variables allowed us to collect information on the extent and intensity with which firms participate in the various IP marketplaces and governance structures.

Table 2. Stock and flow of IP

	Patents	Open source	Non-patented technology	Copyright
Stock of IP owned	√			
Stock of IP licensed	√			
Participation in IP marketplace	√	√	√	√
Number of transactions in the last two years	√	√	√	

The following table presents the detailed list of possible benefits that firms may seek from participating in the various IP marketplaces and governance structures. Data was collected for each variable (or benefit type) regarding each governance form.

Table 3. IP market benefits

		Patents	'Open source' IP	No-patent	Copyright
Benefits relating to financial gain	Direct income from market transaction	√		√	√
	Cost cutting (e.g. via savings on royalties or patent administration)	√	√	√	√
	Increasing ability to raise venture capital (e.g. via the stock market)	√	√	√	√
Benefits relating to innovation	Being able to use the best inventions, innovations, creative expressions	√	√	√	√
	Setting common standards / making or using compatible technology or creative expressions	√	√	√	√
	Innovation methodology: developing better technology or creative expressions	√	√	√	√
	Benefiting from user or supplier involvement as a development strategy (e.g. through learning and feedback)	√	√	√	√
Benefits relating to the building of strategic relationships	Building informal relationships with industry networks	√	√	√	√
	Increasing ability to enter collaborative agreements (e.g. joint ventures, strategic alliances, etc.)	√	√	√	√
	Giving something to the community	√	√	√	√
Benefits relating to market positioning	Increasing market share (e.g. building broader user base or securing market protection)	√	√	√	√
	Professional recognition or brand recognition	√	√	√	√
	Competitive signalling	√	√	√	√
	Other (please specify, in each applicable box)	√	√	√	√

The following table presents the detailed list of possible obstacles that firms may encounter when participating in the various IP marketplaces and governance structures. Data was collected for each variable (or obstacle type) regarding each governance form.

Table 4. IP market obstacles

		Patents	'Open source' IP	No-patent	Copyright
Obstacles relating to search problems	Difficulty in locating the owners of IP/ technology developers who do not enforce IP	√	√	√	√
	Difficulty in locating the users of IP/technological solutions	√	√	√	√
	Difficulty in finding the best IP or technological solution	√	√	√	
Obstacles relating to lack of transparency	Difficulty in assessing the degree of novelty/originality of the IP or technological solution	√	√	√	√
	The description or drawing in the patent document is not clear/ The open source description is not clear	√	√		
	Difficulty in understanding non-patented technological solutions as they are not formally documented			√	
	Difficulty in assessing the economic value of the IP or technological solution	√	√	√	√
Obstacles relating to contract design and enforcement	Difficulty in negotiating a price for the IP or technological solution	√		√	√
	Difficulty in negotiating the terms (not related to price) of the exchange contract	√	√	√	√
	Excessive cost of enforcing the exchange contract	√	√	√	√
	Problems (not related to cost) with enforcing the exchange contract	√	√	√	√
	Trust issues (e.g. opportunistic behaviour, free-riding, or similar)	√	√	√	√
Obstacles relating to regulation	Regulations allow too exclusive rights	√	√	√	√
	International IP regulations do not fit the needs of different local markets	√	√	√	√
	Differences in practices of firms	√		√	√
	Other (please specify, in each applicable box)	√		√	√

Finally, firms were requested to provide some general company information: geographic localization (derived from address), ownership (independent or subsidiary company), size (current number of employees, current yearly turnover), research intensity (yearly expenditure in R&D), geographic extension of the firm's main

market (domestic or international), and sector of activity. A few additional variables relating to firm characteristics were derived from the FAME database: company name, full address, telephone number, primary UK SIC (2003) code, director's name and position, e-mail, website, last turnover (in thousands of GBP), number of employees.

4. Analysis

4.1. Software firms' involvement in IP marketplaces

The number of valid responses obtained was 38 (response rate 3.9%).

Respondents, as can be seen from the following table, are over-represented both in the very small firms category and in the large firms category, while they are slightly under-represented in the medium-sized firms category. This pattern holds both when size is measured in terms of number of employees and when size is measured in terms of yearly turnover.

Table 5. Size distribution of population and respondents

		Population	respondents
n firms		980	38
n. employees	less than 10	18.06%	23.68%
	between 11 and 50	30.82%	13.16%
	between 51 and 250	37.24%	42.11%
	more than 250	13.78%	21.05%
Latest turnover (GBP)	less than 1 million	15.61%	26.32%
	between 1 and 10 million	39.69%	23.68%
	between 10 and 50 million	25.82%	28.95%
	more than 50 million	12.55%	15.79%

We will first assess the patterns of participation in different IP marketplaces, and thereby address RQ (Research Question) 1.

Of the 38 respondents, 10 (26.3%) do not participate in any of the four IP marketplaces, while 28 (73.7%) participate in at least one IP marketplace. Of the respondents that participate in IP marketplaces, only 10 (35.7%) are involved in one

marketplace, while most (18, that is 64.3%) are involved in two or more marketplaces. (More precisely: 10 engage in 1 marketplace, 12 engage in 2, 3 engage in 3, and 3 engage in all 4). Furthermore, while 5 firms (17.9%) only engage in proprietary IP marketplaces (patents and/or copyright) and 11 firms (39.3%) use a combination of proprietary and non-proprietary forms of protection of their IP (11 firms, or 45.8%), the greatest share of respondents that participate in IP marketplaces engage only in non-proprietary ones (12 firms, or 42.9%). These results indicate that most firms exchange intellectual property that is not formally protected, and that for many firms participation in proprietary and non-proprietary marketplaces represent complementary rather than alternative strategies of knowledge protection and transfer. The reasons (in terms of value seeking) for the strategic use of different types of IP marketplaces are explored in the section 4.2.

The table below compares several average characteristics of firms that participate in IP marketplaces. With respect to the overall set of companies that engage in at least one IP marketplace, firms that engage only in proprietary IP marketplaces (either patents, or copyright, or both) are on average smaller in terms of turnover and employees, but they are more research intensive (research intensity is measured as the ratio of R&D expenditure and turnover); they also tend to be more open to international markets. Firms that engage only in non-proprietary IP marketplaces (either open source, or non-patented technology, or both) tend to be even smaller, less research intensive and less open to international markets. Firms that engage in both proprietary and non-proprietary IP marketplaces tend to be much larger than average and much more open to international markets, but less research-intensive. There are no relevant differences among these groups in terms of prevalent sector of economic activity.

Table 6. Distribution of firm characteristics according to participation in IP marketplaces

	average turnover (000 GBP)	average research intensity	average n. employees	% group	% international	% software (NACE code 71)	% hardware (NACE code 30)
at least one IP marketplace	167093	6.82	905	38.5%	60.0%	50.0%	10.7%
Only proprietary	61670	11.62	462	40.0%	60.0%	60.0%	20.0%
Only non-proprietary	15767	2.50	138	8.3%	25.0%	58.3%	0.0%
Both proprietary and non-proprietary	364907	3.15	1944	63.6%	81.8%	36.4%	18.2%

Therefore, firms that are highly research intensive still prefer to protect the results of their costly research activities through proprietary IP. Smaller firms that are less engaged in formal research activities are more likely to exchange technology that is non-proprietary, thus forsaking the high administrative and legal costs that obtaining patent and copyright protection entails. However, while firms that engage in proprietary marketplaces are larger than those which engage only in non-proprietary ones (a result already found in the literature on the propensity to patent and firm size: Scherer, 1965, 1983), we find that the largest firms participate in the full range of IP marketplaces: this may suggest that participation in IP marketplaces is a costly activity which requires time, financial resources and specialized capabilities internal to the firm, requiring smaller firms to focus on a more limited range of marketplaces. On the other hand, it is interesting to observe that it is not only small firms that engage in non-proprietary IP marketplaces: if we consider firms with more than 250 employees, 50% of them engage in open source, and 62.5% in the exchange of non-patented technology (for firms with less than 250 employees the shares are, respectively, 33.3% and 46.7%).

We now look in more detail at the various governance forms for IP that organizations implement within each marketplace (listed in Table 1). Of the 13 firms that engage in the patent marketplace, most in-license (9) and out-license (10) patents; 7 engage in cross-patenting and/or in buying patents, and 5 in selling patents. Only 3 participate in patent pools. 9 firms exchange copyright; of these, 5 sell copyright, 4 buy copyright, 3 out-license it and 2 in-license it⁴. Only 3 firms in-license university patents, 1 buys university patents, 1 buys and in-licenses university copyright. We also find that patented university knowledge does not seem to be a key input to our sample of UK software firms. This is consistent with the results of other investigations with respect to the software industry (see e.g. Cohen et al). Due to the small number of firms that engage in the transaction of university IP, in the rest of the article we do not consider these particular governance forms, and we only focus on the buying, selling, in-licensing, out-licensing and cross-licensing of proprietary IP.

With respect to non-proprietary IP, 14 firms engage in open source software, and 6 of them also participate in other open source communities. Of the 19 firms that exchange non-patented technology, 7 release technology to the public, 11 release non-patented technology to private firms, 13 use non-patented technology, and 6 collaborate with universities with no patent restrictions.

⁴ We did not have precise information on how many firms engage in each copyright governance structure. These figures reflect the number of firms that actually answered the questions related to each governance structure. This may somehow understate the number of firms engaged in each governance structure, since there could be firms that participate in a certain governance structure but decided not to answer the related questions. However, this would not significantly alter the results of our analysis.

4.2. Strategic value seeking and the role of IP marketplaces and governance structures

We seek to investigate what are the various types of strategic benefits that firms seek when exchanging IP in different marketplaces, and thereby address RQ2 and RQ3. We check in particular whether there is a link:

- between the various marketplaces in which firms engage and the benefits that they seek, and
- between the various governance structures (within the patent, open source and non-patented technology marketplaces) and the benefits that firms seek.

The table below⁵ summarizes the answers given by software firms with respect to the benefits that they derive from engaging in the various IP marketplaces (the columns do not sum to 100% since each firm could choose more than one category of benefits).

Table 7. Benefits from participation in IP marketplaces

	Patents	Open source	Non-patented technology	Copyright
Number of respondents	13	14	19	9
Finance	29.3%	33.3%	44.5%	42.5%
Innovation	42.4%	88.1%	74.2%	53.3%
Strategic relationships	18.0%	65.5%	48.5%	11.3%
Market	24.7%	50.0%	56.9%	27.9%
No option chosen	28.4%	8.3%	8.4%	30.0%

Firms seek all kinds of benefits in all marketplaces, but with different intensity. In all marketplaces, the most important strategic benefits that firm seek relate to improving their innovation processes.

⁵ In order to construct the shares presented in Table 7, the firms' responses given with respect to each benefit (as listed in the previous Table 3) were aggregated into the four main categories ('finance', 'innovation', 'strategic relationships', 'market'), taking care to avoid double-counting. The shares of firms ticking at least one benefit in each category were computed for each IP governance form, and they were then averaged across all governance forms within each marketplace.

The importance of innovation benefits for the patent and copyright marketplaces is in line with the conventional view that IPR protection fosters innovation processes (see Dosi et al, 2006, for an overview of the debate on the relationship between patenting and innovation activity). However, fostering innovation is the most important benefit also for firms that engage in open source and non-patented technology. That firms use non-proprietary IP to improve their innovation processes is quite well known. The literature on open source has often remarked that firms engage in open source in order to use and develop better innovations (Kuan, 2001), especially when user-driven (Bessen, 2002). It has also pointed out the importance of standardization and compatibility, which allow firms to enlarge their user bases (Wichmann, 2002a and 2002b).

Most firms in the patent marketplace also seek benefits relating to financial gain, market positioning, and the building of strategic relationships. In the copyright marketplace, financial gain is indeed the second most important benefit sought, followed by market positioning.

In the two non-proprietary IP marketplaces, the second most important categories of benefits concern the building of strategic relationships and market positioning. In general, firms have been known to contribute to open source projects out of individual extrinsic and social motivations (Bonaccorsi and Rossi, 2003) especially when the technology is not crucial to the firm's competitive advantage (Henkel, 2002).

If we analyze in more detail the respondents' answers with respect to the specific benefits within each category (these data are not reported), we find that, with respect to financial benefits, the exchange of copyright allows firms to derive income (for 37.5% of respondents), while cost cutting is the most important financial benefits

that accrues from open source and non-patented technology (33.3% and 23.5% of respondents respectively).

36.3% of respondents that engage in the patent marketplace believe that patents allow them to use the best innovations, but similar shares of respondents in the open source and non-patented technology marketplaces (36.9% and 34.1% respectively) believe that they can use the best innovations by relying on non-proprietary IP. The engagement in non-proprietary IP marketplaces allows firms to make or use compatible technology (60.7% of respondents in open source, 45.6% in non-patented technology), which is generally not possible when firms protect their technology through patents.

Reliance on open source (58.3%), non-patented technology (36.5%) and copyright (48.3%) also have distinctive advantages in terms of allowing the development of better technology, which, in the former case, often takes place through the involvement of users (23.8%).

The exchange of non-proprietary IP allows firms to build relationships with industry networks (34.5% and 40.1% respectively) and provide them with strategic assets that increase their ability to raise capital (27.4% and 26.2%). 22.2% of firms engaging in open source also find motivation in ‘giving something to the community’.

In terms of market positioning, similar shares of respondents in all marketplaces (around 21%) use IP in order to gain market share. It is interesting to observe that market positioning is a benefit sought in all IP marketplaces, not only in proprietary ones. This suggests that firms in the software industry do not attribute exclusive importance to the use of patents as a means to prevent imitation and hence maintain market share: the importance of accessing a wider user base by developing compatible technologies probably plays an important role in market strategies. This is

consistent with findings from the literature, which point to the importance to factors other than patent protection, such as lead time and secrecy, to improve market positioning (Levin et al, 1987). Engagement in non-proprietary IP also allows firms to gain professional or brand recognition.

In sum, three patterns stand out. First, while conventional economic theory suggests that formal IP protection is often necessary to induce firms to invest in costly innovation processes (Nelson, 1959), these data suggest instead that exchanging proprietary IP is not the only nor the main channel through which software firms boost their innovation strategies: in fact, greater shares of respondents derive benefits for their innovation activities from engaging in the open source and non-patented technology marketplaces. Second, all IP marketplaces, and not only proprietary ones, provide firms with benefits related to financial gains. Third, firms use non-proprietary IP in order to increase their market share.

We will now move on to discuss the role of governance structures in the value seeking process within IP marketplaces. Building upon Andersen and Konzelmann (2008), we hypothesized that, within each marketplace, there is a link between the governance form in which firms engage and the benefits that they seek. That is, benefits are not only market-specific, but also governance specific.

In order to further deepen our understanding of the relationship between the use of different governance forms within each IP marketplace and the seeking of benefits, we build an index which measures the extent to which organizations that take part in a certain governance form ‘specialize’ in seeking a certain benefit when compared with the set of organizations that take part in the marketplace in general. Because this index is constructed exactly as the widely used Revealed Technological

Advantage index, we refer to it as the index of ‘Revealed Governance Advantage’ (RGA)⁶.

Let x_{ij} be the number of times that benefit i is chosen in governance form j , and $\sum_i x_{ij}$ the number of times that all benefits are chosen in governance form j ; let $\sum_j x_{ij}$ be the number of times that benefit i is chosen in all governance forms, and $\sum_i \sum_j x_{ij}$ the total number of benefits chosen in all governance forms (that is, the index is the ratio between the share of benefit i in governance form j and the share of benefit i in all governance forms). Then, for a certain governance form, the revealed governance advantage index is:

$$RGA = (x_{ij} / \sum_i x_{ij}) / (\sum_j x_{ij} / \sum_i \sum_j x_{ij})$$

This index only assumes positive values: a value that is smaller than 1 indicates that governance form j is relatively under-specialized in benefit i , while a value greater than 1 indicates that governance form j is relatively over-specialized in that benefit.

The values of the RGA index show that financial benefits are sought when selling, out-licensing and cross-licensing patents or copyright, since these transactions provide firms with direct income. Innovation benefits are particularly sought when buying and in-licensing patents and copyright, since these activities allow firms to use the best innovations. Buying and in-licensing patents allow firms to improve their market position by granting them exclusive access to certain technologies. Instead, out-licensing copyright is particularly used to improve market position, probably in order to create some technological dependency from other firms.

⁶ In order to compute the RGA indexes, as well as the following RMA indexes, the firms’ responses given with respect to each benefit (as listed in the previous Table 3) were aggregated into the four main categories (‘finance’, ‘innovation’, ‘strategic relationships’, ‘market’), taking care to avoid double-counting. The “no option” category of responses was not considered.

Table 8. 'Revealed governance advantage' for the various benefits

Marketplace	Governance form	RGA index			
		Finance	Innovation	Strategic relationships	Market
Patents	Selling patents	4.08	0.00	0.00	0.00
	Buying patents	0.37	1.27	0.54	1.61
	out-licensing patents	1.81	0.62	0.65	0.98
	in-licensing patents	0.48	1.15	1.39	1.04
	cross-licensing patents	1.25	0.86	1.36	0.68
	participating in patent pools	0.00	2.79	0.00	0.00
Open source	Participating in open source software development	1.19	0.98	0.94	0.95
	Participating in other open source communities	0.47	1.05	1.16	1.13
Non-patented technology	Releasing not patented product or process innovations to the public	0.81	0.74	1.02	1.51
	Releasing not patented product or process innovations to private firms	1.03	0.94	1.13	0.96
	Using not patented product or process innovations	0.93	1.41	0.66	0.75
	Collaborating with universities without patent restrictions	1.40	0.77	1.32	0.75
Copyright	Selling copyright	1.11	0.83	1.67	0.83
	Buying copyright	0.48	1.43	1.43	0.71
	out-licensing copyright	1.67	0.42	0.00	1.67
	in-licensing copyright	0.00	2.50	0.00	0.00

In the case of non-patented technology, firms particularly seek financial benefits when they collaborate with universities, which allows them to derive income and save on IP protection costs. Releasing technology to the public allows them to improve their market position, confirming the importance, in the software industry, to build a base of users and gain recognition by releasing technology into the public domain. Innovation benefits are mainly sought when using non-patented technology, which give firms access to the best innovations. Finally, firms particularly use collaborations with universities in order to build strategic relationships.

In the case of open source - apart from financial benefits which are particularly sought from open source software development - there is not much

difference in the extent to which each benefit is sought by firms engaging in open source software and by those participating in other open source communities.

The same index can be computed at the level of marketplaces, rather than governance forms. The ‘Revealed Marketplace Advantage’ (RMA) index is computed as

$$RMA = (y_{ij}/\sum_i y_{ij})/(\sum_j y_{ij}/\sum_i \sum_j y_{ij})$$

where y_{ij} is the number of times that benefit i is chosen in marketplace j , $\sum_i y_{ij}$ the number of times that all benefits are chosen in marketplace j , $\sum_j y_{ij}$ is the number of times that benefit i is chosen in all marketplaces, and $\sum_i \sum_j y_{ij}$ is the total number of benefits chosen in all marketplaces (that is, the index is the ratio between the share of benefit i in marketplace j and the share of benefit i in all marketplaces).

This index allows us to compare the relative advantage of the various marketplaces in allowing firms to reach certain benefits.

As shown in the following table, firms particularly seek benefits relating to innovation and the building of strategic relationships when they engage in open source, financial benefits when they engage in copyright, and market benefits when they engage in patents.

Table 9. ‘Revealed marketplace advantage’ (RMA) for each category of benefits

Category:	RMA index			
	Patent	OS	Non-patented	Copyright
Finance	1.02	0.85	1.00	1.38
Innovation	0.95	1.03	1.04	0.90
Strategic relationships	0.94	1.18	0.97	0.75
Market	1.12	0.94	0.97	1.00

In order to quantify the extent to which a benefit is specific to one or a few governance forms, or whether it is equally sought in different governance forms, we compute the coefficient of variation of the RGA index across governance forms ($\sigma_{RGA}/\mu_{RGA} * 100\%$); similarly, we quantify the extent to which a benefit is specific to

a certain marketplace by computing the coefficient of variation of the RMA index across marketplaces ($\sigma_{RMA}/\mu_{RMA} * 100\%$). The higher the coefficient of variation, the more a certain benefit is specific to one or few governance forms or to a marketplace, so the stronger is the revealed advantage.

Table 10. Coefficients of variation across governance forms and marketplaces

	Finance	Innovation	Strategic relationships	Market
Index of governance specialization (patent marketplace): $\sigma_{RGA}/\mu_{RGA} * 100\%$	112.32	84.04	94.05	87.98
Index of governance specialization (open source marketplace): $\sigma_{RGA}/\mu_{RGA} * 100\%$	61.25	4.46	14.63	12.08
Index of governance specialization (non-patented technology marketplace): $\sigma_{RGA}/\mu_{RGA} * 100\%$	24.38	32.03	26.88	36.51
Index of governance specialization (copyright marketplace): $\sigma_{RGA}/\mu_{RGA} * 100\%$	89.55	69.87	116.15	85.00
Index of marketplace specialization: $\sigma_{RMA}/\mu_{RMA} * 100\%$	21.34	6.88	18.52	7.98

These results show that in proprietary marketplaces and in the non-patented technology marketplace, all benefits are very specific to certain governance structures within each marketplace.

In the case of open source, financial benefits are specific to open source software development, while the other benefits are similarly sought across open source governance forms. The coefficients of variation of the RMA indexes confirm that all kinds of benefits are sought across all marketplaces, so there is no strong effect of the role on markets on corporate IP strategies.

4.3 Institutional failures in IP marketplaces

In their use of different marketplaces, firm may encounter obstacles that prevent them from obtaining the value they seek. We now investigate the nature of these obstacles in response to RQ4. Furthermore, we check whether the obstacles are

somehow inherent to certain marketplaces or to specific governance forms within each marketplace. If that is the case, IP marketplaces would then appear to suffer from certain types of ‘institutional failures’ of which policymakers seeking to improve the smooth functioning of these institutions should be aware.

The table below⁷ summarizes the main obstacles that software firms encounter when engaging in various IP marketplaces (the columns do not sum to 100% since firms could choose more than one category of obstacles).

Table 11. Obstacles to participation in IP marketplaces

	Patents	Open source	Non-patented technology	Copyright
Search	20.3%	29.8%	17.8%	17.5%
Transparency	38.9%	38.1%	22.2%	22.5%
Contract	35.4%	52.4%	22.4%	55.8%
Regulation	5.7%	22.6%	12.3%	32.1%
No option chosen	44.1%	36.9%	48.3%	25.8%

In the patent marketplace, the greatest share of firms identify lack of transparency as the main problem (28% of firms find it difficult to assess the economic value of patents, and 18% find it difficult to assess their degree of novelty), followed by issues relating to contract design and enforcement, mostly having to do with difficulties in negotiating a price for the patent and the other terms of the contract (relevant to, respectively, 26.1% and 21.6% of respondents).

In the open source marketplaces, contract design and enforcement are the main problems: firms find it particularly difficult to enforce the IP contract (22.6%) and to establish trust with the other parties (29.8%). Thus, the risk of opportunistic behaviour in this marketplace appears to be quite high. Firms also suggest that the

⁷ In order to construct the shares presented in Table 11, the firms’ responses given with respect to each obstacle (as listed in the previous Table 4) were aggregated into the four main categories (‘search’, ‘transparency’, ‘contract’, ‘regulation’), taking care to avoid double-counting. The shares of firms ticking at least one obstacle in each category were computed for each IP governance form, and they were then averaged across all governance forms within each marketplace.

market lacks transparency - since they find it difficult to assess the economic value of open source (26.2%), and its degree of novelty (19%) - and that it is difficult to find the best open source projects (14.3%).

Firms report less obstacles when they exchange non-patented technology, where the main obstacles relate to transparency, particularly the difficulty in assessing the degree of novelty of the technology (16.2%), and to contract design and enforcement (negotiating a price and lack of trust are relevant to 10% of respondents).

For firms in the copyright marketplace, the main issues relate to negotiating the (non-price) terms of the patent contract (44.6%) and to accommodating different practices of firms (25%). Many find that the market lacks transparency in terms of assessing the degree of novelty of copyright (22.5%) and assessing its economic value (17%).

It is important to investigate whether these obstacles affect firms in all IP marketplaces or governance structures to a similar extent, or whether they are instead specific to certain ones. This would then help us focus more clearly our analysis of which obstacles are considered particularly relevant in each context.

Thus, we compute the ‘revealed governance advantage’ indexes mentioned earlier, only this time with respect to obstacles⁸.

With respect to proprietary IP marketplaces, transparency problems – which we have seen have mostly to do with assessing the patent’s economic value– are particularly relevant when selling, buying and in-licensing patents, while contract problems (mostly relating to difficulty in negotiating its price) are particularly relevant when buying and cross-licensing.

⁸ In order to compute the RGA indexes, and the following RMA indexes, the firms’ responses given with respect to each obstacle (as listed in the previous Table 4) were aggregated into the four main categories (‘search’, ‘transparency’, ‘contract’, ‘regulation’), taking care to avoid double-counting. The “no option” category of responses was not considered.

In the case of copyright, contract and transparency problems mostly relate to negotiating the non-price terms of the contract and assessing the degree of novelty of IP, and they are particularly relevant when selling and in-licensing copyright. Search problems are relevant when selling and out-licensing patents and when buying and in-licensing copyright. Patent regulations are found to be too rigid when in-licensing and cross-licensing, while different practices of firms are a problem when selling and out-licensing copyright.

Table 12. 'Revealed governance advantage' for the various obstacles

Marketplace	Governance form	RGA index			
		Search	Transparency	Contract	Regulation
Patents	Selling patents	1.20	1.33	0.71	0.00
	Buying patents	0.96	1.07	1.13	0.00
	out-licensing patents	1.80	1.00	0.71	0.00
	in-licensing patents	1.01	0.84	1.04	1.68
	cross-licensing patents	0.00	1.14	1.21	2.29
	participating in patent pools ⁹	n.a	n.a	n.a	n.a.
Open source	Participating in open source software development	1.05	0.92	1.03	0.98
	Participating in other open source communities	0.76	1.33	0.89	1.07
Non-patented technology	Releasing not patented product or process innovations to the public	1.43	0.56	1.11	1.00
	Releasing not patented product or process innovations to private firms	0.92	0.71	1.19	1.29
	Using not patented product or process innovations	0.95	1.48	0.74	0.67
	Collaborating with universities without patent restrictions	0.00	3.33	0.00	0.00
Copyright	Selling copyright	0.00	0.00	1.52	1.33
	Buying copyright	1.33	1.78	0.76	0.67
	out-licensing copyright	0.00	0.00	1.14	2.00
	in-licensing copyright	1.60	1.07	0.91	0.80

⁹ Since firms have not ticked any obstacles in the patent pool governance form, the RGA index cannot be calculated.

Contract and regulation issues (mostly relating to lack of trust, difficulty in negotiating a price, and to excessive exclusivity and rigidity of IP regulations) are particularly relevant when releasing non-patented technology to private firms.

Transparency issues are particularly important when using non-patented technology, and when collaborating with universities (in the former case, the main difficulty concerns assessing the degree of novelty of the technology, in the latter it concerns the difficulty in assessing its economic value).

We also compute the ‘revealed marketplace advantage’ introduced in the previous section, this time with respect to obstacles. This index allows us to compare the relative importance of each category of obstacles in each marketplace. Search issues particularly affect firms that engage in open source while transparency issues are a problem for firms in the patent and non-patented technology marketplaces. Regulation issues particularly affect firms in the copyright marketplace.

Table 13. ‘Revealed marketplace advantage’ (RMA) for each category of obstacles

Category:	RMA index			
	Patent	Open source	Non-patented technology	Copyright
Search	0.98	1.17	0.95	0.75
Transparency	1.12	0.82	1.16	0.92
Contract	1.09	1.03	0.88	0.93
Regulation	0.59	1.00	1.07	1.69

Finally, the coefficients of variation of the RGA and RMA indexes allow us to assess the extent to which obstacles are specific to certain governance structures and marketplaces.

In almost all cases, obstacles are found to be very specific to certain governance forms within each marketplace. They are instead less specific to individual marketplaces, since: firms find all categories of obstacles in all

marketplaces (with the exception of regulation problems, which are particularly reported by firms that engage in copyright).

Table 14. Coefficients of variation across governance forms and marketplaces

	Search	Transparency	Contract	Regulation
Index of governance specialization (patent marketplace) ¹⁰ : $\sigma_{RGA}/\mu_{RGA} * 100\%$	65.22	16.82	24.85	139.53
Index of governance specialization (open source marketplace): $\sigma_{RGA}/\mu_{RGA} * 100\%$	22.81	25.71	10.10	5.66
Index of governance specialization (non-patented technology marketplace): $\sigma_{RGA}/\mu_{RGA} * 100\%$	72.40	83.75	71.47	74.96
Index of governance specialization (copyright marketplace): $\sigma_{RGA}/\mu_{RGA} * 100\%$	116.42	122.47	30.52	50.51
Index of marketplace specialization: $\sigma_{RMA}/\mu_{RMA} * 100\%$	17.76	16.27	9.74	41.85

We also investigated the extent to which the obstacles that firms encounter in each marketplaces are correlated to the benefits they seek, but we did not find any strong patterns in this sense. This confirms that obstacles are more related to the nature of governance structures than to the firm's individual objectives.

4. Conclusions

The results show that software firms participate in a variety of proprietary and non-proprietary marketplaces, in which they seek a variety of benefits but encounter numerous obstacles. The intensity of engagement in a range of different marketplaces on the part of these firms challenges the mainstream view that knowledge privatization, normally attached to a patent, is necessary in order to remedy the market failure connected to the inherently public nature of knowledge, since all these marketplaces provide them with some kind of benefits – including financial benefits - and hence they all provide incentives for firms to produce and share their IP.

¹⁰ The coefficient of variation does not include the RGA index for the patent pool governance form, since this index could not be calculated.

For example, according to our sample of firms, the patent marketplace is not necessarily the place where ‘best’ innovations can be found, and patent protection is not always necessary to develop the superior innovations. Further, patents are not always necessary in order to increase market share: often, technological compatibility achieved through participation in non-proprietary IP and the professional recognition that these activities confer are more important in order to improve market positioning.

Also, financial gains are accrued in all marketplaces, not just proprietary ones. In the patent marketplaces, firms find it difficult to negotiate prices, often because they find it difficult to assess the economic value of the IP that they are trading. Consequently financial gains are not the primary benefit that firms seek in this marketplace.

Secondly, while the generally accepted argument is that the public nature of knowledge can often cause under-investment in knowledge production (what has been termed ‘the tragedy of commons’) much less attention has been paid to the failure of institutions such as IPR to function efficiently and smoothly. The results of our analysis show that firms encounter obstacles in all IP marketplaces, both proprietary and non-proprietary. It cannot therefore be assumed that these markets function perfectly: instead, interventions aimed at removing or easing such obstacles may be beneficial.

Thirdly, the analysis confirms that each IP marketplace is very different and their specific features must be considered in depth before broad IP policies are issued. While firms seek a wide range of benefits and encounter a wide range of obstacles in all marketplaces, the intensity with which they do so within each marketplace is different, and very often depends upon the specific governance structure used. Therefore, policymakers wishing to improve the functioning of IP marketplaces

should be aware of the obstacles that firms encounter when engaging in each of them: interventions that are appropriate in order to improve transactions in certain IP governance forms may not be necessary or even appropriate in others.

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