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*Incentives and Obstacles in the Patent
Governance of UK ICT Firms*

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Incentives and Obstacles in the Patent Governance of UK ICT Firms

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ABSTRACT:

This paper explores how firms exploit the patent marketplace to organise their strategic value creation using different patent governance forms. The focus is on how firms use the patent marketplace (through buying, selling, licensing, cross-licensing or pooling) to realise specific forms of strategic value (related to financial and non-financial strategic aims). The patent marketplace is an institution where knowledge assets are exchanged for value creation. Therefore, understanding the functionality and efficiency of the patent marketplace is important for value creation. The case study - based on thirteen UK ICT firms – explores the firms' patent governance, their behavioural patent incentives and the market obstacles they have experienced. This paper shows that patents are exchanged through specific forms of patent governance (such as buying, selling, out or in-licensing, cross-licensing and pooling) in order to realise specific kinds of strategic value. However, institutional inefficiencies may hamper the value creation process. Therefore, the obstacles that prevent the governance within the patent marketplace from functioning smoothly are also explored.

KEY WORDS:

Patent strategy; patent governance; UK ICT firms; firms' strategy; market obstacles.

1. INTRODUCTION: IMPORTANCE OF THE PATENT MARKETPLACE

This paper focuses on the strategic aspect of how patents are used in practice. The expansion of the usage of patents and the emergence of new ways to exploit them have brought to the fore the issue of their strategic value in terms of their generation, dissemination and appropriation. Having a patent is only a means to an end, and firms are trying their very best to create more value from their patents.

Mansfield et al (1981) and Hall and Ziedonis (2001) suggest that certain characteristics of patents bring forth different kinds of impact on their value based on the intended utilisation of patents. Furthermore, Cohen et al (2000) probe differences in motives for patenting across industries, while Levin et al (1987) focus on patent effectiveness across industries in explaining variations in R&D productivity. Their survey shows that covering R&D expenditures is not the primary motivation for appropriation from patents, and that those motivations are related to strategic value from patents which can be obtained through licensing markets (i.e. the patent marketplace). However, their contributions can be extended further by focusing on the patent marketplace as an important theoretical position underpinning this paper. The patent marketplace is an important platform for exchange, able to stress the institutional arrangements and social interactions, while the functionality of the marketplace creates more economic and social value.

The term ‘patent marketplace’ refers to the space, actual or metaphorical in which a market operates (Smith, 2002). It is a place where knowledge-based information is exchanged, and where patents act as the commodity. The patent marketplace is an important platform within the patent system, and plays a key role in introducing spill-over and technology transfer through technology adoption and learning. It is able to help firms to create more value from their patents, by sharing and giving access to others through licensing and cross-licensing, for example. In general, this will also create opportunities for more social economic equality in our society.

The commoditisation of patents has been seen as the best solution for firms to extract more value from their patents. It can therefore be deduced that it is financially advantageous for firms to know how they can leverage the rights given to them. This phenomenon can be

viewed as an effort to reward inventiveness and creativity throughout the economic system, which enables the sustainable development of industries in general, and firms in particular (IBM, 2006).¹

Most studies that deal with patent governances only focus on single aspects of the structures: either licensing only (for example: Bessy and Brousseau, 1998) or the patent pool only (for example: Lerner, Strojwas and Tirole, 2003), or a comparison between a few forms of governance (for example: Shapiro, 2001, who compares patent thickets in cross licenses, patent pools and standard-setting). The abovementioned studies on patent governance show that much work to date belongs to what that can be classified as a ‘first stage effort’, where the focus lies on communicating the importance of the specific governance in creating and managing competitive advantage. The theoretical work by Andersen and Konzelmann (2008), in which they consolidated all types of patent governance structures and related the different governance structures to different forms of market platforms where patents can be exchanged, has brought this issue to a new level.

This is relevant because different market-platforms function differently and are enforced in different ways. Also, the institutional economics literature (Hodgson 1987, 1999) argues that there is not only one market (as the standard textbook theory claims) but that there are many different types of market (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. Thus, an important theoretical position underpinning this paper is that markets are *platforms of social relations*. We also need to recognize that conflicts embedded in these social relations, or market obstacles, inhibit the effectiveness of the functioning of these markets (see section 2.2). Thus, the patent market cannot be reduced to simple supply and demand curves, as within standard textbooks. This point is also emphasized by institutional economics (Hodgson 1987, 1999).

¹ The perfect example to show the importance of the patent marketplace is Procter & Gamble's Connect + Develop programme. The programme pledged to source half of all of P&G's innovations from external sources, and to offer its patents up for licensing to others if they remained unused three years after being granted. This shows a clear change of mindset, where firms no longer see patents merely as an R&D tool, but also as part of their business strategy. Using external firms to accelerate firms' innovation process through returns for royalties is one major strategy (Economist Intelligence Unit, 2007).

Hence, this paper extends the existing literature of Andersen and Konzelmann (2008) by focusing on the operationalisation issues of the patent marketplace (including its strategic aims and obstacles), covering value creation and the value distribution of patents. The term ‘patent governance structures’ used in this paper refers to the selling, buying, out-licensing, in-licensing, cross-licensing and pooling of patents.²

This paper also deepens our understanding of the wide range of strategic benefits of patenting. Management and economics scholars have long recognised that some firms accumulate portfolios of patents for trading purposes (see, for example, Von Hippel, 1988; Grindley and Teece, 1997). Indeed, one set of survey evidence by Teece (1986) suggests that the economic value of intellectual property is highly context specific, hinging on its use within a particular technological or competitive setting. This paper builds on this literature, while suggesting that strategic benefits of patents may vary considerably even within an industry and are driven by firm specificity and patent governance structures.

To analyse this issue in more detail, this paper aims to explore particular incentives that motivate firms to participate in the patent marketplace in order to obtain some economic and social gains, which can be summarized in terms of (i) *financial* factors (which focus on the monetary benefits that come with patents), (ii) *market positioning* factors (which look into the formal and informal aspects of gaining market and industry recognition, such as competitive signalling and gaining market and industry recognition), (iii) *innovation methodologies* factors (which focus on the technological advances) and (iv) *network* factors (which look into the formal and informal aspects of establishing relationships such as joint ventures or community interaction).

This also allows us to investigate the reasons why firms engage in specific patent governance structures. Firms definitely know when and how to manoeuvre around patent thickets through institutional solutions such as patent pools (Merges, 2001; Shapiro, 2001). For example, patent pools and cross-licensing agreements will lead to ‘bundling’ effects and the ability to reduce the collective transaction cost (Merges and Nelson, 1990; Merges, 2001; Shapiro,

² Since this paper is investigating the patent marketplace, the governance structure of the ‘keeping at home’ or ‘hold on’ element is not considered.

2001). Similarly, a cross licensing agreement regarding patents may be due to strategic market positioning, whereas selling a patent may be due to the need to gain one-off income.

Despite the existence of such research that indicates the strategic benefits of patents, the theoretical and empirical literatures have focused very little on the functioning and efficiency of the patent marketplace itself. That is why this paper also contributes new empirical evidence towards an emerging literature on problems in the market for technology (i.e. patents) and their implication for firms' strategy (Arora et al, 2001). Specifically, it explores what factors inhibit or create obstacles in respect to the three broad strategic economic aims listed above. Obstacles faced in the IP marketplace, which are addressed in this paper, can be divided into four groups (and are analysed in detail in terms of 15 different obstacles in this paper): (i) *Market search problems*, (ii) *IP assessment problems*, (iii) *Contract and enforcement problems*, and (iv) *Regulation and practices*

Overall, this paper will shed new light on the relationship between firms' objectives (in terms of value seeking) and their governance structures (embedded in buying or selling patents, simple or cross licensing, or pooling). It also focuses on the obstacles that prevent the patent marketplace from functioning smoothly.

1.1 Why ICT firms?

This study examines firms in the domain of information and communication technologies (ICT) located in the UK. The selection of firms was actually consistent with the hype surrounding the information technology paradigm,³ wherein we hope to see great activity in the patent marketplace.

One of the reasons for the perceived increase of activity in the patent marketplace by ICT firms is due to the high level of disintegration of ICT modules production of products and components, especially software. These types of disintegration are later combined into more complex systems (Arora, Fosfuri and Gambardella, 2001). Such activities also involve a cumulative and incremental process where different things need to be combined to create commercially desirable products. The complex technologies underpinning the ICT industry

³ The information technology paradigm, which can also be known as 'knowledge economies', started around 1980s and 1990s, based upon the 'fifth Kondratiff'³ as explained by Freeman and Perez in 1986.

and the challenge of short life-cycle products mean that firms are inclined to become involved in the patent marketplace for patent transactions, especially because product innovation in the ICT sector is very closely tied to time.

Apart from that, many ICT firms, especially software firms, have limited investment in downstream commercialisation capabilities, and usually choose to license to bigger software firms (Arora, Fosfuri and Gambardella, 2001). The patent marketplace gives them a platform to be more competitive. Although it is less obvious how much the benefits of firms' involvement in the patent marketplace outweighs the obstacles faced, this is indeed an interesting perspective through which to understand ICT firms' experiences in the patent marketplace.

1.2 Data Selection

Recently, researchers have shown an increased interest in the technology market (Arora, Fosfuri and Gambardella, 2001). However, a more specific issue related to the patent marketplace focuses on patent transaction (Serrano, 2005), using patent reassignment data (Chesbrough, 2006) and patent intermediaries (Arai, 2000; Monk, 2009) in order to explain the patent market. While these types of evidence are interesting, it is more beneficial to know firms' motivations to participate in the patent marketplace in the first instance by illustrating firms' strategic benefits as an incentive. This supports Monk's (2009) claim that the growth of the patent market relates to firms' patent strategies.

Hence, this paper exploits micro-data involving a set of thirteen UK ICT firms, focusing on the embedded units of analysis (patent strategic benefits, obstacles firms experience and patent governance structures).⁴ This approach enables us to identify the subtle similarities and differences, and allows new categories and concepts to be identified (Eisenhardt 1989; Yin 2003). Respondents were asked to answer questions based on the number of transaction from September 2006 to September 2008. With regard to questions related to strategic aims (benefits) and obstacles, firms were asked to consider up to five of the most important benefits and obstacles for each governance structure for patent-related activities in which the

⁴ The data was collected as part of a U-KNOW project (Understanding the relationship Between Knowledge and Competitiveness in the Enlarging European Union: 2005-2009), which is an EU Specific Targeted Research Project (STRP) work package "An IPR Regime in Support of a Knowledge Based Economy".

firms were engaged. The interviews were conducted with knowledgeable respondents within each firm (such as the CEO, R&D manager, CTO and head of IP).⁵ The fieldwork was carried out between October 2008 and April 2009.

1.3 Paper outline

This paper examines the incentives for firms' involvement in the patent marketplace and the obstacles they face. The focus is on two issues: the strategic aims and the obstacles faced by firms and their specificities with patent governance structures. Section 1 covers the introduction and information on the data. Section 2 reviews some of the literature on firms' strategic incentives and value creation through the patent marketplace. It starts with section 2.1 - understanding the strategic aims, and then covers the obstacles in the patent marketplace in section 2.2. This literature review will reinforce the importance of this paper for understanding the patent marketplace. Section 3 covers the analysis of the data gathered, with an analysis of strategic benefits in section 3.1, followed by the analysis of the obstacles in section 3.2.

2: STRATEGIC INCENTIVES AND PATENT MARKET OBSTACLES

2.1 Literature review: The strategic incentives from patent portfolio management

This section addresses the first research question, [RQ1: What are the various types of strategic benefits that firms seek when exchanging patents?]. A list of variables were consolidated and classified in accordance with firms' broad incentives. Table 1.1 demonstrates the strategic incentives of firms when they participate in the patent marketplace.

Financial benefits

Table 1.1 illustrates three specific variables that explicate the financial factor. This financial factor drives firms into regarding patents as a competitive weapon and as a source of unexpected revenues. Patents, which allow firms to have some breathing space to develop more ideas without the risk of other people stealing them, can help firms to recover the fixed cost involved in the first place (Kitch, 1977). They can also be used to appropriate the initial

⁵ More precisely, in relation to firms that are involved in the patent marketplace, six interviews were conducted with R&D Managers/Chief Technology Officers/Heads of Operations and five interviews were conducted with heads of IP. In addition, two interviews were also conducted with person in other positions in the firms.

cost of innovation, as mentioned by Taylor and Silberston (1973). The fact that there is a well-documented relationship between research and development (R&D) and patenting (see Scherer and Ross, 1990) may also show firms' enthusiasm to use their patents to recover their investment in R&D.

Table 1.1 Firms' strategic incentives when participating in the patent marketplace

Broad incentives	Specific strategic incentives
Financial	Direct income from market transaction
	Cost cutting
	Increasing ability to raise venture capital
Market Positioning	Competitive signalling
	Professional recognition or brand recognition
	Increasing market share
Technological Innovation	Being able to use the best inventions or innovations
	Setting common standards / making or using compatible technology
	Innovation methodology: developing better technology
Network	Benefit from user or supplier involvement
	Increasing ability to enter collaborative agreements
	Building informal relationships with industry networks
	Giving something to the community

In contrast to past firms' behaviour where licensing was only used "as a means of extracting remaining value from a mature technology" (Telesio, 1979, p.14), today's firms will not allow their technology to mature and becoming worthless before thinking of creating more value out of it. Hence, cross-licensing has become a new trend that helps firms to share each other's patent portfolios of basic technologies. As highlighted above, firms decide to pursue this path in order to reinforce their market advantage. If firms need to use other technologies as a complement to their product, this will help them to save by not having to pay licensing fees to a third party. This will improve the credibility of a company's product by reducing the cost of components.⁶ In 2004, Sony and Samsung set the trend for competitors embarking on a cross-licensing agreement that focused not only on one product or technology, but also on each other's patent portfolios of basic technologies. However, they still exclude key technologies that help differentiate their products. Their aims are to speed up product development and avoid cross-border patent disputes (Takenaka and Layne, 2004).

⁶ As is the case with Dell, which uses its patents as the collateral for a USD16 billion cross-licensing deal with IBM that provides it with lower cost components (Rivette and Kline, 2000).

Additionally, knowledge, either generated inside or outside the firms, is important as an input to the firm's own R&D, which portrays their credibility and competitiveness, and also showcases the firm's level of innovativeness. This view is also supported by Engel and Keilbach (2007), who highlighted that venture capitalists choose firms that are able to demonstrate innovative output. They also confirmed that firms that are funded by venture capitalists have a higher number of patent applications, compared to the control group. It was found that these VC-funded firms had obtained patents even before the VC investments were made. In another study on Italian firms that went public between 1995 and 2004, Caselli, Gatti and Perrini (2009) encountered the same results as Engel and Keibach, who studied German firms.

The phenomenon might also be due to the changes in the financial regulatory framework in the 1980s, which started to allow the listing of patents in financial statements for Nasdaq (Coriat and Orsi, 2002; Hall, 2002). This important change placed more value on patents. Firms can simply increase their stock prices, just by possessing a strong patent portfolio (Lerner, 2002). All of these points support the notion of a 'financial driven innovation model' (Shapiro, 2001).

Market Positioning

Table 1.1 illustrates three specific incentives that explicate the market positioning factor. This factor drives firms to make their presence in the market known, through either gaining professional recognition, signalling or increasing their market share. According to Weigelt and Camere (1988), reputation-building initiatives work best when there are two or more players involved, with firms having information asymmetries regarding the value of the transaction. However, continuous commitment is needed in order to maintain one's reputation. Hence, the patent marketplace suits this description best.

One study by Bhattacharya and Ritter (1983) examined signalling by a firm with private information, especially in relation to the value of its innovation. On similar lines, Gallini and Wright (1990) focused on signalling to potential purchasers of the rights to the innovation. Their focus was on post-innovation signalling and the choice of contractual forms that convey the information advantages to others. In other words, the focus was on 'making their technology known to others'.

Patents are used to support firms' branding effectiveness, especially in trying to protect their own market share (Rivette and Kline, 2000).⁷ Reputation-based trading serves as assets that are able to reinforce the competitive advantage by increasing firms' access to external technologies (Gans and Stern, 2003), or by means of competitive signalling (Granstrand, 1999). Patent can be used to signal its technological strengths that enable firms to position themselves in the market. Reputation management through signalling is an important factor in attracting partners and external funding. This can be seen as a precondition for others' willingness to do business with any firm.

Apart from that, firms are also able to use patents to increase their market share by securing market protection or by building a wider user-based market. Firms' incentive to encourage the growth of their industry, rather than their own immediate profitability, also helps to reinforce their reputation in the market. Hence, out-licensing, or even cross-licensing, might be an excellent choice. This is supported by Ramello (2004), who highlighted that the primary aim of IPR is to give a certain amount of market power to its owner that will contribute towards the competitiveness of its market structure.

Technological Innovation Benefit

Table 1.1 illustrates three specific variables that explicate the technological innovation factor. Technological innovation often serves as a foundation for new knowledge. The interrelatedness between ideas and invention makes technology and innovation into elements of social progress. Merges and Nelson (1990) described this phenomenon as 'cumulative system technologies', where the connectivity makes new technologies more desirable than others. On that basis, this factor has increased in its importance due to the complexity of modern technology.

For firms, the main way to compete in the patent marketplace is by focusing on their chances of using the best invention or innovation. Firms develop or acquire key technology to ensure that the innovations that they offer are on a par with or better than their competitors' products. In simple words, there must be a customer value proposition. Firms that are able to use the best invention or innovation can gauge the advantage as a first mover, or as an early

⁷ IBM manages their brand value really well by providing external clients access to their research results that will also give monetary gain as well as building up their own reputation amongst clients

adopter. However, in order to do that, firms need to conduct searches. There is a significant stream of research on searching that focuses on how firms search in order to innovate (see Katila and Chen, 2008; Greve, 2003, among others), and how this type of competition promotes or deters innovation through searching (see, for example, Schumpeter, 1934; Scherer, 1990; Porter 1990). The patent marketplace is able to provide platforms to help firms in using the best invention acquired to recombine and innovate - an activity that is somewhat trackable by researchers through patent citations (see Rosenkopf and Kerkar, 2001; Katila and Ahuja, 2002).

On the other hand, patents are sometimes considered as bargaining chips that enable firms to access other resources. Firms may be forced to negotiate in order to get access to important technology. When that happens, firms may buy or in-license patents. However, certain types of technology may be part of a patent-pool, where they can only be accessed by members of the pool, which is very exclusive. Here, the concept of access comes into the picture. Firms that want to use the best invention and innovation will try their best to get access to the particular patent, which may lead to the best available technology.

Making or using compatible technology by competing for common standards also contributes towards firms' competitiveness. This is because, by using a compatible technology that is comparable to or better than existing products, firms are able to tap into the market more easily, and are hence able to increase profitability. However, firms that pursue cooperative options with other firms rather than involving themselves directly in the product markets may change the technological leadership, but this may not result in changes to the market leadership (Gans and Stern, 2003). Technological leadership is good enough to create a positive reputation that can also induce profitability.

Additionally, firms can be involved in setting the industry standard by participating in a patent-pool arrangement, where a group of firms that owns patents in a specific technology enforces its IPRs collectively. As an example, recently, mobile and IT industries have formed a patent-pool to develop new wireless technology standards (Anderson, 2007), wherein the majority of big firms in the industry participated in the pool.

Network Benefits

Table 1.1 illustrates four specific variables that explicate the network factor. In order to leverage on patents as a source of corporate competitiveness, firm may need to gain access to the market through cooperation and networking (Kortum and Lerner, 1999). Owning a good technology is not enough, especially for small firms. This is because the benefits of networking (i.e. geography and community of interest) can assist firms to open up their minds and increase their creativity.

This shows that networking with other firms can provide corporate competitiveness, either through informal or formal relationships. Formal business relationships will increase the ability to enter into collaborative agreements, and will enable firms to benefit from user-supplier involvement as part of their development strategy. Firms need to demonstrate the advantages that made them attractive in order to collaborate. Patents can also be used as a signal to others in order to showcase firms' capabilities. Stand-alone technology, which is sometimes represented with a patent, is more easily transferred compared to competency, which is embedded in the social system of the partner. On top of that, having a successful and famous R&D lab, or even product development skills, also enhance the success rate of the collaboration (Hamel, Doz and Prahalad, 1989).

Weck and Blomqvist (2008) studied inter-organisational relationships in the development of patents, finding that interaction with suppliers, customers and even R&D consortia could help inventors in solving related problems and also in developing new ideas. They also stressed that the buyer-seller relationship is valuable, in line with the issues highlighted by Trott (2002) regarding the importance of customers, suppliers, vendors and universities as important sources of innovation. This is because firms are able to learn from their feedback and make product adjustments for further improvement. Firms that have buyer-seller or even supplier-customer relationships are aiming to learn from each other. Learning is one of the best-known motives for inter-organisational ties (Kogut, 1988; Weck and Blomqvist, 2008).

Informal exchanges and socialisation enable firms to internalise the technological externalities that spill over from the technological or regional innovation systems in which

the firms operate. Hence, this type of knowledge is important to implement firms' internal knowledge by means of learning processes.

Gans and Stern (2003) highlight that one of the ways for start-up innovators to compete directly in the product market is through a strategy of cooperation, the value of which is determined by the price agreed through negotiations in the patent marketplace. This circumstance lends support to the assumption that networking through licensing is a normal way to conduct innovation, especially with complex technology (Smith, Dickson and Smith, 1991). It can also be said that complex technologies are the creation of networks of organisations that come together to carry out the perennial incremental innovation (Roycroft and Kash, 1999).

Overall, the paper explores four main categories through which strategic value can be realised through participating in patent marketplace. We anticipate that the patent governance structure applied for each strategic aim is not random (and that the thirteen UK ICT firms have some dominant patent governance structures for each strategic aim, which they believe enables them to reach their strategic aims).

This lead us to the next research question, while suggesting that strategic benefits of patents may vary considerably even within an industry and are driven by patent governance structures and not firm specificity.

RQ2: To what extent are the strategic aims (benefits) specific to certain patent governance structures?

2.2 Literature review: Obstacles in the patent marketplace

This section attempt to help addressing the third research question, [RQ3: What are the various types of obstacles that firms experience when exchanging patents?]. A list of variables were consolidated and classified in accordance to firms' broad obstacles in Table 1.2.

Table 1.2 *Obstacles experienced by firms in patent marketplace*

Broad obstacles	Specific obstacles
Search problems	Difficulty in locating the owners of a patent/patents
	Difficulty in locating the users of a patent/patents
	Difficulty in finding the best invention
Patent assessment / transparency problems	The description or drawing in the patent document is not clear
	Difficulty in assessing the degree of novelty/originality of the patent/patents
	Difficulty in assessing the economic value of the patent
Contract and enforcement problems	Difficulty in negotiating a price for the patent/patents
	Difficulty in negotiating the terms (not related to price) of the contract
	Excessive cost of enforcing the contract
	Problems (not related to cost) with enforcing the contract
	Trust issues (e.g. opportunistic behaviour, free-riding, or similar)
Regulation and practices	Regulations allow too exclusive rights
	International patent regulations do not fit the needs of different local markets
	Differences in practices of firms

There is a concern that the existence of too many patents with too few inventive steps can become a hindrance towards the effectiveness of exploitation of economic resources. Hence, when obstacles to bargaining in the marketplace are present, under-utilisation of patents might occur. The fragmented ownership of patents may lead to the under-use of economic resources, and this is where the term ‘tragedy of the anticommons’ arises to explain the problem (Heller and Eisenberg, 1998).

The strategic interaction in the patent marketplace can sometimes be turned into a strategic exploitation by firms, either through an increase in their speculative and opportunistic behaviour, or even through an increase in litigation cases. The issue of speculative behaviours among players, especially firms, brings up an important question as to whether firms feel compelled to patent in a complex industry after anticipating that others will do the same in order to maintain their status as a player, despite realising the complexity involved in patenting. Firms speculate in order to achieve profits using information and cost advantages. By patenting, firms will be able to protect themselves from infringers and ‘patent attack’ from other firms. In this context, firms decide to speculate in order to reduce the risks of not owning a patent.

Search Problems

Table 1.2 illustrates three specific obstacles that explicate a search problem. Search problems in the patent marketplace can appear with regard to owners, users and the invention itself. Firms may find it hard to find users for their invention, to find owners of the patent that they want to use, and most importantly to find the best invention amidst the sea of patents. The lack of access to patent data, either because the owner's information is not up-to-date or simply because there are too many patents, may be one of the reasons why this problem exists in the first place.

The aggressive patent filing pattern by firms contributes to the proliferation of patents. Accordingly, users have many choices to choose from, although some may say that most of the patents, when standing alone, have no economic value at all (Shapiro, 2001). Along similar lines, it has also been acknowledged that technological advances build upon one another cumulatively (Merges and Nelson, 1990; Scotchmer, 1991) and the ICT products themselves are likely to have multiple patents to cover their technology. This particular instance increases the number of patents and also the emergence of patent thickets (Shapiro, 2001). Ayres and Parchomovsky (2007) explain that potential users will find themselves in a bind when the technology is covered by multiple patents, owned by different patentees. More problems arise when a user needs to contact all the patentees who have a stake in the technology. In contrast, it is easier for users to identify a licensor or owner when a technology is covered by a single patent.

Kingston (2001), on the other hand, recommends that a lower cost of patent dispute in complex technology can be achieved through shared-risk compulsory licensing. However, Heller and Eisenberg (1998) argue that licensing solutions may fail with a very high transaction cost when a large number of patent holders are involved. Since ICT firms are involved with a complex technology (cumulative innovation), there is a possibility that these firms will fall into this proposed category.

Transparency Problems

Table 1.2 illustrates three specific obstacles that explicate transparency problems. In theory, patent documents are supposed to satisfy the disclosure requirement of patent law, making

sure that society benefits from the issued patent. The disclosure through the document should include how to make and use the invention.

Unfortunately, the assumption that all aspects of an ‘idea’ can be conveyed in words that explain how an artefact or technology works is over-optimistic in its understanding of how technology works (Carolan, 2009). This is because tacit knowledge embedded in a person (i.e. an inventor) is not easily transferable. This type of knowledge has been accumulated over the years through experience, which is not easily shared in written form.⁸

In fact, Macdonald (2001) explains that in practice, the patent document contains the information needed for the patent to be issued (i.e. based on the requirement of the patent system) and not the information required by the society to replicate and develop the invention. This sometimes leads to problem whereby others do not even understand the descriptions or drawings in the document, although some inventors deliberately do that as part of their patent application strategy.

As a result, it is impossible to reproduce the technical work that is patented, as the wording of the patent’s documents is not sufficient (Bessy and Brousseau, 1998). In the same paper, they also highlighted three factors that contribute towards the incompleteness of patent documents, as identified in Bessy and Brousseau (1997): (i) the boundaries of human language; (ii) the description cost; (iii) the failure of the patent institution itself (which incites firms to hide important information that is crucial to a patent). On top of that, test data and industrial secrets, to name but a few, may not be declared and translated in the patent document.

Although the average application document is between 20 and 40 pages long, the situation is made worse by instances when the patent application carries 160,000 pages of information,

⁸ The significance of the tacit knowledge in reproducing technology based on the patent document supplied can be seen in Collins’ (1974) account of the difficulties encountered in their effort to replicate TEA (Transverse Electrical discharge in gas at Atmospheric pressure). Similar examples can also be seen in Steen (2001) on the problem with the reproduction of synthetic organic chemistry when relying only on patent documents. These two examples show that a patent document is not enough to replicate an idea.

especially for biotechnology patents (Hardy, 2002). This might be due to increased complexity or even used purely as a business strategy.

Another issue that is related to the transparency problem is the level of quality of patents. Lemley (2001) has argued that the cost of having higher quality patents may exceed its benefit.⁹ Low quality patents can create uncertainty among firms as investors, which raise the transaction costs for inventors obtaining access to it. Although some scholars, such as Shapiro (2001), have argued that the large number of low quality patents may increase the fragmentation of property rights covering complementary technologies, recent experience (IBM, 2006) suggests that it has the consequences of complicating the patent marketplace. It will be difficult for firms to access the degree of novelty and understand the economic value of a patent with so many low quality patents around. In fact, according to the report produced by IBM in 2006, there are too many similar patents with no inventive step, which also causes many other problems. This brings us to the problem of “patent flooding” where firms file a large number of patent applications on every conceivable improvement on a broad basic invention patented by a rival firm (Sankaran, 2000).

The issue of broad patents means that competitors will find it difficult to develop competing alternatives. This is because this practice limits the work of others to explore and widen the scope of an invention. According to Merges and Nelson (1990), firms conduct research according to their path dependence. Firms usually work within their own skills and competency and leave unexplored areas for others to explore, which can be done through licensing. However, according to Caves, Crookell and Killing (1983), the cost of technology licensing can be extremely high, especially for a targeted licensee. To some extent, this leads to more problems, as it is difficult to put a price on any transaction such as licensing.

⁹ Robert Merges (1999) refers to quality patents as “valid patents which may be reliably enforced in court, consistently expected to surmount validity challenges and dependably employed as a technology transfer tool”. Although this is indeed an excellent definition, it is unable to give the patent office a clear-cut definition of the process of granting a high-quality patent. This ambiguity could also contribute towards the proliferation of low-quality patents.

Contract and Enforcement Problem

Table 1.2 illustrates four specific obstacles that explicate the contract and enforcement problem. This problem is usually characterised by issues related to negotiation, cost and trust. Interestingly, this problem highlights the risk of being unable to enforce control, and also explains the risk of opportunism and quality (Mottner and Johnson, 2000).

Opportunism is a central concept in Williamson's transaction cost economic logic. According to him, opportunism is the seeking of self-interest with guile. It allows for strategic behaviour, to which he refers as "the making of false or empty, that is self-disbelieved, threats and promises in the expectation that individual advantage will thereby be realised" (Williamson, 1975; p.26). This contributes towards the difficulty in negotiating the appropriate price or even the terms of the contract, especially when firms from both sides are behaving strategically with a view to maximising their intake.

Although firms who are specialised in their own technology might be able to differentiate between high and low quality patents, having bounded rationality, it is impossible for firms to include everything in a contract while maintaining an affordable transaction cost (Williamson, 1979). This may later lead to difficulties in reaching agreement, either due to high cost incurred or inability to put everything into writing. It is also very difficult to avoid opportunistic behaviour in business dealings, although trust is an important factor in a successful market interaction (Bachmann, 2006).

Aulakh, Kotabe and Sahay (1998) discussed types of uncertainties that impact on licensing's perception on risk. Although this discussion was written in the context of international licensing, it seems that two of the obstacles faced by firms are quite similar in the context of contract problems. The two factors highlighted, and which can be considered relevant to those involved in licensing in general, are: (i) the potential for opportunistic behaviour, and (ii) uncertainty in valuing the licensed technology¹⁰.

¹⁰ The other factor is related to the host country's economic and legal circumstances. Although legal factors can be regarded as one of the obstacles faced by firms in general, the host country's economic level is not relevant in the context of this research

The uncertainties in terms of completing the contract or even the value and payment mechanism contribute towards the problem with the patent marketplace. Cost is an issue here due to the fact that not all contingencies are known beforehand, and it is impossible to put every single issue in the contract, as this will also make the negotiation process longer and is unrealistic in practice. In fact, there are numerous uncertainties involved in this kind of partnership, and this will also create more problems later on (especially when the contract needs to be amended due to changes of circumstances). The incomplete contracting model (see Williamson, 1996) is thus preferable in many ways. However, if too little information is covered in the contract, trust issues will emerge. Will the other party honour the agreement? Conversely, if too many constraints are covered in the contract (by detailing every single issue), the other party might be annoyed by the rigidity of the arrangement.

Regulation and practices

Table 1.2 illustrates three specific obstacles that explicate the problem of regulation and specific practices. When addressing this problem, it is useful to start with the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) administered by the World Trade Organization (WTO), which was negotiated at the end of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) in 1994, having emerged due to the increase in piracy. The call for an international IPR harmonisation regime was initiated through intense lobbying by the United States, supported by the European Union, Japan and other developed nations, whose strategy was to link trade policy to certain minimum standards for patent regulation.

This much acclaimed agreement managed to create an understanding that all nations are in need of strong intellectual property rights in order to achieve economic progression. The one-size-fits-all IPR regime ignores the fact that each nation has its own capabilities and needs (Carolan, 2009). Despite that, to ensure that its enforcement does not become a barrier to legitimate trade, it also takes into account differences in national legal systems. By setting the minimum standard, the agreement thus recognises that there will still be diversity, and some issues are left for national action (Ohly, 2008). The agreement also creates an understanding of the importance of the harmonisation of strong property rights regimes, although, on the contrary, as shown by Kumar (2003), countries like Japan and Korea achieved substantial technological learning under weak IPR protection regimes during their early days. This

supports the claims that the international patent regulations do not fit the needs of different local markets, as each nation has its own development trajectories, with different needs and capabilities.

On the other hand, the differences in firms' practices can also make any cooperation difficult. In terms of implementation, some firms – particularly larger firms - may have their own IP department, headed by their own IP manager, whereas others may just manage their patent portfolios within their own marketing or R&D departments. This depends on the level of importance given by the management towards their patent stock. It has been suggested that in-house patent law expertise makes some contribution towards firms' patenting activities (Somaya, Williamson and Zhang, 2007). This may also explain some differences in terms of how these firms participate in the patent marketplace.

As with the issue of strategic aims, the obstacles experienced may vary in accordance to patent governance structures. This leads us to address the research question below.

RQ4: To what extent are the obstacles experienced by firms specific to certain governance structures?

3. ANALYSIS

This section addresses the four research questions highlighted earlier. Section 3.1 covers the results for strategic aims, section 3.2 highlights the role of governance structures, whilst section 3.3 looks at obstacles.

3.1 Relative importance of strategic benefits

This section seeks to identify the various types of strategic aims that firms seek when exchanging patents in the patent marketplace, thereby addressing RQ1. This explorative paper is also an attempt to understand the complex relationship between the strategic aims and patent governance structures, which will address RQ2.

Table 1.3 is an overview of the percentages of respondents who choose at least one benefit in the corresponding category, averaged across governance structures, taking care to avoid double-counting.

Table 1.3 Strategic aims from participation in the patent marketplace

Economic and social benefits categories	Specific benefits	Percentage*
Financial	Direct income from market transaction (e.g. to cover R&D or for profit)	10%
	Cost cutting (e.g. via savings on royalties or patent administration)	10%
	Increasing ability to raise venture capital (e.g. via the stock market)	2%
Market positioning	Competitive signalling	8%
	Professional recognition or brand recognition	6%
	Increasing market share (e.g. building broader user base or securing market protection)	16%
Technology and Innovation	Being able to use the best inventions or innovations	18%
	Setting common standards / making or using compatible technology	6%
	Innovation methodology: developing better technology	8%
Network	Benefiting from user or supplier involvement as a development strategy (e.g. through learning and feedback)	4%
	Increasing ability to enter collaborative agreements (e.g. joint ventures, strategic alliances, etc.)	12%
	Building informal relationships with industry networks	2%
	Giving something to the community	0%

*Percentage of firms that choose each specific aims

Specifically, it seems that the highest benefit sought is related to fostering innovation – ‘being able to use the best inventions or innovations’ (18%). The importance of innovation benefits for the patent marketplace 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). The second highest strategic benefit is concerning building and increasing market share (16%). The third benefit is the increasing ability to enter collaborative agreements (12%). Surprisingly, two financial benefits come behind the abovementioned: cost cutting measures and direct income each score only 10%. The rest of the strategic benefits are all below 10%, and can be seen in Table 1.3.

These results indicate that each of the categories (financial, market positioning, technology and innovation, and networks) has at least one benefit that is rated by more than 10% of respondents as being among the most sought-after benefits. Although the technology and innovation category scores the highest, it is worth highlighting here that the financial category has two benefits with percentages of 10%. This suggests that firms in the ICT sector do not attribute exclusive importance to the use of patents as a means to gain access to better technology: the importance of financial gains still plays an important role in market strategies. However, overall, the most important factor for firms to take into consideration when involved in the patent marketplace is in relation to technology and innovation, and this corroborates previous literature on the rationale of the patent system (see Andersen, 2004). Financial and market positioning factors are the second most important factors, and the network factor is the least important of all the rest.

The next section analyses the role of governance structures in the value seeking process of patent marketplace. This will be able to deepen our understanding of the relationship between the use of governance structures in patent marketplace and the seeking of benefits.

3.2 Role of governance structures

It is well known that firms seek all kinds of benefits in the patent marketplace with varying degrees of intensity. Thus, in answering to RQ2 [To what extent are the strategic aims specific to certain patent governance structures?], it is interesting to know whether the benefits firms seek are specific to certain patent governance structures (see Table 1.4). The ‘Revealed Governance Advantage’ (RGA) index is calculated in order to answer these questions.

Basically, the index built measures the extent to which a certain governance structure (in which firms participate) ‘specialises’ in seeking a certain strategic benefit, compared with all governance structures overall. Because this index is constructed in exactly the same way as the widely used Revealed Technological Advantage index¹¹, it is referred as the index of ‘Revealed Governance Advantage’ (RGA). The index is able to reinforce the idea of a strong

¹¹ Revealed Technological Advantage (RTA) is a widely-used index to measure cumulative technological achievements in relation to innovation and technology based competitiveness. (See, for example, Amendola, Dosi and Papagni, 1993 and Andersen, 2001)

link between the firm's overall strategy and the governance it chooses. The calculation of the index is explained in the following paragraphs.

Let x_{ij} be the number of times that benefit i is chosen in governance structure j , and $\sum_i x_{ij}$ the number of times that all benefits are chosen in governance structure j ; let $\sum_j x_{ij}$ be the number of times that benefit i is chosen in all governance structures, and $\sum_i \sum_j x_{ij}$ measures the total number of benefits chosen in all governance structures (that is, the index is the ratio between the share of benefit i in governance structure j and the share of benefit i in all governance structures). Then, for a certain governance structure, 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 benefit i is relatively under-specialized in governance form- j , while a value greater than 1 indicates that governance form i is relatively over-specialized in that benefit.

The patterns that can be seen in Table 1.4 are very interesting. The highlighted columns are those that have an index of more than 1, which means that each governance structure highlighted is relatively over-specialised in that specific benefit. However, in order to quantify the extent to which a benefit is specific to one or a few governance structures, or whether it is equally sought in different governance structures, the coefficient of variation of the RGA index across governance structures ($\sigma_{RGA} / \mu_{RGA} * 100\%$) is computed. This is also to measure the robustness of the results. The higher the coefficient of variation, the more a certain benefit is specific to one or a few governance structures, so the stronger is the revealed advantage.

Table 1.4: Index of Revealed Governance Advantage for strategic benefits*

Economic and social benefits categories	Specific Benefits ¹²	Selling	Out-Licensing	Buying	In-Licensing	Cross-licensing	Pooling
Financial	Direct income	11.67	3.59	0.00	0.00	0.00	0.00
	Cost cutting	0.00	0.77	0.71	0.42	2.67	0.00
	Raising venture capital	0.00	0.00	0.00	2.92	0.00	0.00
Market Positioning	Competitive signalling	0.00	1.35	2.50	0.73	0.00	0.00
	Professional recognition or brand recognition	0.00	3.59	0.00	0.97	0.00	0.00
	Increasing market share	0.00	0.49	1.82	1.06	0.85	0.00
Technology and Innovation	Use the best inventions	0.00	0.00	1.25	1.28	1.17	2.19
	Innovation methodology	0.00	0.00	2.00	1.75	0.00	0.00
	Common standards	0.00	3.59	0.00	0.00	0.00	11.67
Network	Benefit from user or supplier involvement	0.00	0.00	0.00	2.92	0.00	0.00
	Collaborative agreements	0.00	0.60	0.56	1.30	1.56	0.00
	Informal relationships	0.00	1.35	0.00	0.73	2.33	0.00
	Giving something to the community	N/A	N/A	N/A	N/A	N/A	N/A

*Note: The column are arranged according to the type of transaction, whereby selling and out-licensing can be categorised as dispensation movement of patent rights, while buying and in-licensing can be categorised as acquisition movement of patent rights. Cross-licensing and patent pooling can be categorised as cooperation movement with sharing and exchanging patents. This is done so that any patterns can be more visible to the naked eye.

It can be seen from Table 1.5 that all the values of the coefficient of variation have very high percentages, with all of them being above 100% except for the benefits of increasing market share, use of the best inventions and collaborative agreements. However, the figures for these three benefits are still high, with the lowest being 86%. These results show that in the patent marketplace, the benefits stated above are very specific to certain governance structures, and very robust.

¹² The specific benefits here have been simplified due to space constraints

Table 1.5 Coefficients of variation across governance structures for RGAs

Economic and social factors in the value of patents	Economic and social benefits	Coefficient of Variation Across Governance Structures (patent marketplace): $\sigma_{RGA}/\mu_{RGA} * 100\%$
Financial	Direct income from market transaction	185%
	Cost cutting	130%
	Increasing ability to raise venture capital	245%
Market Positioning	Competitive signalling	133%
	Professional recognition or brand recognition	189%
	Increasing market share	99%
Innovation and Technology	Being able to use the best inventions or innovations	86%
	Setting common standards / making or using compatible technology	185%
	Innovation methodology: developing better technology	155%
Network	Benefit from user or supplier involvement	245%
	Increasing ability to enter collaborative agreements	97%
	Building informal relationships with industry networks	130%
	Giving something to the community	N/A

In the patent marketplace, it seems that the thirteen UK ICT firms particularly focus on gaining a direct income through selling and out-licensing their patents. This is predicted since both governance structures are the most conventional way to gain some monetary compensation from patents and the results also corroborate the findings of Mann (2005). Additionally, firms in-license when they want to increase their ability to raise venture capital. On the other hand, firms particularly seek the cost-cutting measure when they engage in cross-patenting. This also reinforced by Merges and Nelson's work (1990), which highlights the fact that cross-licensing has its own social value of sharing and exchanging, which is actually the best way to cut cost. Another interesting trend is on setting common standards, where the thirteen UK ICT firms focus on out-licensing and pooling as the way to achieve this. They also focus on out-licensing and cross-licensing with regard to building informal relationships with industry networks. The rest of the pattern can be seen in Table 1.4.

3.3 Analysis: obstacles experienced in the value creation process

Relative importance of obstacles

This section seeks to identify the various types of obstacles that firms experience when exchanging patents in the patent marketplace, thereby addressing RQ3 [What are the various types of obstacles that firms experience when exchanging patents?]. The next subsection

looks into whether there is a link between the various patent governance structures and the obstacles that firms seek, thereby addressing RQ4 [To what extent are the obstacles experiences by firms specific to certain governance structures?].

Table 1.6 demonstrates the obstacles that the thirteen firms encountered when engaging in the patent marketplace. This is an overview of the percentages of respondents who chose at least one obstacle in the corresponding category, averaged across governance forms, taking care to avoid double-counting.

Table 1.6 Obstacles in the Patent Marketplace, sorted and averaged across governance structures

Broad categories	Obstacles	Percentage
Search problems	Difficulty in locating the owners of a patent/patents	5%
	Difficulty in locating the users of a patent/patents	7%
	Difficulty in finding the best invention	7%
Patent assessment / transparency problems	The description or drawing in the patent document is not clear	7%
	Difficulty in assessing the degree of novelty/originality of the patent/patents	11%
	Difficulty in assessing the economic value of the patent	14%
Contract and enforcement problems	Difficulty in negotiating a price for the patent/patents	16%
	Difficulty in negotiating the terms (not related to price) of the contract	11%
	Excessive cost of enforcing the contract	11%
	Problems (not related to cost) with enforcing the contract	5%
	Trust issues (e.g. opportunistic behaviour, free-riding, or similar)	2%
Regulation and practices	Regulations allow too exclusive rights	2%
	International patent regulations do not fit the needs of different local markets	2%
	Differences in practices of firms *	0%

* No firms chose differences in practices of firms as one of their obstacles in the patent marketplace

Based on the table above, it can be seen that the greatest percentages of firms identify ‘difficulty in negotiating a price for the patent’ (16%) as the main obstacle. The obstacle chosen least frequently is in relation to issues on trust, patent regulations with overly exclusive rights and also international patent regulations that do not fit the needs of local markets; each of which only represent 2% of the total obstacles.

Specifically, it seems that difficulty in accessing the economic value of patents is the second most important obstacle, at 14%. Difficulty in assessing the degree of novelty of patents, difficulty in negotiating the terms (not related to price) of the contract and excessive cost of enforcing the contract are the three obstacles that hold 11%. It seems that ‘differences in practices of firms’ is not a problem for the thirteen UK ICT firms involved in the patent marketplace.

The results indicate that two broad categories (transparency problems and contract and enforcement problems) have the most obstacles, with more than 10% among the most important obstacles. This suggests that the thirteen firms found these two categories’ problems to be the most problematic issues. This is to be expected, since a contractual agreement is needed for any kind of patent transaction, and Bessy and Brousseau (1998) have already highlighted a few specific problems with regard to contractual arrangements.

The next section analyses the role of governance structures in the value-seeking process of the patent marketplace in relation to its obstacles. This will be able to deepen our understanding of the relationship between the use of governance structures in the patent marketplace and the obstacles encountered.

Role of governance structures

It is well known that firms experience a range of obstacles in the patent marketplace with varying intensities. Thus, in answering RQ4 [*What obstacles, if any, encountered by firms in their value creation process?*], it is interesting to know whether the obstacles experienced are associated with the firms’ governance structures. A similar index to the RGA, called the ‘Revealed Governance Obstacle’ (RGO) index, is calculated in order to answer the question.

In calculating the RGO, let x_{ij} be the number of times that obstacle i is chosen in governance structure j , and $\sum_i x_{ij}$ the number of times that all obstacles are chosen in governance structure j ; let $\sum_j x_{ij}$ be the number of times that obstacle i is chosen in all governance structures, and $\sum_i \sum_j x_{ij}$ measures the total number of obstacles chosen in all governance structures (that is, the index is the ratio between the share of obstacle i in governance structure j and the share of

obstacle i in all governance structures). Then, for a certain governance structure, the revealed governance obstacle index is:

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

Table 1.7: Index of Revealed Governance Obstacles (RGO)

Broad category	Obstacles	Selling	Buying	Out-Licensing	In-Licensing	Cross-patenting	Pooling*
Search problems	Difficulty in locating the owners of a patent/patents	0.00	0.00	0.00	2.62	0.00	NA
	Difficulty in locating the users of a patent/patents	3.80	0.0	4.38	0.00	0.00	NA
	Difficulty in finding the best invention	0.00	1.90	0.00	1.57	0.00	NA
Patent assessment / transparency problems	The description or drawing in the patent document is not clear	0.00	0.00	0.00	1.97	1.46	NA
	Difficulty in assessing the degree of novelty/originality of the patent/patents	0.00	1.58	0.65	1.16	0.65	NA
	Difficulty in assessing the economic value of the patent	2.34	1.10	0.90	0.81	0.90	NA
Contract and enforcement problems	Difficulty in negotiating a price for the patent/patents	1.27	1.58	0.49	0.87	0.97	NA
	Difficulty in negotiating the terms (not related to price) of the contract	1.52	0.95	1.17	0.79	1.17	NA
	Excessive cost of enforcing the contract	0.00	0.59	1.46	0.98	1.46	NA
	Problems (not related to cost) with enforcing the contract	0.00	0.95	2.34	0.00	2.34	NA
	Trust issues (e.g. opportunistic behaviour, free-riding, or similar)	0.00	0.00	0.00	2.62	0.00	NA
Regulation and practices	Regulations allow too exclusive rights	0.00	0.00	0.00	1.31	2.92	NA
	International patent regulations do not fit the needs of different local markets	0.00	0.00	0.00	2.62	0.00	NA
	Differences in practices of firms **	NA	NA	NA	NA	NA	NA

* Since no firms have ticked any obstacles for patent pool, this governance form was not included in the analysis, and is thus denoted as NA.

** No firms chose differences in practices of firms as one of their obstacles in the patent marketplace. Calculation for the RGO also cannot be calculated, and is thus denoted as NA.

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

In order to quantify the extent to which an obstacle is specific to one or a few governance structures, or whether it is equally experienced in different governance structures, the coefficient of variation of the RGO index across governance structures ($\sigma_{RGO}/\mu_{RGO} * 100\%$) is computed. This is also to measure the robustness of the results. The higher the coefficient of variation, the more a certain obstacle is specific to one or few governance structures, so the stronger is the revealed advantage.

Table 1.8: Coefficients of variation across governance forms for RGOs

Broad category	Obstacles	Index of governance specialization (patent marketplace): $\sigma_{RGO}/\mu_{RGO} * 100\%$ ¹³
Search problems	Difficulty in locating the owners of a patent/patents	224%
	Difficulty in locating the users of a patent/patents	138%
	Difficulty in finding the best invention	138%
Patent assessment / transparency problems	The description or drawing in the patent document is not clear	139%
	Difficulty in assessing the degree of novelty/originality of the patent/patents	74%
	Difficulty in assessing the economic value of the patent	53%
Contract and enforcement problems	Difficulty in negotiating a price for the patent/patents	40%
	Difficulty in negotiating the terms (not related to price) of the contract	25%
	Excessive cost of enforcing the contract	69%
	Problems (not related to cost) with enforcing the contract	104%
	Trust issues (e.g. opportunistic behaviour, free-riding, or similar)	224%
Regulation and practices	Regulations allow too exclusive rights	153%
	International patent regulations do not fit the needs of different local markets	224%
	Differences in practices of firms	NA

It can be seen from Table 1.8 that only some of the obstacles have coefficients of variation whose values are more than 100%. This result suggests that not all obstacles experienced by

¹³ The calculation coefficient of variation for obstacles does not include the patent pool governance structure, since the RGO index for this structure cannot be calculated.

firms are specific to certain governance structures. It also shows that the highest obstacles chosen by the thirteen firms are the ones with the lowest coefficients of variation. This indicates that the obstacles experienced by the thirteen firms are not specific to certain governance structures, and are more generic across patent governance structures.

SECTION 4: CONCLUSION

This explorative paper demonstrates that firms' strategic aims are specific to the choice of patent governance structures (buying or selling patents, in or out-licensing, cross licensing, or pooling) used for value seeking. Results did not show a strong pattern between the obstacles firms experienced with the governance structures, which may support the claim that obstacles are actually related to the nature of the patent marketplace, and not to any specific governance structures.

The implications of the results for policy and management are manifold. For example, we see that firms are seeking a variety of forms of economic value from their patents, and that they use a variety of patent governance forms to reach this value, so there is no 'one size fits all' policy or management for patents regarding the support of the value creation process. Also, value creation processes are not automatic, but policy makers and industrialists need to recognize the obstacles and conflicts experience by firms participating in such activities, which may reduce the value they realize.

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