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Defensive and Evasive IP Strategies: An Exploratory Analysis among Sectors

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Abstract

State-of-the-art:
A growing literature has begun to address the company strategies behind the acquisition and use of intellectual property (IP), and scholars within this literature have sought to understand the linkages between IP as a strategic tool and its impact on firm competitive advantage and performance (for a review see Somaya, 2012; Pisano, 2006). One commonly understood strategic use of IP is to prevent the imitation of- or to isolate- the firm?s rent-yielding assets (Rumelt, 1984; Mahoney & Pandian, 1992), which represents a proprietary IP strategy. By contrast, firms also often employ defensive or evasive IP strategies that are designed to respond to IP that can be potentially acquired and enforced against them by other firms and entities. The ultimate goals of a defensive IP strategy are to retain design and commercial freedom (despite the IP held by others), and avoid being held up for exorbitant rents.
Theoretical arguments:
Prior research on companies? stated reasons for obtaining patents has noted a number of motivations that are consistent with a defensive IP strategy, such as (defensive) blocking, building (defensive) thickets, avoiding litigation by others, and use in negotiation and exchange (e.g., Blind et al., 2006; Blind et al., 2009; Cohen et al., 2000; Cohen et al., 2002; Duguet & Kabla, 1998). Indeed, the idea that firms build patent portfolios or thickets to defend against litigation by other patent owners is well understood (Hall & Ziedonis, 2001; Reitzig, 2004; Ziedonis, 2004), and it is also recognized that such portfolios are often cross-licensed to avoid litigation (Grindley & Teece, 1997; Galasso, 2011; Galasso et al., 2011).
Research gap and contribution:

However, research has remained largely focused on defensive patent portfolios or thickets, while a range of alternative defensive strategies- such as inventing around IP, terminating R&D projects to avoid infringement, licensing-in rights, opposing or revoking rights, and so on- remain underexplored. Additionally, we currently know very little about the prevalence of different defensive and evasive strategies and their distribution across different types of industries and firms. Thus, in this paper we investigate the prevalence and predictors of companies? usage of a range of different defensive and evasive IP strategies. Rather than focus on a single defensive strategy- such as the building of deterrent IP portfolios- we take a broad exploratory approach to contribute to our neglected understanding of a wide range of defensive and evasive strategies.

Data and method:

The empirical setting of this study is based on 6,010 German manufacturing and services companies. The data we use come from the 2008 German MIP (Mannheim Innovation Panel; ZEW) which represents the German Community Innovation Survey (CIS). We exploratorily detect and interpret underlying structural relationships among the different defensive and evasive strategies with the help of multiple correspondence analysis- a categorical data analysis technique.

Results:

The empirics reveal interesting differences for manufacturing and non-manufacturing sectors as well as for subclasses within the manufacturing sectors, which can be explained by differences in the underlying IP regime in each sector. In general, we find that the two most common defensive strategies used by manufacturing firms are modification of innovation projects and in-licensing whereas the two least common ones are stopping of R&D projects due to missing access to property rights and cross-licensing. Evidently, the portfolio of defensive and evasive IP strategies used varies by size such that smaller firms mainly rely on one or two strategies whereas bigger firms employ a larger defensive IP strategy arsenal. We also find evidence for different combinations of defensive and evasive IP strategies among sector and size classes.

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Defensive and Evasive IP Strategies – An Exploratory Approach Among Sectors

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Abstract

One commonly understood strategic use of intellectual property (IP) is to prevent the imitation of the firm's rent-yielding assets, which represents a proprietary IP strategy. By contrast, firms also often employ defensive or evasive IP strategies that are designed to respond to IP that can be potentially acquired and enforced against them by other firms and entities. However, research has remained largely focused on defensive patent portfolios or thickets, while a range of alternative defensive strategies – such as inventing around IP, terminating R&D projects to avoid infringement, licensing-in rights, opposing or revoking rights – remain underexplored. In this paper, we exploratorily investigate the prevalence and predictors of companies' usage of a range of different defensive and evasive IP strategies. The empirical setting of this study is based on 2,995 innovative German manufacturing and service companies. We apply multiple correspondence analysis – a categorical data analysis technique – and find evidence for different combinations of defensive and evasive IP strategies among sector and size classes. Our results have implications for policy and the strategic management of IP.

Keywords: IP Strategy; Appropriation; Invent-around; Licensing; Modification; Out-of-court Settlement; Patent Thicket; Multiple Correspondence Analysis

1 Introduction

A dramatic growth in patenting since the early 1980 (also known as patent surge) has raised researchers' awareness who argue that firms use patents strategically in technology competition (Neuhäusler, 2012; Blind et al., 2009).

Therefore, a growing literature has begun to address the company strategies behind the acquisition and use of intellectual property (IP), and scholars within this literature have sought to understand the linkages between IP as a strategic tool and its impact on firm competitive advantage and performance (for a review see Pisano, 2006; Somaya, 2012). One commonly understood strategic use of IP is to prevent the imitation of – or to "isolate" – the firm's rent-yielding assets (Mahoney and Pandian, 1992; Rumelt, 1984), which represents a proprietary IP strategy. By contrast, firms also often employ defensive or evasive IP strategies that are designed to respond to IP that can be potentially acquired and enforced against them by other firms and entities. The ultimate goals of a defensive IP strategy are to retain freedom to operate and commercialize (despite the IP held by others), and avoid being held up for exorbitant rents.

Prior research on companies' stated reasons for obtaining patents has noted a number of motivations that are consistent with a defensive IP strategy, such as (defensive) blocking, building (defensive) thickets, avoiding litigation by others, and use in negotiation and exchange (e.g., (Blind et al., 2009; Blind et al., 2006; Cohen et al., 2002; Cohen et al., 2000; Duguet and Kabla, 1998). Indeed, the idea that firms build patent portfolios or thickets to defend against litigation by other patent owners is well understood (Hall and Ziedonis, 2001; Reitzig, 2004b; Ziedonis, 2004), and it is also recognized that such portfolios are often cross-licensed to avoid litigation (Galasso, in press; Galasso et al., 2011; Grindley and Teece, 1997). However, research has remained largely focused on defensive patent portfolios or thickets, while a range of alternative defensive strategies – such as inventing around IP,

terminating R&D projects to avoid infringement, licensing-in rights, opposing or revoking rights, and so on – remain underexplored. Additionally, we currently know very little about the prevalence of different defensive and evasive strategies and their distribution across different types of industries and firms. Thus, in this paper we investigate the prevalence and predictors of companies' usage of a range of different defensive and evasive IP strategies. Rather than focus on a single defensive strategy – such as the building of deterrent IP portfolios – we take a broad exploratory approach to contribute to our neglected understanding of a wide range of defensive and evasive strategies.

The empirical setting of this study is based on 2,995 innovative German manufacturing and services companies. The data we use come from the 2008 German MIP (Mannheim Innovation Panel; ZEW) which represents the German Community Innovation Survey (CIS). We exploratorily detect and interpret underlying structural relationships among the different defensive and evasive strategies with the help of multiple correspondence analysis – a categorical data analysis technique. Categorical data are common results of survey research. However, the analysis of such data often is hindered by the requirements and limitations of many familiar research tools. CA is a versatile and easily implemented analytical method to detect and interpret relationships among complex management phenomena.

The empirics reveal interesting differences for manufacturing and non-manufacturing sectors as well as for subclasses within the manufacturing sectors, which can be explained by differences in the underlying IP regime in each sector. In general, we find that the two most common defensive strategies used by manufacturing firms are modification of innovation projects and in-licensing whereas the two least common ones are stopping of R&D projects due to missing access to property rights and cross-licensing. Evidently, the portfolio of defensive IP strategies used varies by size such that smaller firms mainly rely on one or two strategies whereas bigger firms employ a larger defensive IP strategy arsenal. We also find

evidence for different combinations of defensive and evasive IP strategies among sector and size classes.

2 Literature Review

2.1 Appropriation and offensive IP strategies

Scholars have sought to understand why some firms profit from their innovations whilst others do not. In 1986, David Teece developed a framework which since then has had a lasting effect on research and practice. His 'Profiting from Innovation (PFI)' framework predicts that the profits generated by a successful technological innovation tend to go to the owners of either the underlying invention (depending on the underlying appropriability regime[1]) or to the owners of complementary technologies and/or assets (including other components of the value chain) (Teece, 1986). A proprietary strategy refers to patents being used as isolating mechanisms that protect the firm's key competitive advantages from imitation (Lippman and Rumelt, 2003; Rumelt, 1984). According to Teece (1986), in order to appropriate returns from innovation firms first need to successfully complete an innovation project or R&D process but afterwards also prevent imitation and copying of the firm's technological assets, ideas and knowhow (Mahoney and Pandian, 1992; Rumelt, 1984), i.e. with the help of intellectual property rights and other strategies (Neuhäusler, 2012; Somaya, 2012). Therefore, companies themselves endogenously shape appropriability regimes by their behaviors and strategies (Pisano, 2006).

At the same time, patent offices have witnessed an increase in patenting starting (also known as patent surge) which can partly be explained by an increase in patent races. On the one hand, firms seek to protect themselves from being blocked by competitors or on the other

[1] Hereby, the appropriability regime refers to the protection instruments that span both legal mechanisms (e.g., patents, copyrights, and non-disclosure agreements) and "natural" barriers to imitation (e.g., degree of difficulty in reverse engineering, and lead time advantage).

hand they seek to force or negotiate access to rivals' technologies on better conditions (Cohen et al., 2000; Hall and Ziedonis, 2001). And, firms especially in complex industries increasingly started to patent their inventions.

Protection strategies should provide enough incentives to perform R&D and innovation activities in the first place (Somaya et al., 2011). In general, protection strategies can be divided into two groups of measures (e.g., Blind et al., 2006; Neuhäusler, 2012): Formal appropriation instruments which grant inventors and innovators an exclusive right to exclude others from the utilization of the protected subject matter (e.g., patents, trademarks, utility patents or copyright) and strategic appropriation instruments that encompass various measures on the part of companies to prevent spillovers of own innovation efforts and thus to safeguard the appropriation of one's own innovation returns (e.g., . secrecy, complex design of new products or services, lead time advantage).

In sum, all these instruments are examples of offensive IP strategies describing measures a company actively undertakes to secure rents from R&D and innovation. Notwithstanding this terminology, formal appropriation mechanisms can also be used strategically as a quality signal to potential investors as well as to potential, R&D, alliance or licensing partners (Gans et al., 2008; Gick, 2008; Somaya, 2012). Generally, most inventions represent minor advances on the current state-of-the-art which implies that obtaining patent protection represents an instance of firms appropriating value from their innovation through demonstrating and describing originality and superiority of their invention (Reitzig and Puranam, 2009) and mainly using the protection granted for strategic purposes afterwards.

Another stream of research focuses on strategic reasons to patenting which neither weakens nor strengthens appropriability. Firms may use patents and other formal IP to exhibit strategic commitment to a technological or research trajectory in order to drive competitors into exiting R&D competition, patent races or terminating their R&D efforts (Gill, 2008; Somaya,

2012)or to prevent patenting by others and guarantee freedom of operation for the filing company (Guellec et al., 2011). In this vein, firms increasingly use the patent system to create their own freedom of design and operation. Scholars refer to this phenomenon as "defensive" patenting where firms actively file for patents or acquire already granted patents to be able to cross-license competitors, new entrants, and others. Moreover, this strategy provides the firm with bargaining chips in case it (in)voluntarily infringes on other companies' patents (Pisano, 2006; Pisano and Teece, 2007). Firms may also strategically employ formal appropriation measures to discourage competitors from further investments in the same technology domain (Agrawal and Garlappi, 2007; Baker and Mezzetti, 2005; Somaya, 2012). Therefore, firms may strategically patent "poor" inventions to misguide competitors (Langinier, 2005).

A relatively new literature stream has begun to address the impacts of patents and patent strategy on firms' value creation through innovation (David and Hall, 2006), but it is still in its infancy. Research reveals that firms prevent imitation not only by using patents or secrecy, but by building on a full portfolio of protection mechanisms available to them and thus securing or developing competitive advantages (Somaya, 2012). Surprisingly, Pisano and Teece (2007) show that more IP protection and building stronger barriers around innovation are not always the best path to appropriate value. (Brouwer and Kleinknecht, 1999) (also: Arora, 1997; Levin et al., 1987) highlight that patenting is not the most important instrument for appropriation of innovation benefits as companies rather rely on strategic means to capture value from invention.

2.2 Determinants of IP appropriation strategies

Prior literature has intensely discussed firm characteristics such as firm size, R&D personnel, sales, R&D intensity[2], sector or industry affiliation and a firm's degree of internationalization as determinants of different appropriation instruments (Cohen et al., 2000; Peeters and van Pottelsberghe Potterie, 2006). Literature suggests that the reasons why firms patent changes across industries and technologies (Cohen et al., 2000). Other 'traditional' determinants are market power, market and technological opportunities, and R&D efforts related to firm and sector characteristics. Especially firm size and market power relate to the well-known Schumpeter hypotheses (Schumpeter, 1942). First, economies of scale and scope as well as a greater resource endowment render large firms more competitive in comparison to their smaller companies. Second, they do not only benefit from complementarities and spillovers between different departments, employees and thus their knowhow; they also can hedge risks by spreading their investments on several innovation projects. Third, they have easier access to funding and financing opportunities for risky innovation projects. In a study conducted by (Cohen et al., 2000), the authors demonstrate that the most important reason for firms not to patent is the ease of legally inventing around a patent. Some firms also mention the costs for filing a patent and defending it in court which signifies that smaller firms are definitely at a disadvantage in patenting. Hence, large firms are better able to disseminate risks and costs of litigation as well as the fixed costs of filing a patent over greater levels of output.

Scholars argue that large firms rely more on strategic appropriation mechanisms to secure innovation rents (e.g., lead time), and hence are less likely to need patent protection.

[2] Defined as the share of R&D personnel on total personnel Blind et al. (2006). Most studies that include an R&D indicator in patent equations find a positive and significant relationship (e.g., Brouwer and Kleinknecht (1999); Crépon et al. (1998); Duguet and Kabla (1998)).

However, they are better able to set up a patent department and have the resources available to face lawsuits (Peeters and van Pottelsberghe Potterie, 2006).

In sum, there have been ambiguous results for firm size, sector and market opportunity variables. When being controlled for other factors such as industry effects, differences in access to external know-how, and appropriability conditions, firm size is no longer a significant predictor for firms' patenting behavior (Cassiman et al., 2002; Crépon et al., 1998; Duguet and Kabla, 1998). Although firms in high-tech sectors are more likely to patent than other firms (Brouwer and Kleinknecht, 1999; Crépon et al., 1998) there is not always a significant difference (Duguet and Kabla, 1998). In general, market opportunity variables have a positive and significant impact on patent applications, whilst some scholars do not find a significant effect (Cassiman et al., 2002; Duguet and Kabla, 1998).

Additionally, the existence of a patent division and the threat by invent-around strategies have been investigated (Neuhäusler, 2012). Somaya et al. (2007) show that the existence of in-house patent departments increases patenting (performance). In a review Somaya (2012), provides an overview of theoretical drivers of companies' appropriation strategies. Using the special case of patent protection, he emphasizes the importance of integrating protection strategies into the company-level strategy. A study by Reitzig and Puranam (2009) investigates organizational antecedents (e.g., formal structure or composition of the top management team) of patent grant success.

Particularly, strong IP portfolios and aggressive IP protection strategies affect competitive as well as cooperative structures (e.g., Blind and Thumm, 2004; Hertzfeld et al., 2006; Peeters and van Pottelsberghe Potterie, 2006). However, in a micro-perspective the implementation of IP appropriation strategies depends on the firm's cooperative and competitive strategic options and the competitive environment it operates in. With respect to the strategic orientation of the firm, Blind and Thumm (2004) find that protection activities are determined

by technology protection motives and by strategic rationale reflected in a defensive strategy. Firm specific strategic orientation strongly determines the composition and the value of the IP portfolio (e.g. Blind et al., 2009; also: Anton and Yao, 2004). Peeters and van Pottelsberghe Potterie (2006) show that firms' engagement in formal IP protection is more intense when innovation strategies are aligned with research intensive product innovation and low barriers to innovation. Additionally, they find that broad collaboration activities, i.e., cooperative innovation activities with science and industry, increase the intensity of formal IP protection. Blind et al. (2006) seem to contrast this finding, as they cannot identify cooperative innovation as a determinant of protection activities. Yet, these scholars find a strong effect of intensive technologically motivated collaboration captured by their co-patenting variable.

With respect to effects of competition on the protection strategies of companies, the evidence generally points towards a positive relationship. The more intense the competitive environment the more intense the use of formal protection mechanisms (Blind et al., 2006; Hall and Ziedonis, 2001; Peeters and van Pottelsberghe Potterie, 2006; Ziedonis, 2004).

Most studies discuss the above investigated patenting as the only formal means of protection; traditionally, the use of other formal protection rights receives less attention. Nonetheless, the factors influencing trademarks is firstly analyzed by Allegrezza and Guarda-Rauchs (1999). The prosecution of copyright has not attracted a lot of empirical attention, because it is – in general – not registered in databases, hence, data are not readily available.

2.3 Litigation and defensive IP strategies

A proprietary patent strategy seeks to prevent imitation of valuable rent-generating assets and thus, creates or protects a competitive advantage position. On the other hand, firms sometimes may need to have a viable strategy for defending against patents owned (and potentially

enforced) by others to guarantee that it is not put at a competitive disadvantage or at risk of being held up for rents (Somaya, 2012).

The goal of this defensive strategy is to retain for the firm the freedom to operate and commercialize their technologies without interference of other firms' patents. Prior research uses the term defensive patent strategy interchangeably in terms such as portfolio patenting, (defensive) blocking and preemption, (defensive) thickets, validity challenges, and "strategic patenting" (Somaya, 2012).

Particularly in dynamic high-technology sectors, patent races are common phenomena. Firms often irreversibly invest in business opportunities in large scale before it is clear who will win the race and secure the patents for the technologies at stake. In this paper, we focus on a range of alternative defensive and evasive strategies – such as inventing around IP, terminating R&D projects to avoid infringement, licensing-in rights, opposing or revoking rights, and so on which remain underexplored.

Especially multi-invention contexts (e.g., ICT and semiconductor industries) when a large set of technologies is required to commercialize products (Hall and Ziedonis, 2001; Somaya et al., 2011), the exposure to others' patents could hinder firms from using even their own inventions if patents on other inventions required for commercialization include claims against them. In turn, the owners of such patents can bargain for significant rents (e.g., by generating licensing incomes, trading IP in cross-licensing agreements or negotiating access to new technologies) and thus, hold up the alleged infringer with the threat of an injunction (Hall and Ziedonis, 2001; Neuhäusler, 2012; Somaya, 2012).

A typical innovation process exposes firms to uncertainty regarding which patents will be needed or who will own them and thus requires an ex post defensive strategy. Therefore, firms often strategically build large defensive portfolios of their own patents to avoid one-sided hold up situations and pose a valid counter threat with its own patents, leading to a

situation of mutual hold up. Nonetheless, a defensive strategy based on large patent portfolios, cross-licensing, and mutual hold up has restrictions (Somaya, 2012).

Bargaining positions via licensing will be constrained if a patentee is not dependent on access to the focal firm's patents. In recent years, many companies face severe and heavy injunctions and out-of-court settlements caused by specialized patent-holding firms so called patent "trolls" (also "sharks" or non-practicing entities (NPEs)) that are invulnerable against mutually held patents (Fischer and Henkel, 2012; Reitzig et al., 2010; Reitzig et al., 2007).

Moreover, in technology-intensive sectors (e.g., semiconductor industry), patents are often licensed or cross-licensed and hence, the patent-protected technology is mutually exchanged across a number of market players as it is an integral part of many different products. However, this induces risks of litigation and thus, companies try to develop, search and hold patents that their competitors also use to impose a valid counter threat (Hall and Ziedonis, 2001). Companies often use IP information strategically and lay a false trail of which technological trajectory they are pursuing. After having misguided their competitors, companies may cancel or adjust on-going R&D projects (Reitzig, 2004a). Nonetheless, this is sometimes also done to avoid infringement and litigation. Moreover, companies can exert defensive strategies, particularly litigation and out-of-court settlement, to raise market entry barriers and thus impose a threat to potential new market entrants. Patent enforcement implies considerable direct[3] and indirect costs mainly attributable to the time and effort of manpower involved (e.g., key managers, lawyers, engineers, and scientists of a firm) and disruption of organizational routines. Furthermore, Lerner (1995) suggests that litigation led to a 2–3.1 percent average decline in the market value of the firms involved.

The frequency of legal disputes is strongly associated with a variety of characteristics of innovations and their owners. Lanjouw and Schankerman (2004) find evidence that reputation

[3] Direct legal costs alone can run in the range of $1.0–3.0 million (in 1997 dollars) for each side through trial Somaya (2012).

building plays a significant role in the case of patent litigation especially when forward citations to that patent can be attributed to firms active in closely related technology fields. Hence, litigation risk is much higher for patents that are owned by individuals and firms with small patent portfolios. Of course, for reputation building to be effective, the company must impose a credible threat by conveying information to competitors about the willingness to defend the patent. In addition, litigation suits can help build strategic positions (Teece et al., 1997) that can confer advantages in future rounds of competition (Somaya, 2003). Moreover, to secure a bargaining position, patentees are more likely to go to court to protect patents particularly if they form the base of a cumulative chain or technological trajectory. Hence, a firm's ability to appropriate value from their subsequent, incremental inventions, either through direct manufacturing or licensing, depends on their control over the initial invention (Lanjouw and Schankerman, 2001).

In addition to these causes for litigation, Somaya (2004) suggests that irrational behaviors (e.g., egos, poor legal advice, or the loss of perspective) as well as systematic strategic explanations (e.g., 'taking out a competitor', reputation building, protecting its 'crown jewels,' or extracting royalties) play an important role in litigation. Lerner (1995) emphasizes another defensive strategy that has received less attention: the redirection of R&D and innovation activities into technological areas where litigation is less likely.

2.4 Determinants of defensive and evasive IP strategies

Although a lot of research has focused on the determinants of formal measures and a new stream of literature is increasingly dealing with the determinants for the choice of either strategic or formal protection measures, the drivers for defensive strategies have not yet been investigated. The reasons why firms use different defensive and evasive IP strategies may vary across industries and technologies.

In general, the probability for patents to be litigated by a third party can vary by firm size. Large firms tend to possess more resources, market power, financial capacity and experience in patenting to enforce their rights than smaller firms (Neuhäusler, 2012). Large enterprises induce a greater threat potential due to the mere the presence of a large patent portfolio which in turn unlocks potential for cross-licensing negotiations or trade with other firms (Cohen et al., 2000; Hall and Ziedonis, 2001). Prior research shows a greater likelihood of small firms to be the target of patent litigation (Bessen and Meurer, 2005; Cremers, 2004; Ziedonis, 2003). When looking at patent litigation, the chances for companies falling prey to litigation or imitation are greater the more research-intensive a company is because these companies usually generate more patents with substantial economic benefits (‘‘valuable patents’’) (Allison et al., 2004; Harhoff et al., 2003; Neuhäusler, 2012). Additionally, research-intensive companies also incur greater costs, since, relatively seen, they are more likely to enforce their IP rights and litigate or oppose against imitation by third parties which requires more financial resources. Another driving factor identified in prior literature is technological opportunity, which is high when the cost of developing an invention is low e.g., in emerging sectors with a low concentration of firms (Cohen and Klepper, 1992). Technological opportunity describes another determinant for the usage of defensive and evasive strategy assuming that the more technological opportunities exist, the greater a firm’s likelihood to exert defensive strategies.

The sector that a company operates similarly influences the decision to use defensive or evasive strategies as does research intensity. In sectors where the cost of copying an innovation is considerably less than the initial cost of invention, the value of patents is greatest (Arundel and Kabla, 1998) which is true for research-intensive high-tech sectors. According to Blind et al. (2009) (also: Cohen et al., 2002; Cohen et al., 2000), the differences in patenting behavior between sectors and hence the differences in use of defensive strategies mainly stem from the distinction between discrete and complex product industries.

Neuhäusler (2012) argues that in complex product industries, i.e. the electrical engineering and automotive industry, the number of patents per market-exploitable innovation is considerably larger than in discrete product industries, like the chemical sector. Particularly, companies in complex industries use patents more often strategically (e.g., to force rivals into negotiations), than companies in discrete industries which use patents to block rivals (Cohen et al., 2000). Thus, firms operating in these sectors should be more prone to using defensive or evasive strategies as they have to defend more IP. The degree to which a company's successfully uses invent-around or reverse-engineering strategies could also be influenced by firm size and sector. Larger firms may exert reverse-engineering as they generally have more resources at hand, their patent portfolio is larger and they more often employ a patent department than smaller companies which they can fall back on when it comes to litigation. In complex product industries, the existence of a larger patent thicket renders inventing-around more difficult than in discrete product industries. Neuhäusler (2012) reasons that the pharmaceutical sector marks an exception because patents on key molecules are also often fenced by patent thickets.

Moreover, the degree of internationalization of a company can also influence its usage of defensive or evasive IP strategies assuming that more international companies operate in more markets and thus face more competition that creates more potential imitators as well as licensees. Internationally operating firms are also bigger companies with a respectable resource endowment which allows them to defend their per se bigger IPR portfolio. Previous research has identified the increasing importance of patents in entering global markets (Arundel and Kabla, 1998). Particularly, patents filed in exporting markets have a relevant impact on exports which lead to higher profits. Thus, they serve as a value signal and attract imitators. Furthermore, increased market competition is associated with more strategic patenting which in turn relates to defensive and evasive strategies as the threat of being sued

rises (Neuhäusler, 2012). Another driving factor could be the existence of an in-house patent department, mostly consisting of experienced patent attorneys and specialized R&D personnel which reduces fixed costs for the patent application process, especially the costs for information searches by using routines and scale effects (Hall and Ziedonis, 2001; Somaya et al., 2007). The mere existence of a patent department is an indicator that a firm has developed routine in enforcing patents and that it is able to identify and pursue infringers and thus, the likelihood of litigation suits and revocation actions increases. Lanjouw and Schankerman (2001) analyze determinants of patent litigation and focus on patent and patent owner characteristics (e.g., domestic vs. foreign and corporate vs. individual). However, they do not investigate relevant characteristics of companies involved in lawsuits. Firms having a high frequency of cross-citations between their patents they are more likely to enter broad cross-license agreements when their patent portfolios are complementary and when their capital intensities are large enough. These cross-licenses are associated with fewer future law suits between the firms (Galasso, in press). In a recent study, Galasso et al. (2011) find that patent transactions (sales, licensing) negatively influence litigation.

2.5 Research question and contribution

Although a considerable body of literature investigates the use of offensive protection mechanisms, Somaya (2012) argues on a general account that strategic and competitive determinants of protection strategies are still not fully explored. Scholars have found a positive relationship between both proprietary (Hall et al., 2005; Reitzig, 2004b) and defensive (Reitzig, 2004b) patent strategies on firm market value (Somaya, 2012); however, the drivers of companies' use of defensive or evasive IP strategies remain to be studied. In addition to Arora and Ceccagnoli (2006) and Arora (1997), who emphasizes the need to better understand the interplay between different formal and strategic IP instruments available, we

analyze firms' use of defensive and evasive IP strategies in their pursuit to appropriate rents from innovation. This paper tries to shed some more light on the question which firm characteristics exert an influence on the decision for or against a specific defensive or evasive strategy. Additionally, we currently know very little about the prevalence of different defensive and evasive strategies and their distribution across different types of industries and firms. How can companies effectively exert defensive and evasive strategies to gain and sustain a competitive advantage? Research has remained largely focused on defensive patent portfolios or thickets, while a range of alternative defensive strategies – such as inventing around IP, terminating R&D projects to avoid infringement, licensing-in rights, opposing or revoking rights, and so on – remain underexplored. Thus, in this paper we investigate the prevalence and predictors of companies' usage of a range of different defensive and evasive IP strategies by taking a broad exploratory approach to contribute to our neglected understanding of a wide range of defensive and evasive strategies. In sum, we complement the extant discussion on formal versus strategic appropriation instruments by analyzing determinants of firms' usage of defensive and evasive IP strategies as well as different combinations of defensive and evasive IP strategies among sector and size classes.

3 Empirical analyses

3.1 Sample

We use data from the Mannheim Innovation Panel (MIP), ZEW, Mannheim, which is the German version of the Eurostat Community Innovation Survey (CIS). Moreover, it includes additional alternating questions. The MIP is sent out every year to a random sample (stratified by size, region, and sector) of German companies. It addresses topics such as IP, innovation performance, cooperation, etc. To address mortality, new companies (observations) are added every other year. Among scholars (e.g., Belderbos et al., 2004; Cassiman and Veugelers,

2002; Leiponen and Helfat, 2011; Miotti and Sachwald, 2003; Tether, 2002), the interest in CIS data has risen for two reasons. First, the data provide indicators for innovation performance, and second, CIS data are used as a supplement to traditionally used patent data (Kaiser, 2002; Leiponen and Helfat, 2011), thus downsides of patent data can be tackled. We analyze data from the MIP 2008, containing information about defensive and evasive strategies and about protection measures used by the companies in the sample. Furthermore, we match patent and trademark stock data on a 1:1 basis using an ID variable unique to each company throughout the MIP. The final data set contains 2,995 innovative companies and is cross-sectional. In particular, the sample comprises 1,758 companies active in manufacturing and 1,247 in service sectors. For firms to be included in the analysis they had to have selected from the prescribed answers ("yes" or "no") for all eight defensive and evasive strategies outlined above; 2,995 (83.9%) of the 3,517 firms in the full sample did this and were retained for further analysis. This high percentage suggests that most of the surveyed firms were content that the prescribed answers reflected their defensive strategy orientations and activities.

3.2 Measures

Variables

As major variables of interest, we employ eight different types of defensive sand evasive strategies. The operationalization derives from the question "In the years from 2005-2007, did your company encounter any incidents concerning access to IPR?" and results in the strategies "Abandonment", "Cancellation", "Modification", "Invent-around", "In-licensing", "Cross-licensing", "Revocation" and "Out-of-court settlement". Hence, the variable for each strategy is binary, 1 coding that a company has exercised a particular strategy, and 0 coding if it has not employed a strategy. In our estimations, we also include variables which may influence

the likelihood of exercising defensive and evasive IP strategies. For firm size, we use the number of employees in a company which reflects a categorical variable with a scale from 0 to 4. Firm size codes 0 for a company with less than ten employees and, hence, codes a small company. A value of 4 represents a firm with more than 300 employees. By size, firms were divided into five classes: with sampling divided across these five bands, with 12.3% <10 employees, 23.5% 11-30 employees, 23.9% 31-100 employees, 18.9% 100-300 employees, and 21.2% >300 employees. Moreover, we investigate sectorial differences based on the OECD sector classification[4]. Additionally, we differentiate between manufacturing and service firms but also include various sector subclasses to gain a fine-grained picture of the distribution of defensive and evasive IP strategies among them. We also account for firms' usage of different formal appropriation mechanisms (patents, utility patents, design patents, trademarks, and copyright) which we derived from the survey question "Which of the following formal IPR mechanisms have been used in your company from 2005-2007?". Both sector and appropriation variables are binary and their coding resembles the one of the defensive strategy variables. Furthermore, patent and trademarks stock (Patent Stock (ln); Trademark Stock (ln)) variables are added. For an overview of all employed variables, please refer to TABLE 1.

Insert TABLE 1 about here.

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[4] The information on sectors is provided by NACE codes and is translated into the OCED classification based on Eurostat (2009).

Descriptives

The descriptive statistics in FIGURES 1-5 reveal interesting differences for manufacturing and non-manufacturing sectors as well as for subclasses within the manufacturing sectors, which can be explained by differences in the underlying IP regime in each sector. In general, the majority of companies with more than 30 employees operates in manufacturing industries. We find that the two most common defensive strategies used by manufacturing firms are modification of innovation projects and in-licensing whereas the two least common ones are stopping of R&D projects due to missing access to property rights and cross-licensing. Moreover, for companies in non-manufacturing sectors the most pursued strategy is in-licensing followed by modification of innovation projects; the least employed strategies are abandonment and cancellation of innovation projects (see FIGURE 4). TABLE 2 shows some more fine-grained picture and reveals that particularly the chemical and pharmaceutical, the mechanical engineering and non-metallic goods manufacturing sectors are prone to apply revocation and out-of-court settlement as defensive mechanisms. In-licensing is most often used in chemical and pharmaceutical and electrical engineering industries whereas modification is dominant among firms operating in electrical or mechanical engineering and the manufacturing of non-metallic goods. With regards to services, in-licensing is the most frequent strategy in information and communication as well as finance and insurance sectors. FIGURE 1 shows that the portfolio of defensive IP strategies used varies by size such that smaller firms mainly rely on one or two strategies whereas bigger firms employ a larger defensive IP strategy arsenal. TABLES 3-5 show that there are different combinations of defensive and evasive IP strategies among sector classes. In manufacturing, modification goes most frequently together with in-licensing, revocation and out-of-court settlement. In service sectors, modification of R&D projects is frequently pursued together with in-licensing and in-licensing in turn appears together with out-of-court settlement, but at a much lower level than

in manufacturing industries. We also see that larger companies in absolute figures possess a greater number of formal IP rights than smaller companies. Patents and trademarks are the dominating formal protection measures in manufacturing sectors whereas firms operating in service sectors seem to rely on trademarks and copyrights.

While the descriptive statistics already shed some light on the incidences of defensive and evasive strategies across sectors and firm size, only the multivariate analyses can reveal relationships between the variables. The results of these analyses are reported herein.

3.3 Statistical method

We were interested in whether underlying patterns exist in which defensive strategies are pursued together by firms, and we therefore used multiple correspondence analysis, an exploratory statistical technique equivalent to principal components analysis for categorical data, to examine the data. Correspondence analysis (CA) has received considerable attention in the statistical and psychometric literature under a variety of names, including dual scaling, method of reciprocal averages, optimal scaling, canonical analysis of contingency tables, categorical discriminant analysis, homogeneity analysis, quantification of qualitative data, and simultaneous linear regression. Complete histories are given by (Greenacre, 1984; Leeuw, 1973), and (Nishisato, 1980). Though very few applications of CA have been reported in the management literature, it has been frequently analyzed in marketing research (e.g., Carroll and Green, 1988; Hoffman and Franke, 1986; Hoffman and Leeuw, 1992) and interest in management research is increasing.

Usually, multidimensional scaling and unfolding, discriminant analysis, and principal component analysis have been used to analyze and represent interrelationships between the rows and/or columns of a data matrix. However, these methods have little applicability to the

categorical data that arise in many survey research applications because of the limitations and constraints imposed on the data collection process.

The joint graphical display obtained from a correspondence analysis can help in detecting structural relationships among the variable categories which permits rapid interpretation and understanding of the data. Finally, CA has flexible data requirements. The only strict requirement for conducting CA is a rectangular data matrix with non-negative entries (Hoffman and Franke, 1986).

Moreover, multiple correspondence analysis (MCA) extends simple CA as it incorporates more than two variables simultaneously. Basically, it is a simple CA executed on an indicator matrix containing some measure of correspondence between cases (in our case firms) as rows and categories of variables (in our case defensive and evasive strategies) as columns. Similar to the identification of components in principal components analysis, or factors in factor analysis, (multiple) correspondence analysis identifies and extracts a number of dimensions which capture the deviations from the expected values (which would be zero if the variables were statistically independent). The idea of this method is to estimate and maximize the distances between the row or column points in the tables. Hence, the first few dimensions will capture the greatest part of the overall deviation from statistical independence between the variables whereas the following dimensions will less do so.

In general, (multiple) correspondence analysis is used for exploratory, inductive research rather than hypothesis testing and deductive research (Le Roux and Rouanet, 2009; Tether and Tajar, 2008). This exploratory approach generates scatter-plots with the scores of the column variables plotted in the dimensions obtained from MCA. MCA disentangles variables with a high degree of coherence which have similar scores in the analyzed dimensions and hence lie close together. For interpretation, it is also important to note that points and groups that are further away from the origin of the plots, are also stronger associated. Usually, MCA

produces as many scatter-plots as there are binary combinations of the dimensions. Nonetheless, scholars mainly analyze and interpret the first two or three dimensions because these capture the greatest deviance from statistical independence in the data (Le Roux and Rouanet, 2009; Tether and Tajar, 2008).

3.4 Results

The multiple correspondence analysis for the full sample reveals 8 dimensions, each of which accounts for between 34.6% and 5.9% of the total variation in the data (see TABLE 6). For interpretation, we will focus on the first two dimensions, which individually account for the largest amount of variation in the data, and together account for roughly 50% of the variance. FIGURE 6 shows the plot of the defensive and evasive strategy variables for the full sample included in the multiple correspondence analysis according to their scores in dimensions 1 and 2.

As explained earlier, where variables are closely grouped together, particularly if this is at some distance from the origin, this shows variables with high levels of association. A clear cluster of variables appears in the bottom left corner of FIGURE 6. This includes positive answers that the firm has abandoned (Q8_2_a=1) or cancelled (Q8_2_b=1) an innovation project due to missing access to property rights. A second cluster of variables is found slightly to the left along the horizontal axis. This group of variables consists of all other strategies (Modification, Invent-around, In-licensing, Revocation and Out-of-court settlement) except for cross-licensing (Q8_2_f=1) which appears to be a single point in the upper left corner of the plot suggesting that it either is a strategy that is less frequently employed or radically different from all other defensive and evasive strategies. The plot also shows another cluster of variables, located close to the center of the plot. This is comprised of the corresponding negative variables (“no” answers) for all defensive and evasive strategies and hence identifies

the variables of the strategies that firms do not employ. We conducted the same analysis by comparing both manufacturing and service sectors. FIGURE 7 reveals some interesting differences. For manufacturing, we identify four clusters of variables similar to the ones revealed in the full sample suggesting that the manufacturing sector seems to be a better representation of the full sample than the service sector. As the descriptives have already shown, most larger companies and firms operating in the manufacturing sectors also have a greater arsenal of defensive strategies they employ which may explain the stronger association of the variables for this sector affiliation. Another reason might be due to the fact that the service sector is very diverse and comprises small sector subclasses. For the service sector, the picture is less clear. The variables "Abandonment" and "Cancellation" group together in the lower left corner. Another cluster consists of "Modification" (Q8_2_c=1) and "Invent-around" (Q8_2_d=1) and a third group comprises of the strategies "Revocation" (Q8_2_g=1) and "Out-of-court settlement" (Q8_2_i=1). In the service sector, "In-licensing" (Q8_2_e=1) and "Cross-Licensing" (Q8_2_f=1) reflect separate strategies. For a more precise overview, FIGURE 8 shows different associations of defensive and evasive strategies based on two especially selected sectors (Chemicals and Pharmaceuticals as well as Information and Communication sectors). For Chemicals and Pharmaceuticals, we find five different clusters of defensive strategies. Cluster one comprises of the strategy "Cancellation" in the bottom of the plot, cluster two of the strategies "Abandonment", "Modification" and "Invent-around", cluster three "In-licensing", "Revocation" and "Out-of-court settlement". In the top left corner of the plot, we find "Cross-licensing" reflecting another cluster with a single strategy. In contrast, the graphical representation for the Information and Communication sector shows a different pattern of six defensive strategy combinations. Cluster one represents the strategies "Abandonment" and "Cancellation", in another cluster at the top of the plot the strategies "Cross-licensing", "Revocation" and "Out-of-court settlement" appear together. However, the

strategies “In-licensing”, “Modification” and “Invent-around” seem to reflect separate strategies in this sector. All these differences among the sectors may be due to the underlying IP regime in each sector.

In sum, the results suggest that there is evidence for different combinations of defensive and evasive IP strategies among sector classes. A drawback of the method relates to the ratio distortion of the maps; the scales on the vertical axes are usually different from that on the horizontal axes (Tether and Tajar, 2008).

4 Discussion and implications

In addition to Arora and Ceccagnoli (2006) and Arora (1997), this study examines the interplay between different defensive and evasive IP instruments available to firms in their quest to appropriate rents from innovation. From a theoretical perspective, this paper sheds some light on the prevalence of different defensive and evasive strategies and their distribution across different types of industries and firms. With a broad exploratory approach, we are able to identify different combinations of defensive and evasive IP strategies among sector and size classes.

A crucial feature of our data is that the unit of observation is at company level - not at product level. This might be important when analyzing defensive and evasive IP strategies as these often refer to specific products or components of technologies rather than entire product portfolios. Nonetheless, we assume a certain extent of homogeneity of in the firms’ product portfolio.

In this paper, we use MCA to disentangle associations of companies’ use of specific defensive appropriation strategies. Correspondence analysis (CA) has a long research tradition as a technique for exploratory data analysis with a few exceptions; management scholars have not reported many applications of its use. Moreover, CA has received little attention in the

management literature (Carroll and Green, 1988). Researchers often need to detect and interpret underlying relationships among variables. The purpose of our article is to increase awareness of the business research community for a multivariate descriptive statistical method that represents graphically the rows and columns of a categorical data matrix.

MCA does have limitations. It is a multivariate descriptive statistical method and is not suitable for testing hypotheses. Finally, it must be recognized that in many ways MCA is a subjective technique. Often it is possible to obtain many different representations of a data set, resulting in different analysis categories and solutions. Nonetheless, MCA offers great flexibility which can initiate more insight in the underlying relationships of the variables studied due to these different portrayal options. Hence, flexibility comes at the cost of subjectivity of the analysis (Hoffman and Franke, 1986).

Prior research suggests that management of these new options of defensive and evasive IP strategies remains unclear. In this paper, we contribute to resolve this issue by linking firm determinants to defensive and evasive IP instruments. By doing so, we hope that managers gain a better understanding of the general relevance and hence the impact of exercising these different strategies. Thus, we expect managers to develop better knowledge and expertise of when and how the use of either defensive or evasive strategy is an appropriate measure to capture value from an innovation. Moreover, firms and their managers should be aware of the prevalent defensive and evasive strategies employed in the sectors they are operating in. Especially smaller firms- that usually apply less of these strategies- can benefit from this analysis here. Small companies should be aware of the whole portfolio of different defensive mechanisms so that they know how to cope with them in case they encounter similar situations. Managers should reconsider the costs of some of the strategies presented in this paper as there are other defensive mechanisms which might be less costly. On the other hand, a company enforcing its rights in court or with revocation may set an example and thus, pose

a credible threat with regards to potential future IP disputes. This paper further shows that firms may not only file patents for proprietary reasons but rather to be strategically well positioned in case of counter-sues and in terms of competition. Thus, companies more often use patents as a strategic weapon in the competitive arena. Recent figures provided by the United States Patent and Trademark Office (USPTO) seem to support this assumption: The number of patent applications has roughly quadrupled between 1983-2010. By contrast, neither innovation nor R&D expenditures have exhibited any particular upwards trend, not to speak of factor productivity. While patent litigation has increased, few patents are actively used (Boldrin and Levine, 2012). The same is true for the European Patent Office (EPO) which has seen a patent application upsurge since the 1990s (Blind et al., 2006). Discouraged by a growing fear of lawsuits, firms are increasingly afraid to invest in expensive research projects. Especially small companies, which only own few patents, increasingly invest more carefully as they cannot a priori assess whose patents they infringe upon (Schwiebacher, 2012).

In sum, companies having had experience with infringement situations might have developed their arsenal of defensive and evasive strategies based on these prior experiences and hence, a successful invent-around experience may induce the use of this strategy again.

Our analysis provides two main insights. First, innovating companies must early on assess the benefits and drawbacks of the different organizational IP strategies, and then decide for the most effective defensive or evasive strategy for the given context. Second, the innovating company must decide on strategies that are well aligned with its general corporate strategies and goals as companies can lose credibility when exercising defensive or evasive IP strategies. In sum, we emphasize the importance of a valid defensive strategy at hand and as an essential part of the firm's business strategy and not just an ‘afterthought’ (Somaya et al., 2011). The technological and research trajectories of a company have to be well aligned with

its usage of defensive and evasive strategies. Hence, IP becomes a strategic weapon in the corporate arsenal (Reitzig, 2004a).

For policy-makers, this study delivers some interesting aspects of defensive strategies with regards to frequency and increasing importance across all sectors but particularly in the manufacturing industries. Companies seem to feel the urge to exercise these types of strategies due to a non-transparent patent system which is also known as "patent thicket". Oftentimes firms face severe difficulties in gathering all necessary information on already existing patents. Particularly, in some industries (e.g., information and communication technologies or semiconductors), it is difficult to develop innovations or new products without infringing on other companies' rights. This leaves room for improvement of the patent system which needs to become more coherent and accessible. Additionally, the above mentioned weaknesses raise another voice for a more efficient patent system especially against the background of the new European patent announced to be introduced in 2014.

5 Conclusion and further research

Defensive strategies have increasingly raised awareness as they seem to become companies' strategic weapon in an ever faster moving, complex business environment with growing competition and shortening of product-life cycles. We exploratorily detect and interpret underlying structural relationships among the different defensive and evasive strategies with the help of multiple correspondence analysis – a categorical data analysis technique. The empirics reveal interesting differences for manufacturing and non-manufacturing sectors as well as for subclasses within the manufacturing sectors, which can be explained by differences in the underlying IP regime in each sector. Evidently, the portfolio of defensive IP strategies used varies by size such that smaller firms mainly rely on one or two strategies whereas bigger firms employ a larger defensive IP strategy arsenal. We also find evidence for

different combinations of defensive and evasive IP strategies among sector and size classes. Due to the limitations of the statistical method we employ, we are not able to detect any causal relationships. However, in a further paper we are focusing particularly on the drivers and determinants of companies' use of defensive and evasive IP strategies.

From a theoretical perspective, this paper emphasizes the importance for managers to understand the importance of defensive and evasive IP strategies as crucial for value appropriation from innovation.

According to Reitzig (2004a), firms should govern and exploit their IP assets more effectively and integrate their defensive IP strategy into a cohesive corporate strategy (Somaya et al., 2011). The results of this study have implications for policy. Companies' use of defensive and evasive strategies reveals weaknesses and inefficiencies which call for a reform of the patent system.

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Appendix

TABLE 1. Summary statistics (N=2,995)

Variable	Mean	Std. Dev.	Min.	Max.
Defensive strategies				
Abandonment	0.038	0.192	0	1
Cancellation	0.028	0.164	0	1
Modification	0.171	0.376	0	1
Invent-around	0.102	0.303	0	1
In-licensing	0.188	0.391	0	1
Cross-licensing	0.033	0.180	0	1
Revocation	0.121	0.326	0	1
Out-of-court settlement	0.129	0.335	0	1
Formal protection mechanisms				
Patents	0.373	0.484	0	1
Utility Patents	0.297	0.457	0	1
Design Patents	0.110	0.313	0	1
Trademarks	0.396	0.489	0	1
Copyrights	0.201	0.401	0	1
OECD sectors				
High-tech	0.046	0.210	0	1
Medium high-tech	0.183	0.386	0	1
Medium low-tech	0.194	0.396	0	1
Low-tech	0.124	0.330	0	1
Knowledge-intensive services	0.354	0.478	0	1
Less-knowledge-intensive services	0.013	0.112	0	1
NACE sectors				
Manufacturing	0.584	0.493	0	1
Chemicals and pharmaceuticals	0.055	0.228	0	1
Plastics and rubber	0.037	0.188	0	1
Manufacturing of non-metallic mineral products	0.025	0.157	0	1
Manufacturing of food, beverages and tobacco	0.033	0.180	0	1
Metal processing	0.081	0.273	0	1
Electrical engineering	0.109	0.311	0	1
Mechanical engineering	0.127	0.333	0	1
Manufacturing of textiles, clothes and leather	0.030	0.170	0	1
Manufacturing of wood, paper and furniture	0.045	0.208	0	1
Printing and reproduction of recorded media	0.019	0.138	0	1
Other manufacturing	0.102	0.302	0	1
Services	0.416	0.493	0	1
Information and communication	0.077	0.268	0	1
Professional scientific and technical activities	0.112	0.315	0	1
Financial and insurance activities	0.047	0.213	0	1
Other services	0.145	0.352	0	1
Size				
Employees	2.133	1.323	0	4

TABLE 2. Incidences of defensive and evasive strategies across manufacturing sectors

Sectors	Abandon-ment	Cancel-lation	Modi-fication	Invent-around	In-licensing	Cross-licensing	Revo-cation	Out-of-court settlement
Chemicals and pharmaceuticals	10%	7%	27%	15%	32%	4%	21%	24%
Plastics and rubber	6%	4%	19%	15%	10%	7%	22%	17%
Manufacturing of non-metallic mineral products	11%	9%	33%	14%	21%	4%	30%	24%
Manufacturing of food, beverages and tobacco	3%	2%	12%	8%	15%	2%	16%	13%
Metal processing	4%	3%	17%	13%	14%	3%	12%	14%
Electrical engineering	6%	4%	30%	16%	24%	6%	17%	19%
Mechanical engineering	4%	2%	30%	15%	20%	7%	23%	21%
Manufacturing of textiles, clothes and leather	3%	0%	16%	9%	17%	2%	17%	13%
Manufacturing of wood, paper and furniture	3%	3%	8%	6%	17%	1%	4%	10%
Printing and reproduction of recorded media	2%	2%	7%	7%	5%	2%	3%	3%
Other manufacturing	4%	3%	22%	13%	19%	1%	12%	13%
Information and communication	3%	3%	13%	9%	29%	3%	7%	10%
Professional scientific and technical activities	3%	3%	15%	8%	15%	1%	6%	5%
Financial and insurance activities	0%	1%	6%	2%	27%	1%	1%	8%
Other services	1%	1%	4%	4%	13%	1%	5%	6%

TABLE 3. Frequencies of strategies appearing together – full sample (N=2,995)

	Abandonment	Cancellation	Modification	Invent-around	In-licensing	Cross-licensing	Revocation	Out-of-court settlement
Abandonment	**115**							
Cancellation	49	**83**						
Modification	82	63	**511**					
Invent-around	38	27	146	**305**				
In-licensing	56	37	209	98	**563**			
Cross-licensing	20	11	72	32	69	**100**		
Revocation	55	37	214	95	166	71	**362**	
Out-of-court settlement	54	36	209	106	188	73	216	**385**

TABLE 4. Frequencies of strategies appearing together – manufacturing (N=1,748)

	Abandonment	Cancellation	Modification	Invent-around	In-licensing	Cross-licensing	Revocation	Out-of-court settlement
Abandonment	**91**							
Cancellation	37	**59**						
Modification	65	47	**400**					
Invent-around	27	15	118	**232**				
In-licensing	42	28	162	76	**337**			
Cross-licensing	17	9	63	28	53	**81**		
Revocation	49	28	187	81	137	62	**299**	
Out-of-court settlement	46	29	177	88	145	61	184	**301**

TABLE 5. Frequencies of strategies appearing together – services (N=1,247)

	Abandonment	Cancellation	Modification	Invent-around	In-licensing	Cross-licensing	Revocation	Out-of-court settlement
Abandonment	**24**							
Cancellation	12	**24**						
Modification	17	16	**111**					
Invent-around	11	12	28	**73**				
In-licensing	14	9	47	22	**226**			
Cross-licensing	3	2	9	4	16	**19**		
Revocation	6	9	27	14	29	9	**63**	
Out-of-court settlement	8	7	32	18	43	12	32	**84**

TABLE 6. Revealed dimensions from multiple correspondence analysis (N=2,995)

	Principal inertia	Percent	Cumulative percent
Dimension 1	0.346	34,6%	34,58%
Dimension 2	0.154	15,4%	49,95%
Dimension 3	0.114	11,4%	61,35%
Dimension 4	0.098	9,8%	71,20%
Dimension 5	0.090	9,0%	80,20%
Dimension 6	0.075	7,5%	87,70%
Dimension 7	0.064	6,4%	94,10%
Dimension 8	0.059	5,9%	100,00%

FIGURE 1. Incidences of defensive and evasive strategies over firm size

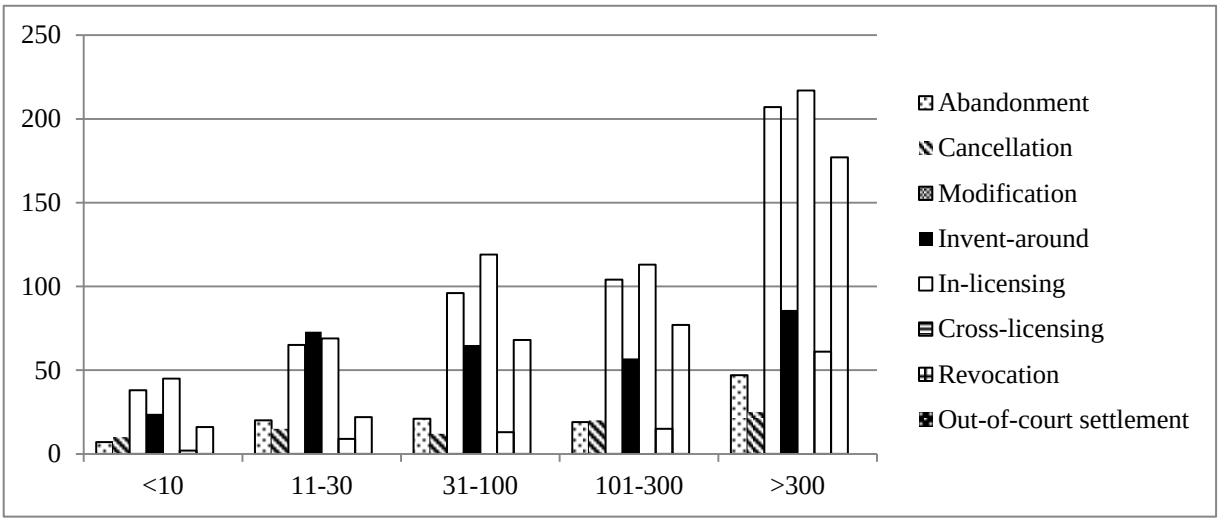

FIGURE 2. Incidences of formal protection mechanisms over firm size

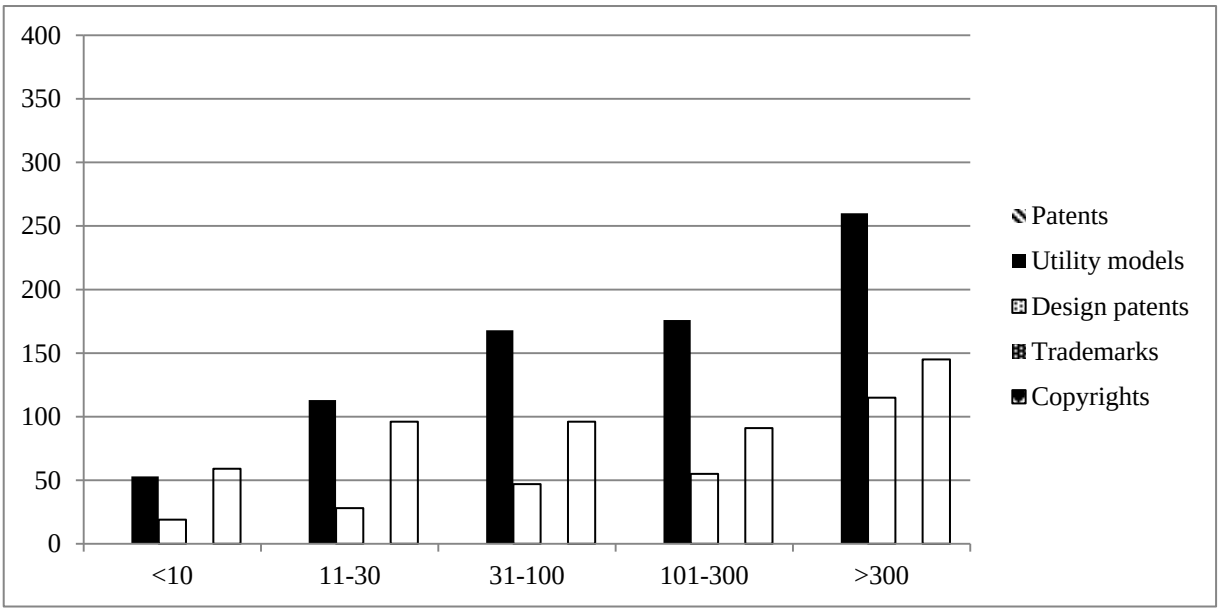

FIGURE 3. Number of observations by firm size and industry affiliation

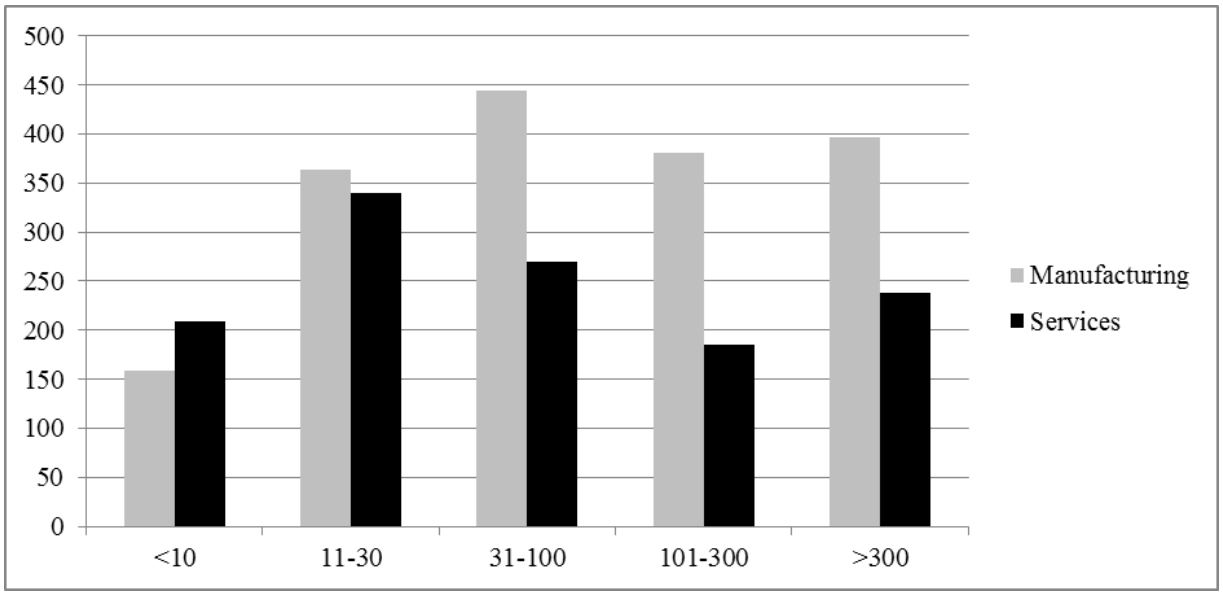

FIGURE 4. Incidences of defensive and evasive strategies over industry affiliation

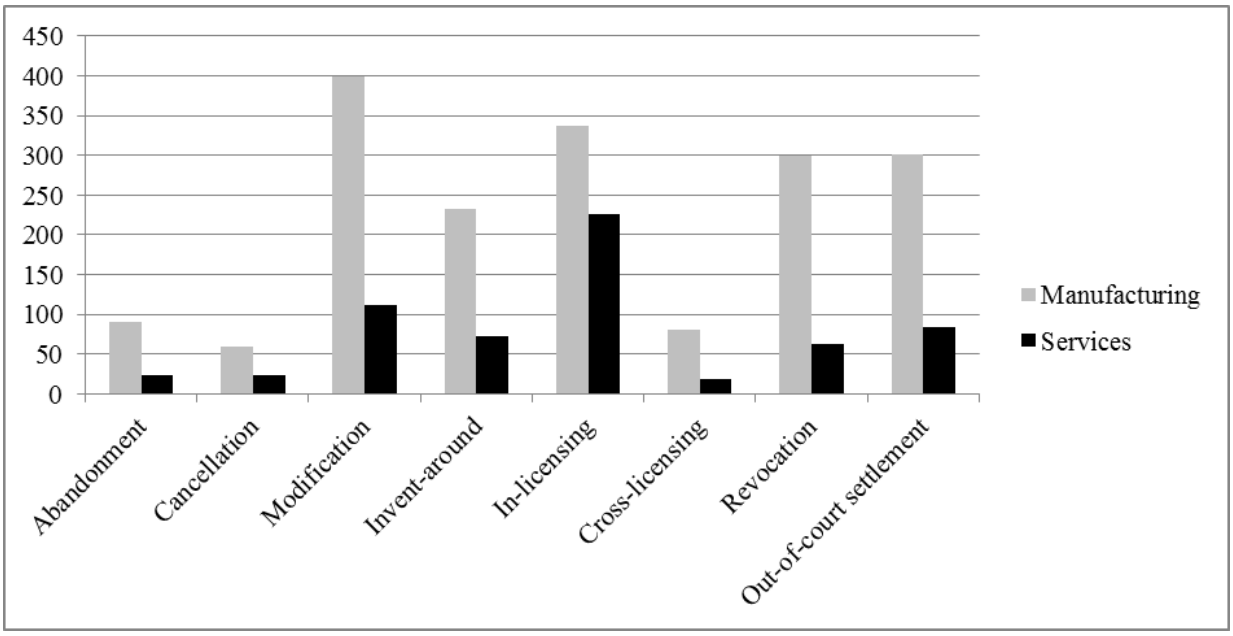

FIGURE 5. Number of observations by formal protection instruments and industry

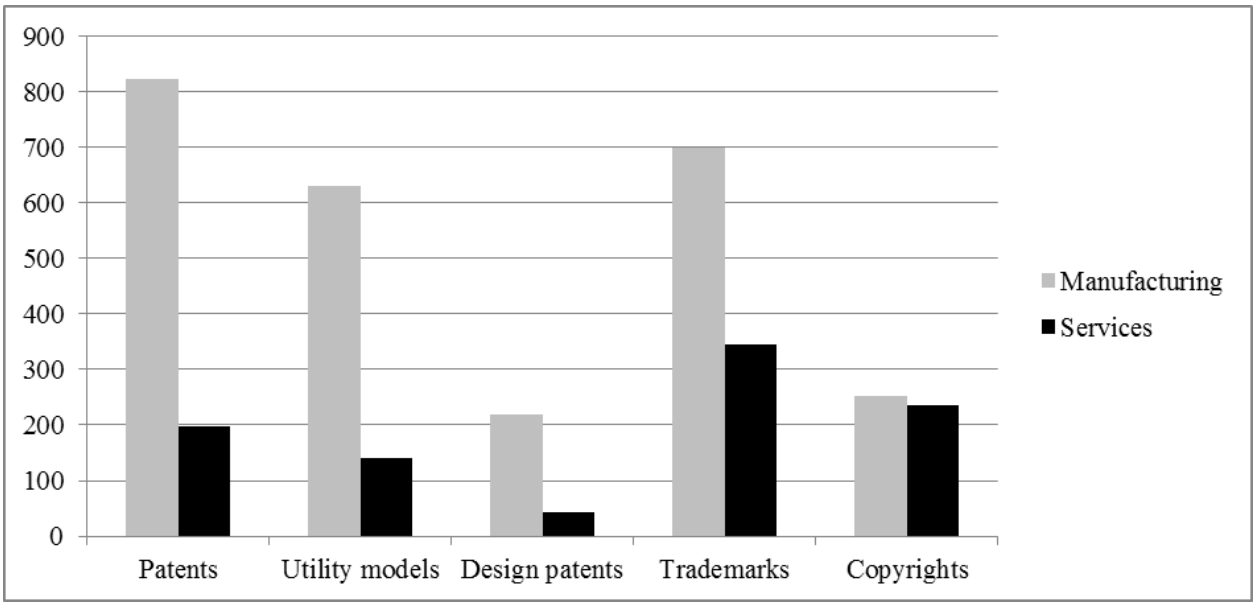

FIGURE 6. Identifying associations of defensive and evasive strategies in the full sample

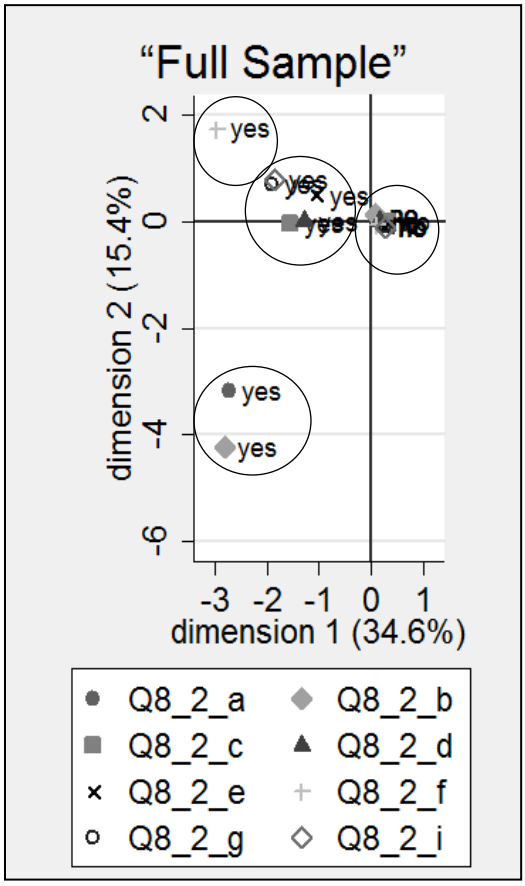

FIGURE 7. Identifying associations of defensive and evasive strategies – manufacturing and service sectors

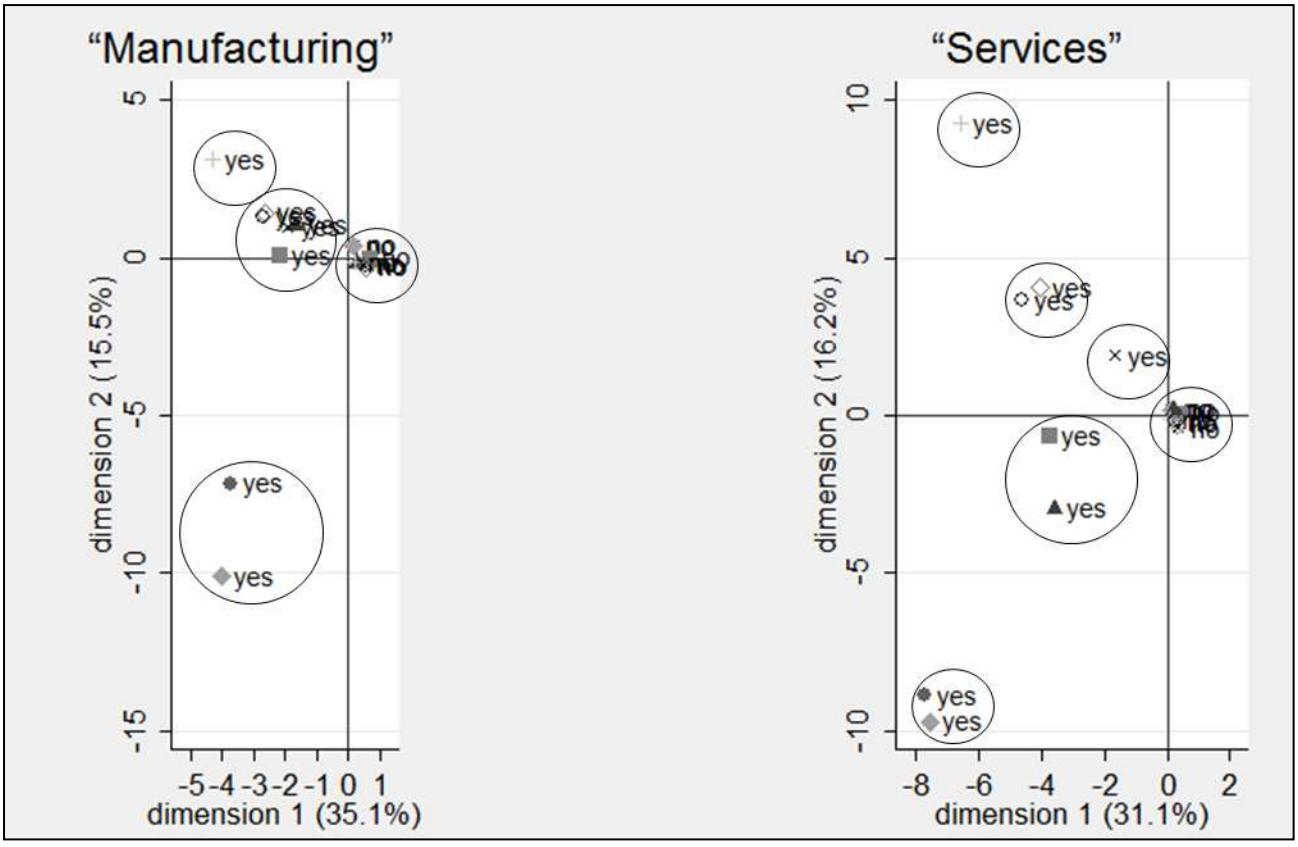

FIGURE 8. Identifying associations of defensive and evasive strategies – chemical and pharmaceutical and information and communication sectors