Always one step Ahead?

The Impact of Competitive Strategy on Susceptibility to Copy of Intellectual Property

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Abstract

Companies with competitive strategy are an attractive target for free riding of intellectual property (IP) as copying their products either provides high margins (differentiation) or opens large markets (cost leadership). We show empirically that differentiators struggle with this issue while cost leaders are less affected. Our findings suggest that cost leaders should use legal protection methods for technology and ensure the enforcement. Differentiators should keep their knowledge and technology secret to mitigate the imitation enabling effect of technical IPR (patents, utility models). Contrasting, trademarks and registered designs are as an effective tool for companies of both competitive strategies as they are for other companies. Policy should improve the effectiveness of IPR regimes regarding easy and fast enforcement of technical IP.

1. Introduction

Are companies shaping the innovative landscape in products or process innovations too fast to be caught up with? Our paper examines the interdependencies of a firm's general competitive strategy (cost strategy versus differentiation strategy) with its vulnerability to copy or infringement of IP(R) of tangibles[1]. According to the OECD (OECD, 2008) copy of IP regarding tangibles[2] causes severe damage which is steadily increasing; in 2005, the damage caused on a worldwide level amounted up to USD 200 billion and grew steadily up to USD 250 billion in 2007. As the total amount increases, so does the relative share of copied products in world trade (1.95% in 2007; OECD, 2009). However, despite the severe damage caused by copy or infringement of IP(R), this topic is not well researched and remains on the agenda for analysis. Apart from the already mentioned studies, industry reports are most frequently cited (Kingston, 2000; Business Software Alliance - BSA, 2008). However, all of them come short in providing a transparent methodological and theoretical approach. The scientific literature is mostly dealing theoretically with the impact of copy or infringement of IP(R) on the affected firms while empirical studies are still very scarce. Moreover, factors influencing a firm's susceptibility to copy or infringement of IP(R) are not yet in the focus of the scientific literature and only few scholars draw their attention to that issue (e.g. Blind, Cuntz, and Köhler, Accepted for Publication), which is why it remains an important research topic. Consequently, a general theoretical framework for a firm's susceptibility towards companies free riding on IP is still missing. This article provides one cornerstone of such a framework. First, we derive a general set of indicators for analyzing whether a firm can be regarded as a cost leader or a leader in product innovations by focusing mainly on their innovative activities regarding products and processes, their product portfolio and market share. In doing so, we rely on Porter's work on competitive strategy (Porter, 1980). The next step is the analysis of the impact of the respective strategy on the firm's susceptibility to infringement or copy of IP(R).

We argue that competitive strategies are an attractive target for companies aiming at free riding on those companies' IP. Competitive strategies function as signal (Akerlof, 1970) for competing companies and show the possibility of outperforming the competitors (Dess and

[1] This excludes media piracy, e.g. copying of music, movies, books, etc.

[2] Media piracy regarding books, movies, music, etc. is not included. The OECD uses the term product 'piracy'. In our paper we stick to copy and infringement of IP of tangibles as the term 'product piracy' is not (yet) an established one with a concrete and stable definition.

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Davis, 1984). Companies engaging in product differentiation substantially differ from cost leaders; they are equipped with distinct core competencies (Miller, 1988), and are found in different market segments (Kim and Lim, 1988). Cost leaders are usually operating in established markets whereas product differentiators are often acting in insecure and fast-changing environments (Miller, 1988). These basic differences allow a theoretical prediction of the susceptibility of companies with competitive strategy to copy of IP. One could assume IP free riding to be most profitable if the dominant design of a product has already been established and process innovations are dominating the technological development (Utterback and Abernathy, 1975). In such cases no risk is taken by the copying companies regarding the possible inability to sell the product if the dominant design shifts towards another technical solution. Hence, companies engaged in copying IP might mainly focus on products with an established dominant design for which firms already engage in cost reduction processes. Leaders in product differentiation, however, focus more on creating and inventing new solutions for customer needs and are focusing less on cost reduction (Porter, 1980). However, other factors also influence the attractiveness of IP free riding. If the copying company focuses more on high margins instead of high volume to make their profit, free riding on a differentiator's IP might be more interesting. The higher margins might compensate the risk of litigation and of following a dead-end innovation which might be overthrown by the dominant design established afterwards. This, obviously, requires high technological capabilities which are generally said to lack companies without a strong record in basic research and relying simply on imitation (OECD, 2008).

Using representative data for German companies contained in the Mannheimer Innovation Panel (MIP), ZEW, Mannheim, we employ multivariate analyses to test the susceptibility of cost leaders and differentiators to copy of IP. The MIP contains representative information about innovative and non-innovative companies in Germany. For the purpose of our study we merge two waves containing, on the one hand, information about possible indicators for cost strategy and product differentiation and, on the other hand, information about the infringement and copy of IP(R). Numbers of patents and European trademarks are matched on firm level. Furthermore, we test intra- and inter-sectorial differences between cost leaders and differentiators.

We find both competitive strategies to be highly susceptible to infringement of technical IPR while the differentiation strategy is even more susceptible compared to cost strategy. Contrasting unauthorized copy is more problematic for cost leaders. Regarding non-technical

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IPR (e.g., trademarks), competitive strategies are not more prone to infringement. Unauthorized copy of registered designs, instead, is a serious problem for both competitive strategies. Hence, both logical arguments for the attractiveness of copying a cost leader's or a product differentiator's IP relate to our findings.

The outcomes of our analysis have implications for management; low price companies should focus on establishing and defending their IP rights while leaders in product innovations can invest more into developing their products further and keeping the technical knowledge secret in order to maintain their leadership in product differentiation. The strategies of both firm types differ also regarding their IP management. For leaders in product differentiation, informal protection methods can be very effective to defend their strategic market position (e.g. time to market) combined with strictly enforced trademarks and registered designs. In turn, the cost leaders' strategy is more prone to unauthorized copy and, hence, cost leaders should focus on formal protection methods in order to be able to defend their rights with legal means.

2. Literature Review

Copy and infringement of IP(R) and especially regarding tangibles is a not very well-researched economic and managerial issue and literature dealing with the case of counterfeiting[3] is more widely spread. The OECD (2008) names *'product piracy'*[4] as one crucial threat for economy going hand in hand with crime while Karaganis (2011) contradicts this findings regarding media piracy: piracy regarding media is stated to be a pricing problem and not an outcome of organized crime. Notwithstanding, the mentioned report only analyzes media piracy in emerging countries and there is evidence for the harmful effect of media piracy in developed countries (Peitz and Waelbroeck, 2004; Liebowitz, 2008).[5]

However, the OECD report does not focus on media piracy and, hence, both reports' findings may be valid. Nonetheless, this contradiction on the first view clearly shows the ongoing debate in the field of copy and infringement of IP(R). Moreover, existing reports

[3] Counterfeiting often refers to the narrow case of trademark infringement. However, counterfeiting can also refer to counterfeiting of money, to imitation of designs or to copying of parts of or even entire products, which might also imply infringement of underlying technical IPR.

[4] Compare footnote 2.

[5] These studies only focus on lost profits of the music industry and do not take into account the rise of welfare by the free availability of music. Moreover, they do not analyze the affect on the supply side. Waldfogel (2011) finds that the supply of new music has not declined and is not affected by file sharing activities while taking into account quality aspects.

(such as Karaganis, 2011; OECD, 2008, 2009; Business Software Alliance - BSA, 2008; Kingston, 2000; also International Chamber of Commerce, 01-23-2007; Americans for Tax Reform Foundation/Property Rights Alliance, 2011; World Trademark Review, 2010) are more hands-on in their approach and come short in providing a transparent methodological and theoretical approach.

Notwithstanding, such reports contain valuable information regarding possible damage infringement or copy of IP(R) (regarding tangibles) may cause. Even though it is hardly possible to assess the damage of (illegal) copying activities (Kirovski, 2010), there are some indications; the OECD study (OECD, 2008) contains figures regarding 'product piracy' and counterfeiting mainly for custom seized goods.[6] The 2008 study estimates a possible damage of up to 200 bn US-$, the updated study (OECD, 2009) speaks of a volume up to 250 bn US-$. The share of such products in world trade is calculated to *'have increased from 1.85% in 2000 to 1.95% in 2007'* (OECD, 2009). Both studies stress the role of pirated products in world trade and also highlight the possible damage done by 'product pirates'.[7]

In this context, however, it is very important to mention that copy of IP can be perfectly legal. Reverse-engineering of products is an established practice of competing and has been explicitly allowed by law for years (Samuelson and Scotchmer, 2002).[8] Moreover, the concept of intellectual property itself is subject to philosophical discussion (Yung, 2009) and the effectiveness of strengthening the IP law in order to fight infringement is, furthermore, debatable (Hu Li, 2006). This aspect is further emphasized by the fact that China has been continuously improving the IPR legislation (Wenqi, 2005) while the incidences of piracy in China, at the same time, are increasing (European Commission and Taxation and Customs Union, 2009). Obviously, there is a discrepancy between legislation and enforcement concerning China (WANG, 2004; Yang and Clarke, 2005).

Literature on counterfeiting highlights the effects and impact on general welfare in theoretical terms. By counterfeiting, different groups get harmed: consumers may be misled

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[6] The study is not completely clear in its approach. It takes a mixed approach relying on custom data and on data of the UN-Comtrade database regarding commodity trade statistics. These figures do not contain products which are produced and consumed in the same country, non-tangible digital products and products sold over the internet.

[7] Other estimates are at least 1% of total sales of companies active abroad Feinberg and Rousslang (1990). The economic impact of piracy is estimated to cost the U.S. *'tens of billions of dollars and thousands of jobs each year'* Hoffman and Marcou (1990)

[8] This attitude seems to be changing. Still, reverse engineering is protected by international agreements such as the TRIPS or national law such as the Economic Espionage Act (EEA) in the U.S.

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by counterfeits and may buy them unintentionally; the companies producing the original product suffer from often illegal competition by counterfeiters and might be forced to adjust their prices and, hence, to lower their margins .On the other hand, global welfare might also profit from counterfeiting if the companies producing the original rise their quality in order to fight the counterfeiters (Grossman and Shapiro, 1988).[9] The last point is underlined and further explored by Raustiala and Sprigman (2009) who claim that innovative activities in sectors like music and fashion are accelerated by copy or infringement (*'Piracy Paradox'*; compare also: Raustiala and Sprigman, 2006) which clearly supports Grossman and Shapiro (1988) stating that infringement or copy also might enhance global welfare by spurring innovation. This aspect is further stressed if one takes positive network effects (Katz and Shapiro, 1994; Slive and Bernhardt, 1998; Prasad and Mahajan, 2003) possibly induced by infringement or copy into account. These effects might help innovators to successful position their products in the market; consumers would in turn profit from lower prices if the original producer decides against protection in order to take advantage of the mentioned effect (Conner and Rumelt, 1991)[10]. Furthermore, there is evidence for an innovation inducing effect of online piracy for both, new entrants and incumbents (Choi and Perez, 2007). However, the positive effects of at least copyright piracy are found to be limited and are often overrated (Liebowitz, 2005). Moreover, other studies speak of copy or infringement (by users) as the *'worst problem facing the (...) industry today'*[11] (Givon, Mahajan, and Muller, 1995). Givon *et al.* (1995) explain the massive thread from copy or infringement by the consumer base and, hence, less profits. Moreover, they also take into account that future revenues might be smaller as cross-selling and marketing campaigns for products cannot be directed at users lost due to infringement or copy. Nevertheless, the positive impact of infringement or copy regarding network goods is also stressed in their article.

A further differentiation of the damage copy or infringement of IP(R) can cause, is the distinction between primary and secondary market. The primary market is defined (OECD, 2008) as customers who purchase the product's copy even though they want to buy the original and are misled by the (almost) perfect copy. Contrasting, the secondary market comprises all customers who purposely buy the copycat knowing (and not caring) that it could infringe the original producers IP. The damage done by copy or infringement is more

[9] Another study of the authors points out Grossman and Shapiro (1988) that the two aspects of status and quality connected to brand-name products are disconnected by the act of counterfeiting.

[10] The authors analyze the positive network effects for the software industry.

[11] The mentioned study only focuses the software industry.

severe in the primary market as it cannibalizes the original producer's products and, hence, diminishes his/her profits. On the contrary, copy or infringement only focusing on the secondary market does not harm the original producer directly as those customers would not have bought the original product anyways. On this differentiation, de Castro, Balkin, and Shepherd (2008) postulate the different harm and good copy and infringement of IP(R) can cause for entrepreneurial firms. They claim, that the *'net impact (…) depends on the overlap between the markets (…): the less overlap, the greater the benefits'* (de Castro *et al.*, 2008). In this context, they stress the importance of quality differences between legal products and illegal copies, and the network and bandwagon effects copy or infringement of IP(R) can have.

Factors that influence the consumer's decision to willingly buy counterfeits are a further research topic. Influencing factors are the price and the branding of the purchased good, but the awareness of selling counterfeits to be illegal does not influence the buying decision (Cordell, Wongtada, and Kieschnick, 1996). Regarding luxury brands, the demand for counterfeits is explicitly articulated by consumers because of the *'social-adjustive'* function of such brands (Wilcox, Kim, and Sen, 2009). In this context, ethical aspects of such consumer decisions (Benjamin Tan, 2002) and the *'intention to pirate digital material'* (Cronan and Al-Rafee, 2008) as a customer are also the subject of research.

Further studies focus on the mechanisms of counterfeiting strategies and give insight into the relevance of knowledge leaks that tend to reveal relevant information to competitors within 12-18 months (Harvey and Ronkainen, 1985; Mansfield, 1985). Furthermore, information disclosed in patents are an important driver for imitation (Horstmann, MacDonald, and Slivinski, 1985; James J. Anton and Dennis, 2004).

Other parts of the copy and infringement literature focus the connection along the value chain and emphasize the importance of continuous monitoring of sales channels to approach the copy/infringement risk in (potentially) threaded markets (Olsen and Granzin, 1992). This goes hand in hand with literature focusing on strategies against piracy (Schuh, Kreysa, and Haag, 2009; Yang, Fryxell, and Sie, 2008) e.g., by raising the costs of counterfeiting (Bekir, El Harbi, and Grolleau, 2010) or by revising the employed IP strategy and reconsider the necessity of legal protection (Conner and Rumelt, 1991).

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The only study[12] existent to our knowledge analyzing factors influencing the likelihood of being infringed or copied (Weatherall and Webster, 2010) analyzes the infringement cases of inventors from Australia. The findings comprise a ratio of 28% of infringement and correlations between incidents of infringement and ex post estimates of the kind of innovation (incremental vs. radical), exports and the value of the respective patents. However, we aim at analyzing the connection between competitive strategy and copy and infringement of IP(R) which clearly goes beyond the results of the mentioned study.

2.1. Appropriability

As stated by many scholars (Grossman and Shapiro, 1988; Audretsch, 1995; Fagerberg and Verspagen, 2003; Grossman and Helpman, 1990; Audretsch, 1995; Segerstrom, 1991) innovation drives growth and is, hence, beneficial for a country's economy. Consequently, governments are interested in fostering growth by stimulating R&D expenses. One means to ensure high R&D expenditures is to guarantee the appropriability of the expected rents from those expenditures. As stated by Teece (1986) imitation of innovation (e.g. due to limited appropriation mechanisms) can reduce the innovation effort of firms. Firms are consequently interested to protect their innovations from (simple) copying of their competitors. Innovation can be a means to compete in markets and to obtain higher margins for one's products. This can be the driving factor to innovate. However, without suitable protection the innovation effort might be in vain if competitors closely follow the innovator as imitators and are able to rip off some of the innovation's profit, which would belong to the innovator if s/he protected his or her innovation. In the light of the rising importance of IP for companies' daily business (Hanel, 2006) it is of crucial importance to understand the shortcomings of the employed protection measures.

There are different possibilities to protect one's innovational efforts, among them are legal protection methods like patents, trademarks, utility models, copyright, registered designs, geographical indicators, etc. (European Commission, 2011) and informal protection methods such as lead time, secrecy, usage of complementary assets, etc. (Cohen, Nelson, and Walsh, 2000; Teece, 1986; Cohen *et al.*, 2002). An effective IP management makes use of different

[12] The other paper with a similar approach on which this work is based is Blind, Cuntz, and Köhler (Accepted for Publication)

measures in order to ensure a holistic approach. Still, legal protection rights can be violated by competitors and informal measures might not work out.

However, only innovative companies care about protection for innovation and being innovative is part of their competitive strategy. Consequently, the IP strategy of a company is closely linked to its competitive behavior. In this article we analyze the connection between competitive strategy and imitation by competitors.[13]

2.2. Competitive Strategies

Companies aiming at free riding on other companies' success by copying certain parts of or even whole products can be regarded as competitors for those firms even though they might compete on what generally may perceived as unfair conditions. However, they still compete against the companies from whose success, knowledge and technological capabilities they profit. Therefore, companies free riding on other companies IP(R) can be regarded as competitors to the producers of the original products.

Regarding their competition strategy, companies have different options to react. If a company wants to compete in a market, different strategies, so called competitive strategies, can be employed. Michael Porter (Porter, 1980: 71–85) differentiates between three main types of competitive strategies: comprehensive cost leadership, differentiation and concentration on core areas meaning hereby the segmentation strategy. For the purpose of this article, we basically follow Porter's competitive strategies and analyze the possible impact of the different strategies on the susceptibility to infringement or copy regarding tangibles. In this paper we discuss cost leadership and differentiation strategy; segmentation strategy focusing on both strategies within a comparably narrow market scope is not analyzed in this article because it is hardly possible to proof whether the company is really applying the segmentation strategy on product level and does not employ a split strategic approach for different products or industries. Empirical evidence on companies using a segmentation strategy on product level is, moreover, ambiguous (Nayyar, 1993). Obviously, the resources a company can exploit play an important role for and influence the choice of a specific competitive strategy (Peteraf, 1993). The resource based view is, however, no contradiction to the competitive strategy theory by Porter, but instead an amplification.

[13] Imitation by competitors is differentiated into two types: violation of a legal protection right and unauthorized copy of legally unprotected IP.

Porter's theory of competitive strategy and advantage is still a widely discussed topic in literature. A lot of scholars provide support for this theory (e.g., Calingo, 1989; Kim and Lim, 1988; Miller, 1988) and empirical evidence shows that cost and differentiation strategy indeed provide a competitive advantage (Dess and Davis, 1984; Calingo, 1989; Campbell-Hunt, 2000; Hutzschenreuter and Israel, 2009). Other studies analyze the costs of implementing such competitive strategies (Barney, 1986), or stress the fact that the competitive advantage generated might be only temporary[14] (Barney, 1991; Powell, 2001; D'Aveni, Dagnino, and Smith, 2010). The theory of competitive strategy is by no means outdated but instead still applicable to companies acting in competitive markets. In combining the protection of IP against imitation with the concept of competitive strategy we provide a new approach for research of competitive advantage and for research of innovation and its protection in a political and a business context.

2.2.1. Cost Leadership

One possible competitive strategy is comprehensive cost leadership. Companies employing this strategy try to undercut the costs of their competitors in order to generate a competitive advantage (Porter, 1980). Even if the competition in the respective market gets more intense, the cost leader's income, in theory, always remains higher than its marginal costs, as the price will not fall below the marginal costs of its competitors (Porter, 1980).[15] Hence, the cost leader is theoretically always able to lower the price under the competitors' best offer and this way maintains its market power.

Cost leadership is based on several economic principles. Economies of scale and the effects of experience or learning curves (firstly described by Wright, 1936 regarding the cost reduction in the aeronautic industry and applied and further developed since then) are concepts that help to find possibilities to cut costs. Economies of scale predict fix costs per unit of production to decrease as the number of production units increases. Hence, the costs of production per unit trend to the marginal cost of production per unit if the number of production units is increasing infinitely.[16] The effect of experience, on the contrary, also

[14] E.g., due to imiation.

[15] However, quality, service and other aspects are still important as the product itself must be a viable alternative for the competitors' products.

[16] This is only theoretically the case. In reality, there will be the need of new production sites, additional investments goods (machines etc.) meaning that the fix cost might increase at a certain point of the augmentation of production.

affects the variable costs of production, reducing the total production costs by 20-30% if the output is doubled (Wright, 1936). Both effects help to cut costs if the company heavily invests in production sites and, at the same time, rules a large market share to ensure that the produced goods are bought by customers instead of overproducing in a saturated market (Porter, 1980). Hence, the characteristics of cost leaders are: possessing a large market share and mainly investing in assets and not in R&D. They focus more on cost reduction process innovations than on product innovations and tend to introduce less new products into the market.

2.2.2. Differentiation

The second competitive strategy is differentiation. The main aim of this strategy is to create something (e.g. a product) completely new to the entire industry. There are different directions to which this kind of strategy can head; examples are differentiation in design or by trademarks, technology, after-sales and distribution networks (Porter, 1980). An ideal and comprehensive differentiation strategy is carried out on different levels at the same time. Important to note, however, is that costs in this strategy play a minor role but are not to be ignored completely as the products' price must somehow meet the customers' expectations. Yet, costs are not the focus of the differentiation strategy. The main typical characteristics of a firm following a differentiation strategy are strength in (basic) research and development, high quality, a leading position regarding technology and capabilities in product engineering.

2.2.3. Codification of Characteristics for Competitive Strategies

For our study, we need to differentiate between the two competitive strategies. As already mentioned before, we take Porter's approach to distinguish between differentiation and cost strategy. The *'commonly required skills and resources'* (Porter, 1980) differ for each competitive strategy.

For our analysis, we take the variables indicated in Table 1 in order to distinguish the competitive strategies. This means, if a company fulfills all characteristics as indicated in the variable columns, it will be defined as following the respective strategy.

Place Table 1 about here.

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2.2.4. Competition Strategies and Susceptibility to IP(R) Infringement

As stated in the previous chapters, the unauthorized usage of IP comes with a potential risk of being sued and with the risk of not being able to successfully imitate the features which incorporate the respective IP. As stated in previous literature (Horstmann, MacDonald, and Slivinski, 1985; James J. Anton and Dennis, 2004; Blind, Cuntz, and Köhler, Accepted for Publication), IPR provide an imitation enabling effect, especially in case of technical IPR (patents and utility models) as they reveal detailed, critical knowledge necessary and sufficient to copy the invention.[17] Consequently, it gets far easier to copy an invention if the invention is patented. However, the patent (or the utility model) also provides protection as it offers the right of exclusion. Hence, to infringe upon a patent comes with the risk of getting involved in a law suit. This risk is higher in case of IP protection by a suitable IP right. However, even unauthorized copy has the risk of infringement if a trade secret is involved. Generally, it is more difficult to prove the infringement of a trade secret compared to the infringement of a patent or utility model as the trade secret is not a registered and examined right. This is why the risk of being sued is smaller with regard to trade secrets. Moreover, this only applies to technical IP (patentable or applicable for utility model), not to registered design and brands as their nature impedes the usage of trade secrets. A summary of the potential risks attached to unauthorized IP(R) usage is given in Table 2.

Place Table 2 about here.

The research question we propose in this article is whether the competitive strategy has an influence on the likelihood of being infringed or copied. An infringer or copier has to take the potential benefits and risks into account before s/he decides for or against an unauthorized IP usage (Staake and Fleisch, 2008). If the benefits exceed the risks, a rational economic agent (risk-neutral) will decide for the unauthorized usage. Depending on the legal form of the company and on the market knowledge of the copying party, the product pirate is more or less able to analyze the competitive behavior of competitors. Competitive strategies in this context might have a signaling value (Akerlof, 1970), which possibly influences the copying decision. If a company successfully follows a competitive strategy, a company willing to free ride on IP could interpret this market as attractive enough (in terms of possible rents) to run the risk of copying IP. However, cost leadership and differentiation strategy differ in their

[17] *'The description shall disclose the invention in a manner sufficiently clear and complete for the invention to be carried out by a person skilled in the art.'* World Intellectual Property Organization (2002)

approach to achieve their profits. An overview of the arguments for and against copying IP of both, cost leaders and differentiating firms, is provided in Table 3. The arguments are more deeply discussed in the following paragraphs.

Place Table 3 about here.

The margins in the market of cost leaders are already very thin and cost leaders are able to obtain their profits by rigorously monitoring their costs. However, for companies willing to free ride on IP the anticipation of small rents from copying (processes or products) compared to the risks (Table 2) can discourage them from free riding on the invention and ideas of others. However, cost leaders normally act in more mature markets (Miller, 1988) in which the shift from product to process innovation has already been carried out by the market participants (Utterback and Abernathy, 1975). Consequently, the knowledge employed in this market is also more mature and might be easier to copy compared to very recent developments in more innovative markets regarding product innovations. Moreover, the dominant design is already established in markets in which cost leaders are active. This reduces the risk of producing a good which does not fit the needs and expectations of the consumers.

Contrasting, the arguments for and against copying of a differentiating company are, first, companies might be attracted by the comparatively high margins which can be attained in markets differentiating firms are targeting. These high margins can set-off the risk attached to the copy of IP. Moreover, the respective markets are not yet saturated and entering them is less risky than entering an established, saturated one. Despite that, there are also reasons not to copy IP of differentiating companies. Initially, the respective IP might be difficult to copy as it is very recent knowledge and even with the encoded knowledge of a patent one might need capabilities in product design and development in order to successfully copy the IP and include it in a successful product. This comes with cost and lowers the profits from copying. Moreover, in new markets the dominant design is not yet established (Miller, 1988), which carries the risk of copying a technology or a product which in the end will not achieve full acceptance in the market because the dominant design does not include it.

In order to hypothesize which competitive strategy is more likely to become a victim of copy or infringement regarding tangibles, further knowledge about the nature of product pirates and their abilities is necessary. This is the very heart of our study: we still do not know how capable product pirates are and what they are targeting at. Hence, we do not

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propose any hypothesis in our article but instead regard all possible outcomes of equal value. Our approach is, hence, more of an explorative nature.

3. Data and Methods

For our study we are making use of the Mannheimer Innovation Panel (MIP), ZEW, Mannheim, and merge two different waves containing information about the characteristics for the competitive strategy (MIP 2007) and information regarding the infringement and unauthorized copy of IP(R) (MIP 2008). Moreover, information regarding patent stock, trademark stock and utility model stock is added to the data set. Since we use data of two independent waves, we are confident to avoid endogeneity issues as the infringement or unauthorized copy indeed can be tracked down to a certain competitive strategy but do not correlate with the error term. The matching of the two waves is done on a 1:1 basis by a variable ('lfdnr') identifying each company throughout the MIP waves with a distinctive number as is the matching of the numbers of patents, community trademarks and utility models.[18] The merged data set contains 6110 randomly chosen German companies of different size, both innovative and non-innovative. In our analysis, however, we focus on those companies that follow a competitive strategy (either cost or differentiation strategy).

3.1. Methodological Approach

Our methodological approach is influenced by our research question and by the characteristics of the data employed. In this paper, we analyze the susceptibility to infringement or unauthorized copy of IP which is, in its methodological essence, very similar to the susceptibility of smokers to lung cancer, or of genetic predisposed patients to Alzheimer. Hence, we choose logistic regressions as our depended variables (infringement or unauthorized copy) are binary (either there is infringement (=1) or no infringement (=0)) and make use of odds-ratios in order to compute the likelihood of infringement or unauthorized copying as it is frequently done in medical research regarding diseases (Sawyer *et al.*, 2007; Hendrickse, Thuluvath, and Triger, 1992). This approach has two advantages: first, we are able to compute the general influence (negative or positive) of variables on incidences of infringement or unauthorized copy. Second, by employing odds-ratios we can exactly tell

[18] Information on the amount of copyright for the different companies is not available as the copyright is not to be registered contrasting to other IPR. Data for registered designs unfortunately were not feasably available and hence miss in our study.

how strong the influence is in lowering or increasing the likelihood (in percentage) of being (or becoming) a victim of product pirates. This enables us to derive interpretable and comprehensive evidence for economic implications and to give recommendations for management. The employed variables are shown in Table 4. We estimate our models against the background of both, innovative and non-innovative companies without competitive strategy. Our aim is to understand the influence of the competitive strategy on the susceptibility to copy or infringement of IP(R). Hence, we include in our models both, innovative and non-innovative companies.

In our models we control for influence of the number of IP rights hold (e.g., number of patents) and test for sectorial differences by employing the OCED classification of manufacturing industries into categories based on R&D intensities (OECD, 7 July, 2011). Furthermore, we differentiate between knowledge-intensive service (KIS) industries and less knowledge-intensive service (LKIS) industries (OECD, 2006).[19]

Place Table 4 about here.

4. Descriptive Analyses

The following section gives a first impression of the employed data set. In order to draw a comprehensive picture of the analyzed firms, Figure 1 shows the mean of key figures (turnover, number of employees, relative exports, and relative R&D spendings) for the different company categories according to their competitive strategy. Starting off with companies engaged in differentiation, they clearly are smaller companies in terms of both, turnover and employees. Furthermore, they tend to spend four times more of their turnover on R&D than firm without strategy. Contrasting, cost leaders tend to be larger firms, export relatively more than firms without strategy (as do firms focusing on differentiation) and spend less on R&D than firms with a differentiation strategy (only 2% of their turnover).

Place Figure 1 about here.

As this article deals with infringement (Figure 2), unauthorized copy (Figure 3) or generally with the adversely affection (violation, Figure 4) of IP(R), it is worthwhile to have a look at descriptive statistics to what extent companies following different (or none) competitive strategies struggle with IP(R) violation. Obviously, companies with a competitive strategy are

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

clearly more often affected by vitiation of IP(R) than IP of companies without a competitive strategy. Obviously, the highest infringement incidences are reported for technical IP. At least every tenth patent or utility model of companies with competitive strategy is infringed upon compared to only 3% of all technical IP of companies without strategy. Trademarks and registered designs are less infringed upon; however, relatively more trademarks and registered designs of companies with competitive strategy are infringed upon.

Even more affected is IP without legal protection: between 14% and 16% of unprotected technical IP of companies with competitive strategy is copied without authorization compared to only 5% of IP of firms without. Similarly, unregistered brands are also relatively more affected by copying compared to trademarks. Contrasting, a huge difference between infringement and copying is found for (registered) designs: 9-12% more unregistered designs are copied without authorization (compared to infringement incidences) regarding companies with strategy. The first impression given by this descriptive data suggests that companies with a competitive strategy are exposed to a higher risk regarding IP violation than companies without such a strategy. This impression will be further checked and elaborated with logistic regression in chapter 5 (p 15).

Place Figures 2,3, and 4 about here.

The main conclusion we draw from the descriptive statistics are, first, companies aligned to a competitive strategy seem to be a favored target for IP(R) infringers or copier and, second, infringement and unauthorized copy are also practiced in the EU and other western countries (e.g. USA) and are not only a thread of the Far East. In the following chapter we will further discuss these conclusions and test them with multivariate analyses.

5. Results

Each logistic estimation includes a variable indicating infringement or unauthorized copy of a certain IP(R) type as depend variable. The cost leaders and the differentiators are the independent variables whereas the scope of business (regional), the number of employees, relative exports and the number of legal protection rights (patents, utility models and trademarks) are included as control variables. An overview for all variables is provided in Table 4. As already mentioned and reasoned in chapter 3, we employ logistic estimations. Regarding the depending variables, we differentiate between IPR infringement and

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unauthorized copy of IP. Hence, this chapter is structured along these different depending variables.

5.1. IPR Infringement

The multivariate results for IPR infringement are summarized in Table 5 (coefficients) and Table 6 (odds ratios). As the coefficients do not give any information on how strong the respective influence is we provide this information with the odds ratios (Table 6). The first impression of the coefficients is the influence some of the control variables have. The intensity of exports[20] and the number of employees as an indicator for firm size are significant in throughout the models. Obviously, larger firms are more affected, as well as companies with a high export rate. The export rate and the company size are directly influencing the diffusion of the products and the embodied IP within them in the world. As we have expected these results we included these variables as control variables. Moreover, the trademark and the stock of technical IPR show significances in the respective models.[21] Furthermore, Table 5 shows that all estimated models are highly significant and explain between 7.2% and 24.4% of the respective variances.[22] Hence, the models have a high fit and degree of explanation. Regarding the studied variables cost and differentiation strategy our models provide a mixed picture. In one case the cost strategy variable is significant (infringement of technical IPR) and positive. Contrasting, differentiation strategy reveals two significant and positive coefficients (infringement of technical IPR and general infringement). However, differences between sectors are not reported.[23]

Place Table 6 about here.

The impressions of the mere coefficients are further distinguished by the odds ratio showing the susceptibility to infringement as likelihood. Patent and utility model infringement is more likely if the firm is a cost leader (86% more) and even more likely in case for differentiators (234% more). That means that the likelihood of patent or utility model rises by the factor 1.86 for cost leaders and by the factor 3.34 for companies with differentiation strategy. Companies pursuing a competitive strategy are obviously more exposed to patent or utility model

[20] Exports are meassured relativele to turnover

[21] We included the trademark stock for all models with infringement/unauthorized copy of trademarks as depending variable and the stock of technical IPR for all models with infringement/unauthorized copy of technical IPR.

[22] Compare Pseudo R^2

[23] Even interaction terms between competitive strategy and sectors are not significant.

infringement compared to companies not focusing on an explicit competitive strategy. Moreover, the odds ratio of differentiators is also very high (2.3) for infringement of any IPR.[24]

Place Table 7 about here

5.2. Unauthorized Copy

The second set of estimation uses incidences of unauthorized copying as depending variables. Unauthorized copy differs from infringement in the fact that infringement is only possible if the respective IP is protected by IPR. Unauthorized copy means the unauthorized use of IP while the IP is not protected by an IPR.

First indications of the competitive strategies' influence are given by the coefficients of the logistic estimations (Table 8). The first notably difference to infringement is that the control variables for trademark and technical IPR stock are not significant and do not influence the copying incidences. This means the signal function of those stocks is limited. Contrasting, the amount of exports positively influences the susceptibility to copying,[25] which draws a similar pattern to infringement. Regarding the competitive strategies our estimations draw a mixed picture. On the one hand we can see that cost strategy is significantly more susceptible to copy of technical IP compared to companies without strategy. On the other hand, differentiation seems to be more susceptible in general than cost strategy: regarding designs and generally (copy of any IPR) differentiators have significant and positive coefficients. In contrast, cost leaders face unauthorized copy of designs and reveal a significant coefficient of general unauthorized copy and copy of technical IP. Regarding the models in general, most are significant on the 1% level[26] and explain between 5.6% and 9.5%.

Place Table 8 about here.

More information on the influence's degree is provided by the odds ratios in Table 9. Regarding registered designs, both competitive strategies increase the risk of infringement by the factor 2.5 (cost strategy) and factor 3.3 (differentiation). Similarly, differentiators are more heavily affected in general (factor 2.7 compared to 1.9 for cost strategy). Cost leaders

[24] Not significant though lower than one are the odds ratios of cost leaders for trademarks and design infringement. That indicates a negative influence as do the coefficients. However, as the coefficients lack the significance the results are not robust enough to justify a thorough research interpretation.

[25] With the exception of copy of brands.

[26] Exception: copy of brands with significance level of 5%.

are more susceptible to copy of technical IP and employing the cost strategy increases the likelihood of copy by the factor 2.2. Summing up, the differentiation strategy is slightly more susceptible compared to cost strategy except for copy of technical IP, and companies with a competitive strategy are generally (compared to companies without) more affected by unauthorized copy of their IP.

Place Table 9 about here.

6. Discussion

The results of our estimation show that the effect of legal protection of IP differs with respect to the affected type of IP. Interestingly, patent and utility model protection do not frighten off companies willing to copy the IP described in them. The trade-off between the risk of a possible legal action taken by the infringed party is more than set-off by the perceived possibilities of reaping some of the cost leader's or differentiator's profits. The likelihood of infringement for differentiators is far higher than for cost leaders. This suggests that the infringing parties are willing and capable to copy the IP of the patent or utility model in at least such a manner that their product infringes upon the respective IPR. This is an indication that 'product pirates' are – contrasting to common believe[27] – capable to make use of published results of R&D and to incorporate the technology into their products. However, the degree to which the infringers' products do substitute or replace the original products remains unclear as the acceptance rate among customers is not subject of our research. Concluding, companies trying to compete through differentiation from their competitors are highly susceptible to infringement of patents and utility models. Also cost leaders face infringement of their patents and utility models while the likelihood of infringement is not as drastically high as for differentiating companies as is the degree of significance.

While patents and utility models do not discourage companies from using the underlying technology without permission, IP of companies with differentiation strategy applicable for patents or utility models is not more likely to be copied compared to companies without competition strategy. In contrast, cost strategy indeed is susceptible to copy of technical IP. This leaves room for interpretation. The imitation enabling effect of patents and utility models seems to make infringers to be able to copy or use the technology of both, differentiators and cost leaders. However, without the detailed description of the publication

[27] This believe is also stressed in literature OECD (2008).

their still seem to lack the crucial capacities to reverse engineer the target products of differentiators. Another effect not discussed, is the signaling effect (Akerlof, 1970) of patents. The simple assumption of infringers could be that important or even path breaking technology is more likely to be patented and hence they concentrate more on legally protected technology. Nonetheless, this argument does not explain the significantly higher susceptibility of cost leaders to copy of technical IP. However, another explanation could be that the technical IP without protection simply is outdated (e.g., the legal protection right might simply have expired) and therefore not attractive to copy. However, we know from discussions with IP managers[28] that IP of outdated patents is often copied – bearing that in mind, it is obvious that the technical IP without protection of companies with differentiation strategy is an attractive target for copying. Moreover, this argument, once again, does not explain the higher susceptibility of cost leaders to copy of technical IP. Hence, the first mentioned argumentation holds. The fact that standardization efforts often are connected with patent pools or so called essential patents (Bekkers, Duysters, and Verspagen, 2002; Gilbert, 2004; Lerner and Tirole, 2002; Baron and Pohlmann, 2011) might also increase the attractiveness of legally protected technology.

Consequently, for companies engaged in innovation and differentiation an interesting option of IP management could be to focus less on patents and more on keeping the knowledge crucial for copying secret. The results of our estimation show that legally protected technology of differentiating companies is more likely to be infringed as unprotected technology is likely to be unauthorized copied. On the other hand, the rising patent propensity over the last years would then be a result of misled management. However, cost leaders cannot rely on keeping their knowledge incorporated in their products secret as they suffer from reverse engineering of their products.

Compared with technology, other forms of IP like, e.g., design and brands behave completely contrarily. While unprotected designs of companies with a competition strategy are highly likely to be copied, trademarks and registered designs are not likely to be subject of infringement. The reasons for the polar opposite are various. First, trademarks and registered designs do not provide the imitation enabling effect like patents and utility models. It is possible to imitated designs and brands without access to a registry entry. Moreover, it is

[28] In a future case study we investigate the mechanisms of companies to fight IPR infringement and unauthorized copy. Some interviews have already been conducted.

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easier to enforce registered designs and trademarks[29] as for the proof of infringement no technological experts are necessary and, hence, the proof is easier (Bhagat and Umesh, 1997). Consequently, it can be fairly assumed that trademark and registered design infringement are more likely to be sued as the probability of a favorable outcome of the legal action for the infringed party might be more likely compared to patent or utility model infringement suits. The threat of legal action in case of trademark or registered design infringement is a serious threat and does more than offset the possible rents from counterfeiting. This is, however, not the case for unprotected designs. In this case it is perfectly legal to imitate it. Especially for companies engaged in differentiation this information is of high value as registering brands as trademarks and designs largely fends off counterfeiting.

More generally, our results clearly show that companies free riding on IP are a severe threat to companies engaged in differentiation and, hence, to one of the cornerstones of an innovative economy. Cost leaders are also a favorite target of companies free riding on IP, however, they still are less likely to be affected by infringement or unauthorized copy of IP compared to companies engaged in differentiation. They, in turn, are more affected by unauthorized copy. Dealing with companies infringing upon or free riding on IP(R) therefore is one of the important topics to be addressed by policy makers and managers alike.

7. Conclusion

Are innovative companies always one step ahead their competitors? The results of our research show that companies whose business model firmly base on innovation are not exempted from unauthorized copy or infringement of their IP(R) but instead a favorite target of 'product pirates'. Companies relying on differentiation of their products are even more affected than companies focusing on cost leadership while providing a sufficiently high quality.

Further, our results indicate that cost leaders can rely on using patents and utility models if they look after the enforcement of these legal rights. Even if the technology is also protectable by informal measures (e.g., secrecy or complex technology), patenting is recommended as our results show that cost leaders suffer from copy of technical IP. At the same time, their brands and designs are less likely to be copied and a lean IPR management regarding trademarks and registered designs is possible.

[29] We assume that trademarks and registered designs are correctly and professionaly filed for.

With respect to companies engaging in differentiation, 'product pirates' indeed are a severe threat. A clear recommendation is not possible. However, our results suggest that informal measures are less prone to attract pirates compared to formal protection measures regarding technology. Hence, we recommend to take a two-step approach; first, the decision for and against patenting ought to be strongly linked to the willingness of enforcement of the patent. If the willingness or the ability of enforcement is not sufficient, patenting is not recommended. In the second step, the company decides for a suitable alternative protection measure, such as secrecy, complex technology, destandardization or the like. Notwithstanding, legal protection of trademarks and designs is very effective in frightening off product pirates. A combination of strictly enforced trademarks and designs and informal measures for protection of technology is an effective strategy against product pirates. However, keeping the leading position in product development and design is not enough if a suitable IP strategy is missing.

Regarding policy recommendations, our results have shown that the IP regime regarding technology is doing good and harm at the same time. On the one hand, the publication of the patent enables companies to copy the technology. However, on the other hand, the IP regime offers the legal enforcement of patents. Our results show that trademark and registered design protection indeed keeps others from illegal usage. Patents and utility models do not likewise. This finding gives concern as it suggests that companies infringing upon patens or utility models do not worry about the legal enforcement – at least not as much as about the legal enforcement of trademarks and registered designs. Possibly, the reasons for this behavior are rooted in the difficulty and expensiveness (Lanjouw and Lerner, 1997) of patent enforcement. One recommendation for policy would consequently be to ensure fast and easy enforcement of patents while at the same time guarantying a high degree of reliability of the patents' validity.

Further research should focus on the effectiveness of strategies against product pirates and work on a deeper understanding of characteristics signaling attractiveness for copy or infringement of their IP(R). Moreover, differences between the different IPR regimes should be analyzed and the likelihood of infringement in certain countries be taken into account.

Our study provides a first indication that copy and infringement of IP(R) indeed is a threat for all companies whether or not they are relying on top edge technology. Being the technology leader in a field and providing highly differentiated products is no longer enough to be always one step ahead.

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Table 1: Indicators for competitive strategies (based on Porter, 2008).

Variables for Cost Strategy	**Variables for Differentiation Strategy**
Company has improved processes by process innovation	Company has done a product innovation
Company has reduced costs	Company has introduced a completely new product to the market
Market share is at least 20%	Product portfolio of company consists of at least 15% new products

Table 2: Risks of unauthorized IP Usage

		Infringement	Potential Risk	Unauthorized Copy	Potential Risk
Technical IP	Patent	Risk of being accused of infringement → possible law suit	High	Trade secret; imitation difficult	Depends on the complexity of the invention and on the existence of a trade secret
	Utility Model		Medium (unexamined)	Trade secret; imitation difficult	
Design			High	n/a	n/a
Brand					

Table 3: Arguments for and Against Copy of IP

Strategy	Pro	Contra
Cost Leader	• Dominant design established • Knowledge more mature and easier to copy	• Only small rents expected • Market may be saturated
Differentiation	• High margins • New market with unsaturated consumers	• Difficult to copy • Dominant design not (yet) established

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Table 4: Overview Variables

Dependent Variables	**Measurement**	**Mean**	**S.D.**	**Min**	**Max**
Infringement of Technical IPR	Dummy	0.0460	0.2095	0	1
Infringement of Trademarks	Dummy	0.0355	0.1851	0	1
Infringement of Registered Designs	Dummy	0.0208	0.1427	0	1
General Infringement	Dummy	0.0769	0.2665	0	1
Copy of Technical IPR	Dummy	0.0276	0.1637	0	1
Copy of Brands	Dummy	0.0154	0.1231	0	1
Copy of Designs	Dummy	0.0396	0.1951	0	1
General Copy	Dummy	0.0655	0.2474	0	1
Independent Variables					
Cost Strategy	Dummy	0.0562	0.2303	0	1
Differentiation Strategy	Dummy	0.0424	0.2014	0	1
Control Variables					
No. Employees (ln)	Integer	3.8175	1.5954	0	12.1
Exports '06 (% Turnover)	Dummy	0.1500	0.2378	0	1
No. Of Technical IPR[30]	Integer	1.4281	22.8049	0	1008
No. Of Trademarks	Integer	0.3446	3.6525	0	144
Sector Types					
High-tech	Dummy	0.0419	0.2004	0	1
Medium-high-tech	Dummy	0.1501	0.3572	0	1
Medium-low-tech	Dummy	0.1446	0.3517	0	1
Low-tech	Dummy	0.1114	0.3147	0	1
KIS	Dummy	0.4199	0.4937	0	1
LKIS	Dummy	0.0313	0.1742	0	1

[30] Patent, trademark and utility model stocks are depreciated annualy by fifteen percent as suggested by Hall, Jaffe, and Trajtenberg ; (2001). We take the stocks until 2004 into account. This means that patents and trademarks registered after 2004 are not considered as the question for infringement or copy aims at the time horizon of 2005-2007. Infringements or incidences of copy in 2005 cannot be connected with IPR registered in 2007. Hence, we use the stocks of 2004 as a approximation. A further inaccuracy is the publication lag which might negatively influence the likelihood of infringement and copy. However, our results are strong enough to buffer these slight inaccuracies.

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Table 5: Logistic Regression IPR Infringement: Coefficients

	Infringement of Technical IPR	Infringement of Trademarks	Infringement of Registered Designs	General Infringement
Cost Strategy	0.623*	-0.353	0.0609	0.00342
	(0.341)	(0.485)	(0.560)	(0.313)
Differentiation Strategy	1.205***	0.157	0.433	0.843***
	(0.370)	(0.543)	(0.631)	(0.314)
No. Employees (ln)	0.342***	0.270***	0.300***	0.305***
	(0.0740)	(0.0742)	(0.0967)	(0.0573)
Exports '06 (% Turnover)	2.953***	1.957***	1.526***	2.468***
	(0.403)	(0.440)	(0.580)	(0.313)
No. Of Technical IPR	0.0435***			0.0302**
	(0.0132)			(0.0125)
No. Of Trademarks		0.132***		0.0626*
		(0.0347)		(0.0362)
High-tech	0.0924	-0.485	-1.368	-0.325
	(0.627)	(0.778)	(1.094)	(0.524)
Medium-high-tech	-0.000953	-0.189	-0.480	-0.0792
	(0.467)	(0.494)	(0.528)	(0.352)
Medium-low-tech	0.0998	0.187	-0.746	0.0765
	(0.470)	(0.479)	(0.580)	(0.352)
Low-tech	-0.277	-0.387	-0.0759	-0.0926
	(0.546)	(0.566)	(0.535)	(0.388)
KIS	-0.0366	0.0324	-0.788	-0.0518
	(0.450)	(0.442)	(0.490)	(0.325)
LKIS	0.330	0.114	-0.590	-0.111
	(0.843)	(0.830)	(1.091)	(0.674)
Constant	-5.621***	-4.926***	-4.957***	-4.485***
	(0.549)	(0.524)	(0.593)	(0.394)
Observations	2,131	2,113	2,118	2,172
Log Likelihood	-300.5	-289.4	-198.6	-488.6
Chi^2	193.9	69.26	30.84	200.5
Pseudeo R^2	0.244	0.107	0.0721	0.170
Prob > chi2	0.0000	0.0000	0.0006	0.0000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Logistic Regression IPR Infringement: Odds Ratios

	Infringement of Technical IPR	Infringement of Trademarks	Infringement of Registered Designs	General Infringement
Cost Strategy	1.864*	0.703	1.063	1.003
	(0.635)	(0.341)	(0.595)	(0.314)
Differentiation Strategy	3.338***	1.170	1.541	2.324***
	(1.235)	(0.635)	(0.972)	(0.729)
No. Employees (ln)	1.408***	1.310***	1.350***	1.356***
	(0.104)	(0.0971)	(0.130)	(0.0777)
Exports '06 (% Turnover)	19.16***	7.079***	4.601***	11.79***
	(7.717)	(3.117)	(2.669)	(3.696)
No. Of Technical IPR	1.044***			1.031**
	(0.0138)			(0.0128)
No. Of Trademarks		1.141***		1.065*
		(0.0396)		(0.0386)
High-tech	1.097	0.616	0.255	0.722
	(0.688)	(0.479)	(0.279)	(0.379)
Medium-high-tech	0.999	0.828	0.618	0.924
	(0.467)	(0.409)	(0.327)	(0.325)
Medium-low-tech	1.105	1.205	0.474	1.079
	(0.520)	(0.578)	(0.275)	(0.380)
Low-tech	0.758	0.679	0.927	0.912
	(0.414)	(0.384)	(0.496)	(0.353)
KIS	0.964	1.033	0.455	0.949
	(0.433)	(0.457)	(0.223)	(0.308)
LKIS	1.391	1.120	0.554	0.895
	(1.173)	(0.929)	(0.605)	(0.603)
Observations	2,131	2,113	2,118	2,172
Log Likelihood	-300.5	-289.4	-198.6	-488.6
Chi^2	193.9	69.26	30.84	200.5
Pseudeo R^2	0.244	0.107	0.0721	0.170
Prob > chi2	0.0000	0.0000	0.0006	0.0000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Logistic Regression Unauthorized Copy: Coefficients

	Copy of Technical IP	Copy of Brands	Copy of Designs	General Copy
Cost Strategy	0.769*	0.434	0.910***	0.632**
	(0.443)	(0.574)	(0.349)	(0.298)
Differentiation Strategy	0.565	1.027	1.194***	0.997***
	(0.501)	(0.637)	(0.380)	(0.307)
No. Employees (ln)	-0.0729	0.336***	0.159**	0.0991
	(0.0941)	(0.113)	(0.0766)	(0.0607)
Exports '06 (% Turnover)	1.896***	0.566	1.830***	1.730***
	(0.477)	(0.747)	(0.425)	(0.331)
No. Of Technical IPR	-0.00247			-0.000608
	(0.0115)			(0.00641)
No. Of Trademarks		-0.0282		-0.0351
		(0.0964)		(0.0613)
High-tech	1.683	0.0853	1.073	0.832
	(1.169)	(1.249)	(0.678)	(0.583)
Medium-high-tech	1.723	-0.198	0.599	0.623
	(1.054)	(0.930)	(0.582)	(0.477)
Medium-low-tech	1.699	0.841	0.948*	1.155**
	(1.054)	(0.820)	(0.570)	(0.461)
Low-tech	2.007*	1.167	0.824	1.177**
	(1.061)	(0.814)	(0.600)	(0.477)
KIS	1.627	0.344	0.504	0.718
	(1.028)	(0.779)	(0.553)	(0.446)
LKIS	(omitted)	0.571	(omitted)	-0.367
		(1.248)		(1.093)
Constant	-5.426***	-6.267***	-5.082***	-4.319***
	(1.063)	(0.888)	(0.612)	(0.489)
Observations	2,032	2,079	2,020	2,138
Log Likelihood	-242.0	-154.8	-304.9	-477.2
Chi²	28.73	20.94	63.61	79.51
Pseudeo R²	0.0560	0.0633	0.0945	0.0769
Prob > chi2	0.0014	0.0340	0.0000	0.0000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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Table 8: Logistic Regression Unauthorized Copy: Odds Ratios

	Copy of Technical IP	Copy of Brands	Copy of Designs	General Copy
Cost Strategy	2.158*	1.544	2.484***	1.881**
	(0.955)	(0.887)	(0.866)	(0.560)
Differentiation Strategy	1.760	2.793	3.301***	2.711***
	(0.882)	(1.780)	(1.253)	(0.834)
No. Employees (ln)	0.930	1.399***	1.172**	1.104
	(0.0875)	(0.158)	(0.0897)	(0.0670)
Exports '06 (% Turnover)	6.657***	1.762	6.236***	5.639***
	(3.175)	(1.317)	(2.652)	(1.864)
No. Of Technical IPR	0.998			0.999
	(0.0114)			(0.00641)
No. Of Trademarks		0.972		0.966
		(0.0937)		(0.0591)
High-tech	5.383	1.089	2.923	2.298
	(6.293)	(1.360)	(1.981)	(1.339)
Medium-high-tech	5.602	0.820	1.821	1.864
	(5.904)	(0.762)	(1.059)	(0.889)
Medium-low-tech	5.470	2.320	2.580*	3.173**
	(5.767)	(1.903)	(1.471)	(1.464)
Low-tech	7.444*	3.213	2.280	3.246**
	(7.896)	(2.616)	(1.369)	(1.548)
KIS	5.088	1.411	1.655	2.049
	(5.232)	(1.100)	(0.915)	(0.914)
LKIS	(omitted)	1.769		0.693
		(2.207)		(0.758)
Observations	2,032	2,079	2,020	2,138
Log Likelihood	-242.0	-154.8	-304.9	-477.2
Chi²	28.73	20.94	63.61	79.51
Pseudeo R²	0.0560	0.0633	0.0945	0.0769
Prob > chi2	0.0014	0.0340	0.0000	0.0000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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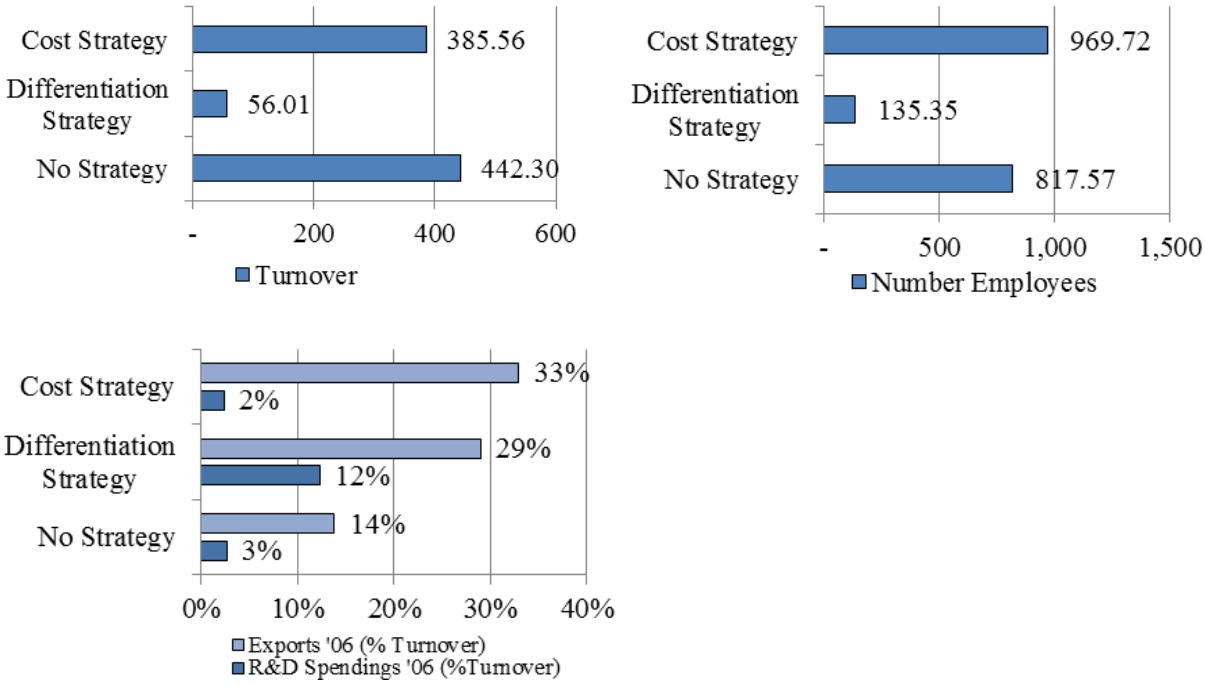

Figure 1: Means of key Figures for Strategic and non-Strategic Acting Companies

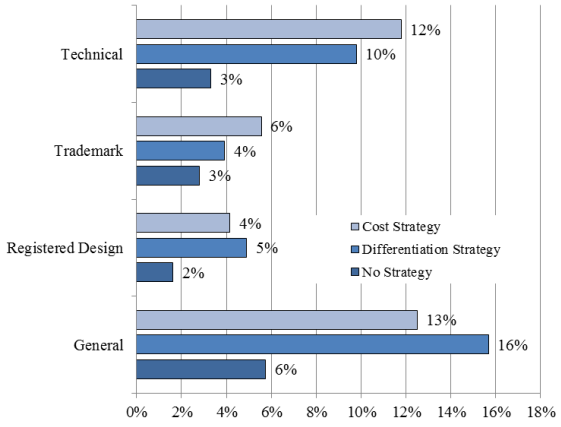

Figure 2: Incidences of Infringement

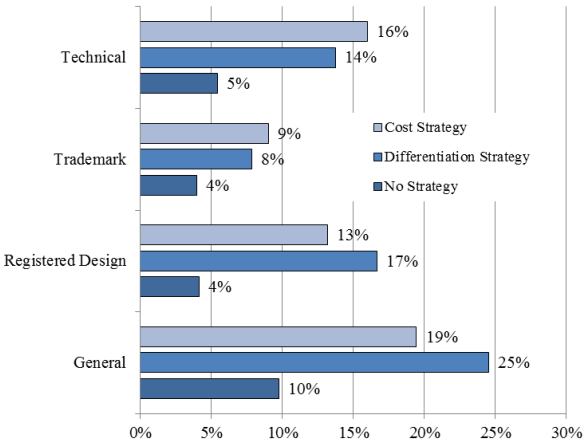

Figure 3: Incidences of Unauthorized Copy

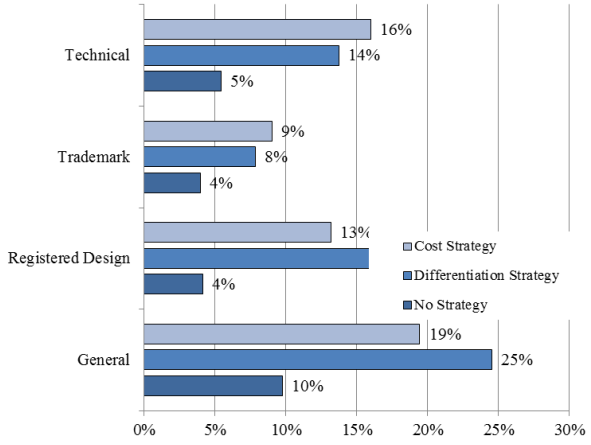

Figure 4: Incidences of IP Violation

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