The Influence of Strategic Patenting on Companies´ Patent Portfolios

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Abstract

This paper analyses whether strategic motives of patenting influence the characteristics of companies' patent portfolios described by citations and oppositions. The investigation is based on data of more than 400 German companies. We find clear evidence that the patenting strategies of companies explain the characteristics of their patent portfolios. First, companies using patents in their original function of protecting their technological knowledge base receive on average a higher number of citations for their patents. Second, we find that the motive of offensive blocking but not of defensive blocking is related to a higher incidence of oppositions, whereas companies using patents as barter chips in collaborations receive fewer oppositions to their patents. These results confirm the valuable contribution patent databases can provide for both characterising the patent strategies of companies and readjustments of the patent regimes, e.g. by increasing examiners effort on securing high patent quality in order to restrict the strategic misuse of the patent system.

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1. Introduction

There exist several studies presenting structures and extent of strategic patenting Arundel et al. 1995; Cohen et al. 2002; Schalk et al. 1999. They argue that the patent system, which original rationale is the temporary protection of the technological knowledge base, is used by companies for various further so called "strategic" motivations. For example, patents are also an instrument to secure the own technological space against competitors or to restrict their future technological opportunities. In recent years, patents became important assets in collaborations, to generate licensing revenues or to get a better access to the capital market especially for start-up companies. Finally, patents can also be used by companies´ management as a performance indicator, but also as a reward mechanism for researchers.

Parallel to the emerging literature on strategic patenting, numerous authors have concentrated on the analysis of indicators of patents to determine their economic value. From bibliographic analyses, the number of citations as a reliable value indicator is successfully transferred to patents.[1] Furthermore, the incidence of patent oppositions is a good signal for a rather valuable patent. Meanwhile, there exist several studies both on the interrelationship of the various value indicators and on their explanatory power for the monetary values of patents Harhoff et al. 2003; Harhoff, Reitzig 2004; Lanjouw, Schankerman 2004; Traijtenberg 1990.

In our paper, we try to bridge for the first time the research on strategic patenting with investigations on companies´ patent portfolios. We extend the systematic analysis of factors explaining the motives of strategic patenting in Germany by Blind et al. 2006 in order to investigate the relation of strategic patenting with the characteristics of companies´ patent portfolios, measured by various value indicators. These insights allow us also to derive conclusion for future patent policy. Based on a sample of almost 500 patenting companies in Germany, the paper presents insights on the influence of strategic patenting based on survey data Blind et al. 2004 on the characteristics of companies´ patent portfolios, like the number of citations per patent or the likelihood of oppositions.

The remainder of the paper is structured as follows. In Chapter 2, we present the most relevant indicators to measure the value of patents. Focusing on a few clusters of patent motives out of those suggested by Blind et al. (2006), we develop in Chapter 3 a set of hypotheses for the empirical investigation of the relationship between the different strategic motives to patent and the characteristics of patent portfolios. Chapter 4 presents the merged database we use for our empirical analysis and some descriptive

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1 See Lanjouw and Schankerman 2004 for a comprehensive overview.

statistics. In Section 5, the results of a series of multivariate regressions are displayed in order to validate or revise the hypotheses developed in Chapter 3. The paper concludes with a summary of results and challenges for future research.

2. Patent Portfolio Characteristics

Patents are heterogeneous and supply different levels of additional profit to companies through the original protection function and strategic functions Somaya 2003. The value a single patent has for its patentee is not observable. The absolute value of patent portfolios or patent stocks is hard to identify from survey data Harhoff et al. 2003. In the following section, we present the most reliable value indicators which can be used to describe the characteristics of a company's patent portfolio.

A patent applicant at the European Patent Office (EPO) suggests patents which should be included as references to the prior art. However, the examiner at the EPO makes the ultimate decision on what patents will be included as backward citations. The references to earlier patents in the German and European system mark the boundaries of patentability and the bases the invention builds on. They are used to substantiate the patentability for which novelty and inventive activity is necessary. This function of citations implies that the number of citations received (forward citations) play a similar role to that of references in scientific publications as an indicator for the importance of the patent. Traijtenberg 1990 supported this argumentation considerably and Harhoff et al. 2003 provided more broad evidence of the correlation between patent value and citations received in subsequent patent applications. Even though the forward citation can point to further development and depreciation of the former invention, the value enhancing effect should be dominant as survey evidence supports Harhoff et al. 2003.

References made to prior patents in both the EPO and DPMA (German Patent and Trademark Office) patent applications reflect the state of the art – the scope. On the one hand, they indicate previously granted patents that pose a potential threat because they are similar to the invention named in the patent application under consideration and may restrict it. On the other hand, scope is confirmed to be significantly positive correlated with the monetary value of German patents Harhoff et al. 2003. These two interpretations of citations are not distinguishable. Lanjouw and Schankerman 2003 argue that a large number of references in the patent application indicates a well-developed technology with less uncertainty than newly developed technologies.

In addition to the number of citations, the incidence of an opposition is also a positive value indicator. A reason might be that the expected value of the protected invention is so high that it is worth opposing for competitors in order to abolish the intellectual property right. Expected innovation rents for patents which withstood oppositions procedures either amended or unchanged are proved to be higher. Harhoff et al. (2003)

found that patents which have defeated an opposition procedure are significantly more valuable than those patents which have not been attacked. This finding was strengthened by the analysis of Harhoff and Reitzig 2004, which shows that opposed EPO patents in biotechnology and pharmaceuticals are generally more valuable, than those which were not opposed when measured by several value indicators. On the one hand a higher expected value of a patent attracts more exploitive interests. On the other hand, a patent which has faced opposition becomes more valuable because it indicates a stronger patent right.

In addition to the two indicators used in our empirical analysis, for completeness, we have to mention the following three indicators family size, number of claims and ways of patent protection.

A patentee can file patent applications for the same subject matter in more than one jurisdiction, building a patent family. Within the one year of priority he or she can file exactly the same patent at certain patent offices while still fulfilling the requirement of novelty. Putnam 1996 first introduced the number of such jurisdictions representing family size as a value correlate of patents because it is associated with considerable costs of application and translation. It is a suitable variable because it reflects the patent holder's private estimation of the patent's value.

A patent claim defines in words the boundaries of an invention so that the public will know what the invention is and can avoid infringing it. A patent usually comprises a bundle of independent principle claims which define the basic elements of the invention. Additional subordinate claims describe the invention in more detail. For the value of the patent the principle claims have a higher relevance than the subordinate claims. For broad patents indicated by a high number of total claims, an infringement is more likely. Since probability of litigation is conditioned on the probability of being infringed, c.p., probability of litigation depends on number of claims. Positive relationships between number of claims and probability of a patent being subject to a dispute are found in Lanjouw and Schankerman 2003, Graham et al. 2003, and Harhoff and Reitzig 2004.

Finally, there are three different ways of seeking protection in more than one country. First, a patentee can apply in each country at its domestic patent office. Second, the European Patent Office can provide protection within any or all of the member states of the European Patent Convention via just one application. A third way is to apply for all countries which are member states of the Patent Cooperation Treaty (PCT) in one so-called PCT-application. In a study by Thumm 2000 the "road of application" is used to indicate the importance an invention has for the inventor or applicant. PCT applications are similar to EPO patents; they seek protection in more then one jurisdiction within the member states. It can be assumed that facing the higher cost of a PCT or EPO applica-

tion compared to a DPMA application the applicant expects compensation through higher profits and this values the patent more highly.

3. Motives to Patent

There are different approaches to structure strategic motives to patent. The basic function of a patent as originally foreseen from the builders of the patenting regime is to provide an effective instrument to prevent imitation by competitors in order to secure the appropriability of the earnings from innovative technologies, which should also increase the incentives for investments in innovative activities.

There is no agreed upon definition of strategic patenting, although most experts include the use of patents to block competitors and for use in negotiations. Arundel and Patel 2003 divide these strategic (in contrast to traditional) reasons into defensive and offensive strategies. A firm will patent defensively to stop other firms from patenting one of its inventions and suing it for infringement, even though the firm does not need a patent on the invention to earn a return on its investments in innovation. The returns derive from non-patent appropriation methods such as secrecy or lead-time advantages, which have consistently been shown in innovation surveys to be more valuable to firms than patents Arundel et al. 1995; Granstrand 1999. Second, firms may choose to patent defensively in order to have something to trade with other firms. In some sectors, such as ICT, the use of patents in negotiations with other firms for technology access is probably one of the most important motivations for patenting. Firms patent offensively to prevent or block other firms from patenting inventions that are similar, but not identical, to the invention that they plan to commercialise. In this case, the firm builds a patent wall around its invention. This prevents other firms from commercialising competing products, even though the firm does not intend to market or license these other products itself.

In the empirical literature, Blind et al. (2006) are able to divide the various motives to patent into the traditional protection motive, the blocking motive, the reputation motive, the exchange motive, and the motive to use patents as incentives, but also as performance indicators for R&D departments and employees. This distinction is based on a factor analysis, which condense the differentiated multiplicity of motives in a meaningful manner. The groups generated by the factor analysis correspond very well to the motive clusters discussed in the literature.

4. Hypotheses

Following this structure of strategic motives, we focus on similar, but fewer clusters of patenting motives and relate these to the selected indicators for the value of compa-

nies´ patent portfolios. In our analysis the traditional protection motive to patent including using patents for securing market shares is the baseline for our hypotheses related to the strategic motives to patent. In contrast to Blind et al. (2006), we focus just on the blocking and the exchange motives to patent. Regarding the blocking motives, we distinguish between offensive and defensive blocking like in the above cited literature. The exchange motive is defined in a narrower sense by just focusing the use of patents for cross-licensing, for earning licensing revenues and to improve the own position in co-operations with other companies.[2]

Regarding the influence of the various motives to patent on the average number of citations per patent of companies´ patent portfolios, we propose the following hypotheses about the selected strategic motives to patent.

If the protection of the technological knowledge base via patenting is very important, we can assume that the protected know-how is rather valuable, which should be reflected in higher number of citations the patents receive. A similar argument is valid for the motive to secure market shares via patenting. In contrast, the research and development activities of competitors can be blocked by patents of rather mediocre quality. Blocking competitors is furthermore more successful, if they are confronted with a higher number of patents claiming different aspects of the same technology. Consequently, the average quality of patents is likely to decrease if they are used for implementing a blocking strategy.[3]

In addition, the intention to block relates on future technological fields which can be, but do not have to be, as successful as anticipated. The uncertainty increases even further, if the own company applies for patents speculating about the possible future technological development of its competitors, as it is the case of offensive blocking. Defensive blocking which is concentrated on the technological fields, which are very close to the actual patenting area, are less speculative. Consequently, their quality should be closer to those patents applied for in order to secure the actual knowledge base

The argument that patents just applied for in order to block competitors receive a smaller number of citations, since competitors are deterred, is not convincing any more. Meanwhile technologies become more complex and numerous single components are necessary to construct a single final product or system. Consequently, patents on a specific type of technology for a singled component do not reduce the attractiveness to patent an alternative technology, which may be the basis for a competing

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2 See Annex II for the correlation structure of the selected motives.

3 Our data show indeed a positive correlation between patenting a technology in smaller “steps” and the importance of the blocking motive.

component. This kind of simultaneous innovation and patenting activities are very frequent in rather complex industries, e.g. information technology Varian et al. 2004

Taking both arguments together, leads us to the first hypothesis:

- H1: The portfolios of companies using patents for blocking their competitors are of less value, i.e. receiving fewer citations, relative to portfolios of companies employing patents to protect their technological base. Especially, companies using patent to block offensively competitors have patent portfolios of less value.

In contrast to use patents for blocking competitors in the market, patents are also important instruments for collaborations with companies both on the vertical and horizontal dimension. Hall and Ziedonis 2001 show that patents allow a further differentiation of the value chain by promoting the division of work between those rather small companies developing the blueprints of new technologies and those large manufacturers owning rather large production capacities and distribution systems .However, patents play an increasing role for collaboration at the horizontal level, since the increasing complexity of products, e.g. in the information and telecommunication technology, requires the use of a variety of technologies, which can even by large multinationals not efficiently invented and developed. Several studies support the positive relationship between the participation in R&D co-operation and patenting activities Peeters, van Pottelsberghe de la Pottene 2006. However, there is no information available about the value of the patent portfolios of companies involved in co-operations, licensing or cross-licensing. In general, companies have to signal that they have a rather large patent portfolio in order to get access to co-operations or cross-licensing arrangements. Therefore, similar to the patent portfolios of companies using patents for blocking reasons this size incentive has negative implications for the values of the average patent. Furthermore, there is a potential information asymmetry between the patent owners and possible co-operation partners and licensees about the quality of the patented technology, which may be exploited by the former. However, different mechanisms work on markets with information differences between the supply and the demand side. On the supply side signalling strategies could be used, i.e. publishing the names of other licensees[4] or even the citations of their patents. Regarding the demand side, the companies using patents extensively as assets in the exchange with other actors have to expect that their collaborators or contract partners will test the quality of the patents they are interested in. Consequently, applications of patents with low quality might be detected and produce negative reputation, which might also be perceived by other

4 E. g. various agencies managing patent pools publish the names of the licensees.

possible collaboration partners.[5] If companies assume a tendency to efficient markets without or low information asymmetries, then they should only try to produce high quality patents, which should receive above average citations. However, if collaboration partners do not have the competencies to detect the quality of patent portfolios or if collaboration is rather short term and collaboration partners change often, then we might observe fewer citations of the portfolios of those companies using patents as assets in exchange processes. Taking the incentive to produce at first a large patent portfolio and the still existing information asymmetry or moral hazard problem together we derive the following hypothesis:

- H2: Companies using patents as barter chips in collaborations and licensing agreements are likely to have patent portfolios of less value compared to portfolios of companies employing patents to protect their technological base, but of higher value in relation of companies using patents for blocking competitors.

A further characteristic of a patent portfolio is the share of oppositions received by patents in the portfolio of a company. Regarding our motivations to patent, companies using patents to protect their valuable technological know-how, should expect on the one hand with a higher likelihood oppositions from competitors because the rather valuable asset will generate a disadvantage for the competitor. On the other hand, if their patents are of high quality and possible opponents are aware of it, then opposition makes no sense for them.

In relation to the companies using patents to protect their own technological knowledge base, companies using patents explicitly as an instrument to block competitors in their activities will receive a more critical feedback from them. Since the technological space and future market opportunities of the competitors will be deprived by this kind of patents, they have a higher incentive to invest in opposing this kind of applications. Consequently, we should expect a higher likelihood of opposition. Simple defensive blocking strategies will only lead to oppositions, if the competitors behave rather aggressively. Based on this straightforward argument, we derive the following hypothesis:

- H3: Companies using patents to block competitors face a higher incidence of oppositions in relation to companies employing patents just for protecting their own knowledge base. The differentiation of using patents for offensive or defensive blocking strategies should reveal a higher likelihood of opposition by applying the former strategy.

The motivation to use patents as assets in exchange processes, i. e. to generate licensing revenues, to use them in cross-licensing or for improving the position in co-

5 Sine et al. 2003 analyse the role of reputation for the licensing success of universities.

operations, is based on a rather collaborative strategy. Consequently, these companies apply for patents that improve their attractiveness as co-operation or contract partner. This strategy should not generate – in relation to use patents simply for the protection of the own technological know-how or even for blocking competitors – additional critical feedback and therefore oppositions from other companies. In contrast, if these companies are important players in various co-operations, their partners are likely to solve possible disputes internally and not via raising oppositions. Based on these considerations, we derive the final fourth hypothesis:

- H4: The patent portfolios of companies using patents as barter chips in co-operations with partners, i.e. licensees, cross-licensors or R&D collaborators, are less likely to receive oppositions than those companies using patents to protect their own technological know-how or even to block competitors in their developing activities.

5. Description of Data

Our analysis is based on the combination of survey information on companies' patenting motives with information on their patent portfolio. All German enterprises, more than 1500, which had applied for a minimum number of three patents in 1999 were contacted via a paper questionnaire in the year 2002 (Blind et al. 2006). Due to great interest in the subject, a response rate of over 33% and thus over 500 completed questionnaires were attained.[6] The companies participating in the survey are responsible for more than 40% of all German applications at the European Patent Office or PCT procedures for the year 1999, covering a high share of very large, actively patenting companies. The companies who had answered the survey were then identified in the patent data of the European Patent Office. This was done via a string search comparing company name and address with the applicant information in the EPO data. The plausibility of the results of the search was then completely manually checked. After cleaning the data, we end up with a sample of 462 companies for which we have combined information on motives and EPO patents.

Descriptive statistics of our dataset can be found in Table 1. The sample comprises very large and very small companies with an average number of employees of 6,445. For the characteristics of their patent portfolios we consider patents that were applied

6 The large majority of more than 85% of the respondents is involved in the strategic issues of patenting and not on the purely technical aspects, which supports the validity of the answers. Only 13% of the answers are given by the persons representing the R&D department.

for in the time period 1991-2000.[7] On average the companies hold 144 patents, the median is only 15, which indicates a skewness of the distribution also found in other studies. Finally, we report the self-assessed competition intensity collected in the survey, which is on average 4.16 on a scale ranging between 1 (= low) and 5 (= high). According to Blind et al. (2006) competition intensity explains positively the relevance of the imitation protection and the blocking motive, but not the slightly broader defined exchange motives.

The patenting motives are taken from the company survey. The motives were asked on a five-point scale from 1 for not important to 5 for very important. The average values show rather pronounced differences in the importance of the motive clusters. It ranges from a high of 4.28 for imitation protection including securing market shares to a low of 2.46 for the average of the exchange motives, whereas the blocking motives reach an average assessment of 3.92. Defensive blocking is slightly less important than offensive blocking (3.86 compared to 4.00). In addition, we classified the companies into three types.

The basic type is a company which gives the protection motive the highest relevance. A company is classified as offensive blocking[8] if the average relevance of offensive blocking motives is higher than the averages for protection and exchange motives. [9] Finally, a company is characterised as an exchange type if the average assessment of the exchange motives is higher than the averages for protection and blocking motives.

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7 The results remain almost identical when we choose the time period 1996-2000. We assume that the characteristics of companies' patent portfolios are rather stable of time, which allows us to explain them with the company characteristics and motive assessments given in the year 2002.

8 For the definition of the blocking companies we included only those companies which gave the offensive blocking the highest valuation based on the analysis differentiating between offensive and defensive patenting.

9 Dummy offensive company = 1, 0 otherwise. The other Dummy for an exchange company is defined in the same way.

Table 1: Descriptive Statistics

	Mean	Median	s. d.	Min	Max
Dependent Variables					
Citations	0.73	0.65	0.56	0	4
Share opposition	0.04	0.00	0.08	0	1
Motives					
Imitation protection	4.28	4	0.81	1	5
Blocking	3.93	4	0.78	1	5
Exchange	2.46	2.33	1.07	1	5
Offensive Blocking	3.85	4	1.04	1	5
Defensive Blocking	4.00	4	0.95	1	5
Company Classification					
Dummy offensive blocking company	0.07	0	0.26	0	1
Dummy exchange company	0.05	0	0.22	0	1
Control Variables					
Portfolio size (patent applications with priority '91-'00)	114	15	631	1	9,534
Competition intensity (self-assessment)	4.18	0.73	4	1.33	5

We then define the two dependent variables that describe average characteristics for the patents contained in the portfolio. Our first characteristic is the average number of received citations.[10] Patents receive citations over a very long time period, which makes older patents on average more heavily cited. To avoid an influence of the age of the patents in the portfolio, we only consider the citations that a patent receives in the

10 We thank Dietmar Harhoff from the Ludwigs-Maximilians-University in Munich for making the citation data available to us.

first five years after its publication. On average, a patent receives 0.73 citations including self-citations.

The phenomenon of opposition is described by the share of patents that were opposed. This variable indicates that 4 percent of all patents are opposed.

We include dummies to control for the technology to which the majority of a company's patents belong. 48.9% of companies have a focus on mechanical technologies, 22.2% on electronics, 14.1% on chemicals, 5.5% on drugs and 9.3% belong to other technologies.

5. Results and Interpretation

In separate regressions, presented in Tables 2 and 3 we shed light on the relationship between the several patenting motives and the patent portfolio characteristics trying to find empirical proofs for our four hypotheses. In Table 2 the regression results regarding the two hypotheses related to the explanation of the average citations of companies' patent portfolio are to be seen.

In our first hypothesis, we state that companies using patents to block competitors have patent portfolios of less value. However, we differentiate further between offensive and defensive blocking strategies, whereas the latter will lead to patents of higher value compared to the former producing rather mediocre patents. Consequently, the first columns in these tables display the test results whether there is a significant difference in the relation between the citation and the two blocking motives. It turns out in the citation equation (Table 2 col. (1)) that defensive blocking itself has a significant positive correlation with the citation measure whereas we could not find a significant result using the blocking motive in general. The marginal effect reported here say that a higher evaluation of defensive blocking is linked with a 0.2 percent change in the average portfolio citation.

If we use the average relevance assessments of the three clusters of motives (column (2)), we reveal a confirmation of the hypotheses one and two that the more intensive companies use patents for achieving the protection objective, the higher is the average number of citations their patent portfolio receives compared to those implementing patents for blocking competitors or for using them as barter chips. The results of the Tobit regression in column (3) reveal impressively that the patent portfolios of both companies using patents to block offensively competitors and those using them as barter chips in the interactions with other companies receive significantly less citations on average for their patent portfolios compared to the company type employing patents to protect the own technological know-how.

In all three regression approaches, we find a significant positive influence of the portfolio size on the value indicator citations, whereas the competition intensity does not play a significant role. The positive influence of the portfolio size on the citations is a clear indication for economies of scales of even learning curves in the production of patents, which leads at the very end also to patents of higher value.

Summarising and interpreting the results of the regressions in order to explain the citations of companies' portfolios, we come to the following conclusion. The patent portfolios of companies using patents in general for the protection of their technological are of higher value than those try to block their competitors by strategic behaviour. This result reflects exactly our hypothesis one. In addition, we find differences in the portfolios values between companies using patents for offensive and defensive purposes. This difference can be explained by the argument that defensive blocking leads to patents which are closely related to the already existing patent portfolio of the companies. Consequently, these patents benefit positively from the actual research activities. In contrast patents used for offensive blocking are of less technological value, since they do not benefit from the positive synergies with the own current research.

Furthermore, the patent portfolios of companies using patents for their original purpose are also significantly more valuable than the portfolios of companies using patents to generate licensing revenues, as barter chips in cross-licensing arrangements or in negotiations with other companies in co-operations. This result confirms our second hypothesis, but it is also an important indication for inefficiencies in markets for technology. As already argued above portfolio size is an important indicator for those engaged in using patents in licensing and co-operation issues, which may lead also to the application of patents of lower value. However, our results indicate that there must exist still a significant information problem in the market for technologies. In perfect markets, the competitive pressure on those trading patents should be so high that offering patents of lower value will be punished by a significant damage for the reputation of the supplying company. Since we have to assume that collaborations in R&D have more a medium- and long-term perspective than being a short-term engagement, damages for the reputation of technology providers are detrimental for the future perspective in the licensing market and for the position in collaborations. However, the competitive pressure on these companies is obviously not yet so high due to market imperfections, which are caused by significant information asymmetries between licensors and licensees or between cooperation partners.

Table 2: Tobit Regressions explaining average number of received citations (Marginal Effects)

Dep. Variable	Citations		
	(1)	(2)	(3)
Offensive blocking	0.002		
Defensive blocking	0.002*		
Imitation protection		0.078**	
Defensive Blocking		-0.012	
Offensive Blocking		-0.014	
Exchange		0.021	
Dummy offensive blocking company[1]			-0.147**
Dummy exchange company[1]			-0.184*
Portfolio size	0.129***	0.123***	0.130***
Competition intensity	0.030	0.012	0.027
No of observations	452	452	452
Log likelihood	-389	-386	-386

Note: We report marginal effects. The reference companies in column (1) are those with the main motive "Imitation Protection" The standard errors are robustly calculated using the Huber/White/sandwich estimator of variance. *, **, *** indicate that the coefficient is significantly different from zero at the 10%, 5%, 1% significance level.[1]

Regarding the second part of our hypotheses focusing on the likelihood of oppositions measured by the share of oppositions in the patent portfolios, we apply the same regression models presented in Table 3.

As we mentioned before distinguishing between offensive and defensive blocking motives is regarding the incidence of opposition leads to a significant correlation between offensive blocking and the share of opposition a portfolio faces. One percent point increase in the importance evaluation of offensive blocking is related to a 0.8 percent point higher share of opposition against the patent portfolio. Regressions in column (2) and (3) consider this phenomenon as well. We can partly confirm hypothesis three, since especially the aggressive offensive patenting provokes oppositions, whereas defensive blocking is not more likely to encourage oppositions by competitors than just protecting the actual technological base. In the model in column (3), we use the dummy approach in order to find out whether companies following an offensive blocking strategy have a higher share of oppositions in their patent portfolios. We find no significantly higher share of oppositions among companies using patent for blocking competitors

compared to those companies using patents in their originally intended sense. Therefore our third hypothesis finds no support in this model.

IOur fourth hypotheses is confirmed both in model just use the average assessment of the motive classes in the regression (column 2), since companies employing patents as barter chips in licensing arrangements or co-operations have the similar share of oppositions as those using patents for protection purposes. In the dummy model (column 3), we find even that this type of company has significantly lower shares of oppositions This corresponds exactly to our argument that those companies are not interested in conflicts with potential collaboration partners due to possible damages for their reputation and that possible conflicts may be solved informally.

In all three regression models both the citations and the portfolio size are significantly positively influencing the share of oppositions. More valuable patents create obviously stronger incentives for oppositions and larger players face also a positive scale effect in receiving oppositions see also Harhoff, Reitzig 2004.

Concluding and interpreting the regression results explaining the share of oppositions, we come to the following conclusions. Offensive blocking strategies provoke significantly more oppositions, defensive blocking has no different impacts than just using patents for the protecting the current technological portfolio. The rather weak support for our third hypothesis on the positive influence of blocking strategies on the share of oppositions can explained by a further linkage we have proved in the regressions related to the citations. Here we argue and find the empirical evidence that the traditional use of patents in protecting the technological base leads to patents of rather high value compared to the patents generated within a blocking strategy. The regressions explaining the shares of oppositions show a very strong influence of the citations. Consequently, those companies utilising patents to protect their own technological know-how receive not only a higher number of citations, but also oppositions. This effects compensates the pure opposition-provoking effect of those companies employing patents for their blocking strategies, which explains the rather low explanatory power of these variables, letting just the offensive blocking to become positively related to the share of oppositions. Although the companies using patents for exchange motives receive a smaller number of oppositions than those just using for protecting objectives, the effect is not significant. In contrast, the companies characterised by these exchange motives have a significantly lower share of oppositions. Obviously, this company type intends to follow a protection strategy causing relatively little conflicts, since the negative reputation effect is much more severe and long-lasting in the whole market it is active in compared to the gains of persecuting one specific patent claim against possible competitors or collaboration partners.

Table 3: Tobit Regressions explaining share of patents receiving oppositions (Marginal Effects)

Dep. Variable	Share of oppositions		
	(1)	(2)	(3)
Offensive blocking	0.008**		
Defensive blocking	-0.000		
Imitation protection		0.005	
Defensive Blocking		-0.001	
Offensive Blocking		0.007*	
Exchange		0.001	
Dummy offensive blocking company			0.003
Dummy exchange company			-0.013*
Citations	0.020***	0.019***	0.020***
Portfolio size	0.008***	0.007***	0.008***
Competition intensity	0.002	-0.001	-0.000
No of observations	452	452	452
Log likelihood	-13	-11	-11

Note: We report marginal effects. The reference companies in column (1) are those with the main motive "Imitation Protection" The standard errors are robustly calculated using the Huber/White/sandwich estimator of variance. *, **, *** indicate that the coefficient is significantly different from zero at the 10%, 5%, 1% significance level.[1]

6. Conclusions

This paper analyses for the first time how strategic motives of patenting interrelate with the characteristics of companies' patent portfolios. Using a data set of more than 400 companies we find – based on different regression approaches – that strategic patenting has an influence of the companies´ patent portfolios.

First, companies implementing patents to protect their technological base and their markets receive a higher number of citations compared to those using patents to block competitors or to use patents as barter chips in collaborations with licensing relations. This finding confirms our first two hypotheses. However, it should be noted that there is a difference between the patent portfolios of companies using patents for defensive blocking, i.e. securing the own future technological space, and applying patents for offensive blocking competitors. The former receive a significantly higher number of citations.

Second, companies using patents to block offensively competitors receive – as postulated in our hypothesis three – a higher share of oppositions for their portfolios. The defensive use of patents is in no significant relation with the opposition indicator. Our fourth hypothesis is also confirmed since companies using patents in exchange relations with licensees or licensors do not only face a similar share of opposition, but even less than those companies using patents just for protection purpose.

Based on these findings we can derive the following policy conclusions. First, the markets for technology are obviously rather efficient, since companies using patents as barter chips possess patent portfolios of similar characteristics. It has even to be noted that this type of company tries to follow a patenting strategy, which do not cause severe conflicts with possible collaboration partners. This additional pressure to secure its reputation is a force, which is positive for the patent quality and the conflict resolution. This positive synergy has to be taken into account in improving the patent system, I .e. the patent quality. Second, the phenomenon of frequent oppositions and rather limited citations in a company's patent portfolio is an incidence for the implementation of an offensive blocking strategy and a misuse of the patent system. This is a potential information source, which could be used for investigations of anti-competitive behaviour in specific markets or by single companies. In summary, this investigations has confirmed the validity and the usability of patent database indicators not only for innovation management, but also policy issues.

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