Intellectual Property Strategy in the Global Cosmetics Industry

Dietmar Harhoff [1] and Bronwyn H. Hall [2]

[1] Ludwig-Maxmilians-Universitaet Muenchen and CEPR

[2] UC Berkeley and NBER

Version of July, 2002

Preliminary and Incomplete
(please do not cite without the authors' permission)

Abstract

In this paper we analyze aspects of the intellectual property strategies of firms in the global cosmetics and toilet preparations industry. Using detailed data on all 4,205 EPO patent grants in the relevant IPC class between 1980 and 2001, we find that about 15 percent of all patents are challenged in EPO opposition proceedings, a rate about twice as high as in the overall population of EPO patents. Moreover, opposition in this sector is more frequent than in chemicals-based high technology industries such as biotechnology and pharmaceuticals. About one third of the opposition cases involve multiple opponents. We search for rationales that could explain this surprisingly strong "IP litigation" activity. In a first step, we use simple probability models to analyze the likelihood of opposition as a function of characteristics of the attacked patent. We then introduce owner firm variables and find that major differences across firms in the likelihood of having their patents opposed prevail even after accounting for other influences. Aggressive opposition in the past appears to be associated with a reduction of attacks on own patents. In future work we will look at the determinants of outcomes and duration of these oppositions, in an attempt to understand the firms' strategies more fully.

Acknowledgements

This version of the paper was prepared for presentation at the Productivity Program meetingsof the NBER Summer Institute. An earlier version of the paper was presented in February 2002 at the University of Maastricht Workshop on Strategic Management, Innovation and Econometrics, held at Chateau St. Gerlach, Valkenburg. We would like to thank the participants and in particular Franz Palm and John Hagedoorn for their helpful comments.

1 Introduction and Motivation

Intellectual property is rapidly becoming a central element in discussions of business strategy. This trend may not be surprising – the rising importance of intangible capital in industrialized economies is apparent in many statistics. In corporations, the value of intellectual property as a share of total firm value has been increasing. The number of patent applications is growing at double-digit rates in the major patent offices. Licensing and cross-licensing are being employed with greater frequency than ever, particularly so in high-technology industries (Arora 1997). There is also strong evidence that the patent output per R&D dollar has been increasing in semiconductors (Hall and Ziedonis 2001), and possibly in other industries as well. Moreover, the realm of intellectual property protection has been enlarged greatly since the US Patent and Trademark Office, influenced by a series of important court decisions, began to issue patents on software, business methods, and life forms only to find itself in the middle of a stormy debate as to how far patent protection should reach.

A key element of corporate intellectual property strategies is the utilization of the patent system. Patents convey the right to exclude other agents from using the patented technology, but the patent system typically does much more than that. It opens up avenues for challenging property rights of other players, for example by allowing firms to challenge a patent right in court. These validity challenges can be understood as an error-correction mechanism – patent offices make mistakes, and while some of these mistakes can be harmless, others may have a considerable effect on the strategic position and profitability of firms or inventors.

In that regard, these error correction devices serve a very useful purpose. In most cases, informed third parties can bring information and evidence to bear that may have been unknown to the patent office and its examiners. That is not too surprising: patent examination is probably one of the most complex tasks available in the modern knowledge economy. But the existence of correction devices also creates opportunities for their strategic abuse. Adopting a "deep-purse" view of the world, one could argue that these institutions allow established and financially well-to-do players to create uncertainty, fear and doubt for new entrants ("FUD"). While this term has been used to describe the marketing strategy of a dominant firm in the software industry, the strategy may also be at work in other arenas. To consider a concrete example: a large incumbent player may simply threaten a small corporation that has been granted a patent which the incumbent fears will impact its own profits with a challenge suit.

The theoretical and empirical literature on litigation has long studied cases in which parties may sue in order to extract settlement offers. In Europe, where there is a well-developed *inter partes* patent opposition system, such frivolous suits may also be present in the patent system itself. Ultimately, a full-fledged welfare analysis of these institutions is necessary, incorporating elements like the immediate welfare implications of patent rights that are imperfectly designed; and the indirect implications emerging from the incentive effects of these institutions, i.e., the extent to which they affect incentives for R&D and innovation. Naturally, a particularly important aspect is the impact on incentives of new firms who will hardly have the financial resources to battle incumbents in court. If large firms can successfully embark on a "bully" strategy, the forces of market entry and competition may seriously be impeded. This point has found some attention in the antitrust literature, but its potential impact on the design of intellectual property systems has not been studied. Given the

rising importance of various kinds of intellectual property and related institutions, it is likely to become an important element in the debate.

In this paper, we study a somewhat unlikely candidate for an analysis of the patent system. We focus on the cosmetics and toilet preparations industry that is more known for its strong emphasis on brand names than for its use of the patent system. But surprisingly, the patent litigation activity in this sector is quite strong, if we consider opposition cases at the European Patent Office as an indicator of litigation. Opposition is a challenge against the validity of an EPO patent grant that may be initiated by any third party within the first nine months after the patent has issued. The incidence of opposition in the cosmetics industry dwarfs the rate of validity challenges seen in other, technologically more advanced industries such as biotechnology, pharmaceuticals, software and semiconductors. Moreover, as we describe below, there is a high incidence of multiple opposition where several opponents file a case against the validity of a patent. This underlines the tough competition for intellectual property in this industry. Finally, about one quarter of all opposition cases originates from one player who is not even a dominant patent applicant. These facts call for a detailed analysis of opposition behavior and strategies, since our economic assessment of the mechanism itself will ultimately depend in part on the extent to which it can be usurped by strategically acting agents.

The remainder of the paper contains five sections. We first describe the institutional framework for opposition challenges at the European Patent Office. We also describe a simple theoretical model that delineates the parameter space in which we would expect opposition to occur. We conclude that section with a set of hypotheses that we test later on in the empirical part. In section 3, we describe the origin of our data and a number of innovations that we introduce into the measurement of patent characteristics. Most importantly, we use the fact that the European Patent Office classifies the references to patents and non-patent document listed as prior art in the research report according to WIPO rules. These classifications can be used to identify particularly relevant earlier documents as has been done in Harhoff and Reitzig (2001); but they can also be employed to find out if a particular patent has been a major stumbling block for subsequent applications.

As background, we describe salient features of EPO patent data in this paper, because these features deviate considerably from those of US patent data and have received relatively little attention in the economics literature thus far. We also describe the intellectual property concentration in the industry studied here, and we compare the patenting activity of firms to their opposition activity. The most stunning result is the emergence of one firm – Henkel KGaA headquartered in Düsseldorf – as the main player opposing the patent grants to other firms. While Henkel holds only about 10 percent of the patents we study, the firm accounts for about one quarter of all oppositions initiated. The relationship between the number of patents owned and opposition cases initiated is generally quite noisy, suggesting that there is room for distinctive IP strategies.

In section 4, we employ multivariate probit models to test our hypotheses and to explore potential explanations for our surprising findings. We can report a number of results that have been shown in earlier work for other industries. For example, highly cited patents are more likely to be attacked under opposition than poorly cited ones; patents which create serious stumbling blocks for later patents are more prone to validity challenges; and a number of decisions made by applicants, such as pursuing a PCT application or requesting an accelerated examination, are associated with higher incidences of opposition. When we introduce

additional measures of opposition activity into the specification we find that firms with high opposition activity are attacked less often than other firms, holding constant a number of variables that control for citations, number of countries in which patent protection is sought, and other determinants of the likelihood of experiencing a validity challenge.

In section 5 of the paper, we look at the outcomes from these opposition filings. Are these patents more or less likely than patents in other technologies to be upheld or revoked as a result of opposition? Do some of the oppositions appear "frivolous" in the sense that they are more likely to fail than others?

We interpret these results in our concluding section and propose avenues for a more structural econometric approach, which we will pursue in ongoing work on this topic.

2 Institutional and Theoretical Aspects of Opposition Challenges

Patent challenges can be of interest to a firm for two reasons: firstly, the challenge may actually lead to a reduction in the scope or breadth of the attacked patent, or to an outright revocation of the patent right; secondly, aggressive attacks may lead competitors to adopt a more careful patenting strategy which avoids a direct confrontation of the challenger. The instrument of attack that we are studying in this paper is the opposition mechanism at the European Patent Office. We first describe important institutional aspects and then present a simple model that helps us to derive hypotheses for our empirical analysis. In both regards, we build on the descriptions developed in earlier work in Harhoff and Reitzig (2001) and Graham, Hall, Harhoff and Mowery (2002). Since our simple model cannot encompass issues of repeated interaction, we comment on those separately before we summarize our hypotheses.

2.1 The EPO Opposition System

Patent protection for European member states can be obtained by filing several national applications at the respective national patent offices or by filing one EPO patent application at the European Patent Office. The EPO application designates the EPC[1] member states for which patent protection is requested. On average, the cost of a European patent amounts to about 29,800 EURO, roughly three times as much as a typical national application.[2] Thus, if patent protection is sought for more than three designated states, the application for a European patent is less expensive than independent applications in several jurisdictions. This cost advantage has made the European filing path particularly attractive for applicants selling goods and services in multiple European markets. Increases in the number of patent applications and grants have given the European Patent Office a level of economic importance that now resembles that of the United States Patent and Trademark Office (USPTO).

---

[1] The Convention on the Grant of European Patents, also referred to here as the European Patent Convention (EPC) was enacted in October of 1973. It is the legal foundation for the establishment of the EPO. The full text of the convention is available at http://www3.european-patent-office.org/dwld/epc/epc_2000.pdf.

[2] As in other patent systems, the official patent office fees are a relatively small part of the costs (in this case 4,300 EURO). Professional representation before the EPO amounts to 5,500 EURO on average, while translation into the languages of eight contracting states requires 11,500 EURO. Renewal fees for a patent maintained for ten years amount to roughly 8,500 EURO. See "Cost of an average European patent as at 1.7.99", http://www.european-patent-office.org/epo/new/kosten_e.pdf (Jan. 14, 2002).

EPO patent grants are issued for inventions that are novel, mark an inventive step, are commercially applicable, and are not excluded from patentability for other reasons.[3] After the filing of an EPO application, a search report is made available by the EPO to the applicant. The search report is generated by EPO's search office in The Hague and then transferred to the examining staff in the Munich office. The search report describes the state of prior art regarded as relevant according to EPO guidelines for the patentability of the invention, i.e., it contains a list of references to prior patents and/or non-patent sources.[4] Within six months after the announcement of the publication of the search report in the EP Bulletin, applicants can request the examination of their application. This request is a compulsory prerequisite for the patent grant. If examination is not requested, the patent application is deemed to be withdrawn. Eighteen months after the priority date the patent application is published. At this point, the application is normally under examination; thus, the patent owner is generally required to reveal some information about his/her invention prior to the grant of the patent even if no patent is ever issued.

After examination (if requested) has been performed, the EPO presents an examination report. At this point, the EPO either informs the applicant that the patent will be granted as specified in the original application or requires the applicant to agree to changes in the application that are necessary to grant the patent. In the latter case, a negotiation process similar to that in the US system may ensue. Once the applicant and EPO have agreed concerning the scope of the allowable subject matter, the patent issues for the designated states and is translated into the relevant national languages. If the EPO declines to grant a patent, the applicant may file an appeal.[5] On average, the issue of a European patent takes about 4.2 years from the date of filing the application (Harhoff and Reitzig, 2000). Within nine months after the patent has been granted, any third party can oppose the European patent centrally at the European Patent Office by filing an opposition against the granting decision. The outcome of the opposition procedure is binding for all designated states. If opposition is not filed within nine months after the grant, the patent's validity can only be challenged under the legal rules of the respective designated countries, some of which have their own opposition proceedings.

The EPO opposition procedure thus is the only centralized challenge process for European patents. An opposition to a European patent is filed with the EPO. The opponent has to substantiate his opposition by presenting evidence that the prerequisites for patentability were not fulfilled, e.g., the opponent must show that the invention lacked novelty and/or an inventive step, or that the disclosure was poor or insufficient. At the EPO, an opposition division determines the outcome. The examiner who granted the patent is a member of the three-person opposition chamber, but may not be the chairperson. The opposition procedure can have one of three outcomes: the patent may be upheld without amendments, it may be amended,[6] or it may be revoked.[7] As we pointed out earlier, revocation occurs in about one third of all opposition cases.[8]

---

3 See Article 52 EPC.

4 It is important to note that applicants at the EPO are not required to supply a full list of prior art – as it is the case in the US system. See Michel and Bettels (2001, 191f.).

5 See Article 106 EPC. Any decisions made by the EPO receiving, examining, opposition sections and legal division can be appealed and the appeal has suspensive effect.

6 See Article 99ff EPC. An amendment normally results in a reduction of the "breadth" of the patent by altering the claims which define the area for which exclusive rights are sought.

Another interesting aspect of the opposition procedure concerns the restrictions imposed by this process on the opponent's ability to settle "out of court". Once an opposition is filed, the EPO can choose to pursue the case on its own, even if the opposition is withdrawn.[9] Thus, the opponent and patentholder may not be free to settle their case outside of the EPO opposition process once the opposition is filed. This provision of the opposition proceeding may discourage its use by opponents seeking to force patentholders to license their patents.

Both the patentholder(s) and the opponent(s) may appeal the outcome of the opposition procedure.[10] The appeal must be filed within two months after receipt of the decision of the opposition division, and it must be substantiated within an additional two months. The Board of Appeal affords the final opportunity at the EPO to test the validity of the contested European patent. Both parties can bring expert witnesses into the proceedings, and there are various options for having deadlines extended. For the two technical fields considered in this paper, the median duration of the challenge procedures (opposition and any appeal[11]) is 3.07 years, although there is considerable variation in the duration of individual cases (the interquartile range is 2.8 years).

The official fee for filing an opposition is 613 EURO; for filing an appeal against the outcome of opposition, the fee is 1022 EURO. But the total costs to an opponent or the patentholder are much higher. Estimates by patent attorneys of the costs of an opposition range between 15,000 and 25,000 EURO for each party. Patent attorneys interviewed by us agreed that there is not much room for the opponent to drive up the patent owner's cost of litigation, for two reasons: 1) Attorney fees are regulated in most European countries, including Germany, where many patent lawyers who have the required EPO registration reside. 2) Extensive use of discovery, a main ingredient in the large cost of U.S. litigation. is not allowed in the EPO opposition system. Nevertheless, opposition by more than one opponent has the potential to create a substantial burden for the patentholder.

2.2 A Simple Theoretical Model

In order to derive our hypotheses in a systematic manner, we briefly introduce a simple formal model of opposition. To simplify matters, we will consider a world in which subjective assessments of probabilities and patent values (profits derived from the patent) are possible, but where no asymmetric information exists. To qualify for opposition, any case must satisfy the condition that the expected value for the opponent must dominate the expected cost of opposition. In other words, we rule out that the opponent "bluffs" and threatens to oppose in circumstances under which the true expected benefit from opposition is lower than the cost.

---

7 On average, the opposition procedure takes around 2.2 years if the patent is revoked and about 4 years if the patent is amended. See Table 2 for similar information on our samples.

8 See EPO (1999), p. 17 and Merges (1999), pp. 612-614. There are no publicly available data as to the frequency and extent of amendments, or the frequency of rejected oppositions. For the technical fields considered in this paper, we compute these figures below.

9 Rule 60 EPC: "In the event of the death or legal incapacity of an opponent, the opposition proceedings may be continued by the European Patent Office of its own motion, even without the participation of the heirs or legal representatives. The same shall apply when the opposition is withdrawn."

10 Article 99ff. EPC

11 For the two technical fields studied in this paper, an appeal occurs in about one third of all opposition cases.

Frivolous suits are possible under asymmetric information, which we ruled out (Bebchuck 1984). If the suit is feasible, then the parties may still settle prior to the expiration of the opposition period, i.e. within nine months after the patent has been granted. We formulate these two conditions in the context of a simple model and then discuss some of the comparative statics in a stylized manner.

The model builds on the classical paper by Priest and Klein (1984) and supports us in our attempt to derive hypotheses on the likelihood of such validity challenges.[12] In the case of opposition proceedings, it is important to recall one distinct institutional feature. Once filed, the European Patent Office can pursue an opposition case even if the parties involved have achieved some kind of understanding. Suppose that the case has been filed, but the opponent has withdrawn after obtaining a license from the patent holder. Such a settlement would be attractive, since both firms will now enjoy patent protection (even if the patent has been assigned erroneously or if it grants too much scope to the owner and licensees). The European Patent Office may nonetheless pursue the case and subsequently revoke the patent. We would therefore assume that settlement negotiations tend to take place mostly prior to the filing of the opposition (if at all). Thus the following considerations are based on the assumption that once an opposition is filed, it is also tried. Settlement may take place, but it would occur prior to filing the case.[13] Thus unlike the case of litigation, where we observe the filing of suits even if they are settled before trial, in this case we do not observe cases that "settle."

We consider a world in which parties make imprecise assessments of case quality and decision standards, but where information is distributed symmetrically.[14] Our first case is one in which successful opposition to a patent grant transforms a monopoly to a duopoly. Suppose that a patent has been granted to one firm and the patent would allow the firm to earn monopoly rents Π^M. Another firm considers the benefits and costs from filing an opposition and letting it go to trial versus settlement of the dispute. The trial can only have two outcomes – the rejection of the opposition or the revocation of the patent right. Should the opponent prevail in having the patent revoked, both firms will be able to earn duopoly profits Π^D in the market.[15] If the opposition is rejected, the attacker will receive zero profits. Note first that the case will only qualify for opposition if

$$p_O \Pi^D - c_O > 0 \qquad (1)$$

where p_O is the likelihood of successful opposition as perceived by the opponent, and the opponent's total cost of opposition proceedings is given by c_O which we treat as exogenously given for now.

---

[12] Lanjouw and Lerner (1998) uses the Priest and Klein model to interpret conditions under which infringement cases will be brought to trial. See also Somaya (2001).

[13] Our interviews with patent attorneys suggest that this is indeed the case - estimates of the settlement frequency range suggest that between 10 and 25 percent of disputes are not filed, but settled between the parties.

[14] In Waldfogel's terminology, this is the case of divergent expectations (DE) which he carefully distinguishes from the case of asymmetric information (AI). Since we cannot distinguish among the different theories in our data, we do not present the arguments in detail. See Waldfogel (2000) for an empirical test the results of which favor the DE hypothesis.

[15] If entry is free, more firms may enter so that profits are driven to zero. Note that in this case the opponent may not wish to oppose the patent, since the opposing firm creates a public good for every other firm in the industry, but bears the full cost of trial. In this case the threat point is negative.

For our discussion of a pre-trial settlement solution, the threat point of the opponent is given by

$$p_O \Pi^D - c_O \ . \tag{2}$$

The threat point for the patent holder is then given by its expected value from trial

$$(1 - p_P)\Pi^M + p_P \Pi^D - c_P \tag{3}$$

where p_P is the likelihood of successful opposition as subjectively perceived by the patent holder. The cost of opposition proceedings (including attorneys' and patent office fees) is given by c_P. The differences in the subjective probabilities simply reflect uncertainty – both parties may assess the quality of their case and the decision standard with some error, but no party has any privileged information.

The trial value of the game is given by the sum of the threat points. The cooperative value of the game is the industry profit in case of settlement net of total settlement costs *S*, i.e., $\Pi^S - S$. We treat the profit level in the case of cooperation separately here, since it may exceed the industry profits of a duopoly if some collusive elements are present in the licensing or side-payment setup chosen by the firms. Hence, we assume that $\Pi^M \geq \Pi^S \geq 2\Pi^D$. Settlement will not occur (i.e., opposition will occur) if the trial value exceeds the cooperative value of the game. This comparison yields the inequality

$$(1 - p_P)(\Pi^M - 2\Pi^D) + (p_O - p_P)\Pi^D + (S - c_P - c_O) \geq (\Pi^S - 2\Pi^D) \tag{4}$$

The first term captures how attractive the monopoly position is as compared to the duopoly case from the patent-holder's perspective. The higher the wedge between monopoly and industry duopoly profits, the less likely the patent holder is to settle, in particular if he perceives the likelihood of successful opposition to be low. Ceteris paribus, we would expect this difference to grow with the level of monopoly or duopoly profits. The second term captures the effects of diverging expectations of case quality and decision standards. If the opponent is optimistic (i.e., if his subjective probability of winning is higher than the patent holder's assessment), then litigation will again become more likely, especially if the level of duopoly profits is high. The third term captures the cost disadvantage (or advantage) of the settlement solution – high trial costs will make settlement more likely, high settlement costs will drive the parties to a trial solution, *ceteris paribus*. One would usually assume that settlement is less costly than a trial. In the case of opposition against patent grants, this conclusion is not necessarily warranted. First, the costs of conducting the trial are born by the European Patent Office. The two parties involved have to take into account a fee for filing opposition and attorney costs. Since the filing fee is minor[16] and since settlement negotiations would also be conducted by attorneys, settlement may actually be more expensive to the parties than the trial. Finally, the term on the right-hand side of the inequality captures the effect of a cooperative solution. The higher the settlement profit is in comparison to the duopoly solution, the more likely settlement will be. This term will be zero if cartel authorities do not allow firms to enter arrangements that leave them more than the duopoly profits.

Now we consider another case in which successful opposition actually functions to maintain a monopoly. Suppose that a firm has received a patent that allows it to enter an industry dominated by an incumbent. The entrant's patent may, for example, protect a technology that

[16] See section 2.4 for details.

neutralizes the former technological lead of the incumbent. In this case the incumbent may oppose the patent right, since it threatens the existing monopoly. The threat point of the ex ante monopolist (the opponent) is given by

$$(1-p_O)\Pi^D + p_O\,\Pi^M - c_O \tag{5}$$

while the entrant views

$$(1-p_P)\Pi^D - c_P \tag{6}$$

as her threat point. The condition for an opposition case to be filed and tried is then given by

$$p_O\left(\Pi^M - 2\Pi^D\right) + \left(p_O - p_P\right)\Pi^D + \left(S - c_P - c_O\right) \geq \left(\Pi^S - 2\Pi^D\right). \tag{7}$$

As a comparison of (4) and (7) show, ex ante asymmetries in the market positions may affect incentives to file an opposition case. Hence, a structural approach to estimation would also necessitate a careful operationalization of the market conditions. For our reduced form estimation, however, the conclusions for the two cases are similar. As the stakes increase and as the cost advantage of settlement decreases, opposition is more likely to occur.

We can make these points graphically. Consider the first case in which the opponent can gain a duopoly position if the opposition case is successful. We consider a profit-probability space. Let us assume that diverging expectations are not present. Hence, in equation (4) the second term would vanish. We also assume that the settlement solution duplicates the duopoly solution, i.e., antitrust authorities can prevent firms from engaging in collusive licensing agreements. Hence, the right-hand side term in equation (4) is zero. To simplify conditions further, let the monopoly profit Π^M be equivalent to $(2+\alpha)\Pi^D$. Equation (4) implies that under these conditions opposition will occur if

$$(1-p)\alpha\,\Pi^D \geq -\left(S - c_P - c_O\right) \tag{8}$$

Moreover, recall that for opposition to be feasible in a world without bluffs, we have to have

$$p\,\Pi^D - c_O > 0. \tag{9}$$

In Figure 1, we plot parameter combinations of p and Π^D that satisfy these conditions. As can be seen from this figure, higher settlement costs make opposition more likely, since the locus of equation (8) shifts downwards. Similarly, higher cost of opposition (to the opponent) make opposition less likely to occur, and an increase in the level of profitability (as measured by the duopoly profit) will tend to enlarge the range of p-values for which opposition occurs. Also, equation (8) demonstrates that larger values of α will also shift the locus of that curve downwards – the likelihood of opposition (non-settlement) increases as the monopoly position becomes more attractive.

These simple considerations neglect the possibility of asymmetric information. In the model developed by Bebchuk (1984), the defendant knows the probability of winning while the plaintiff only knows the distribution of the probability. The less well-informed plaintiff makes a take-it or leave-it settlement offer which in some cases turn out to be unacceptable to the better-informed defendant. These offers will therefore be rejected and a trial ensues. Thus, the likelihood of trial versus settlement should increase in the extent of informational asymmetries. Similar conclusions emerge from other models with asymmetric information

between plaintiff and defendant.[17] We do not specify these models in detail, but simply take from them the prediction that as information is more asymmetrically distributed, the likelihood of an opposition case increases.

2.3 Repeated Interaction

When repeated action plays a role, the implications of the above model may not hold completely or not at all. Suppose for a moment that by filing opposition, the opponent can indeed create uncertainty, since the opposed party is not certain that the patent right will be maintained in its present form. Clearly, the patent is valid during the opposition process, but the patent holder may now have to make capacity and other investment decisions under uncertainty. This can lead the patentholder to reduce installed capacity below that desired when the patent validity is certain, which may profit the opponent by sustaining some level of demand for the opponent's product or by reducing the extent to which price competition harms profits. Opposition *per se* may therefore become a strategic instrument, even if the direct expected economic benefit of opposition may not be large enough to cover the cost of initiating a challenge. In this case, a firm's own opposition activity may well become a determinant of its own propensity of finding its patents challenged later on. We do not capture this logic in terms of a formal model, but we note that the logic is that of the bully strategy in repeated prisoners' dilemma games.[18] The phenomenon is also related to the reputation-building behavior in games with Bayesian updating, such as the chainstore paradox (Selten 1978).

2.4 Hypotheses

While there is no single model that captures all possible situations in which opposition cases may occur, some conclusions can be drawn from the above and the literature. In particular, we would predict that the likelihood of observing opposition increases as

(1) expectations increasingly diverge;

(2) information is distributed more asymmetrically;

(3) the stakes increase, i.e., as the level of profits rises;

(4) the costs of trial (opposition proceedings) decrease in comparison to the costs of settlement.

As to the implications of reputation-building behavior, we would expect that strong opposition activity will either be related to a high incidence of oppositions received (tit-for-tat) or – if competitors shy away from attacking a firm that employs a bully-strategy – by a strong reduction in oppositions received. The latter case has been made convincingly by Lerner (1998) who shows that young biotechnology firms shy away from patenting in areas with high litigation activity.

---

[17] See, for example, Png (1983). Waldfogel (1998) provides an empirical test of the diverging predictions of AI (asymmetric information) and DE (diverging expectations) models.

[18] See Besanko, Dranove, and Shanley (1996), pp. 362-376.

3 Data Sources and Descriptive Statistics

3.1 Data Source and Sample

The data used in this paper originate from two sources: the EPASYS vector database that is internally used at the EPO, and excerpts from the on-line EPOLINE database.[19] EPASYS data were used to extract the number of claims in EPO patents and to identify patents with accelerated examination requests and PCT applications. Moreover, we identified opposed patents using the EPASYS data. All other data originate from the EPOLINE database. Using these data sources, we identified all EPO patent applications that contained the IPC classification A61K 7, either as the main or as an auxiliary classification. Thus, we are not restricting the analysis to patents with A61K 7 as their *main* IPC group. Table 1 lists all IPC classifications falling under the heading of cosmetics and toilet preparations. We also list our own aggregation to nine groups of IPC sub-classes. This aggregation still needs to be refined in future work, but it reflects discussions with practitioners as well as our own analysis of multiple subclassifications in the sample. As it will turn out later, the most interesting group is D which groups hair-related preparations like shampoos, dyes, conditioners etc. This category of patents attracts a large fraction of the oppositions in our sample.

The selection criterion yields a total of 8,501 patent applications. Naturally, some of these applications were still pending in July of 2001 when the legal status data were collected from EPOLINE. Other applications had been withdrawn, some had been refused by the EPO, and in a very small number of cases other exit types (death of applicant, consolidation with other applications) had occurred. Table 2 provides information on the legal status of the documents by application year.[20] A high percentage of the younger application cohorts was still pending in July of 2001 – for example, about one quarter of the 1995 application cohort was still pending. Note that for earlier cohorts, about two thirds of the applications will turn into patent grants, about thirty percent will be withdrawn by the applicant after the examiner has provided the examination report, and about five percent are ultimately refused by the EPO. The latter case indicates that the applicant was eager to see the patent granted, but that the examiner (or – in the case of an appeal against the examiner's decision - the appeals board) ruled that the application did not qualify for a patent grant.

The patent applications carry information on the geographic extension of patent protection sought by the applicant. In the case of our data, applicants can designate any of the nineteen EPC (European Patent Convention) member states. This is potentially valuable information for us, since it may be correlated with the anticipated value of the patented invention. Applicants will only take out costly patent protection in an extended set of countries if they expect a sufficiently high return on this investment. The data in Table 3 show that almost all applications and granted patents designate Germany, France, Great Britain and Italy which are the largest EPC member countries. A second set of countries (Austria, Belgium, Switzerland,

[19] http://www.epoline.org

[20] Closer examination of the data reveals that it might preferable to use the EPO priority date rather than the EPO application date as the measure of application year. Many firms apply in their national office first and use that date as the priority date at the EPO. Because they are allowed 12 months until EPO filing, usually the priority year will be one year prior to the EPO application year. We will correct our numbers in to allow for this fact in a revision of this paper.

Spain, Liechtenstein, Netherlands, and Sweden) are named in between 60.7 (Austria) and 73.9 (Netherlands) percent of the applications. The comparison over the three types of legal status shows little variation for the larger countries, and a minor decline in representation for the smaller ones.

3.2 Treatment of Applicant and Opponent Names

The EPO uses a system of patent applicant identification numbers that – in theory – can be employed to identify particular applicants over time. However, it is not completely clear which criteria are used to distinguish between corporate entitities over time. Obviously, there are also complex issues of how to deal with acquisitions or mergers. For the purpose of this paper, we used a simplified approach that allowed us to allocate the 8,501 applications to applicant names. Most importantly, we used the same criteria for consolidating applicant *and* opponent names, since we are interested in documenting the adversarial relationships between these two parties. To that extent, we proceeded as follows. We first considered all applicant names from the 8,501 applications and consolidated the names of all entitities being named five times or more in the raw data.[21] These are about 230 applicant names in the raw data that account for about 6700 applications.

A more difficult question concerns the treatment of multiple applicants. These cases are sometimes solved automatically by consolidating names of different branches of one and the same corporations. For example, almost all Unilever patents are assigned to *Unilever PLC* and *Unilever N.V.* In the case of individuals as applicants, we simply created a new entity, representing the patent document. In the case of firms jointly applying for a patent together with individuals, we assigned the patent to the firm(s), assuming that the economic interests of that firm would be more relevant for oppositions than those of individuals. Individuals who appeared multiple times in the data were treated like firms, since we cannot exclude the possibility that these applications reflect family businesses. Whenever universities or national institutes were involved as applicants jointly with a firm or several firms, we again assigned the patent to the firm(s) in question. However, we maintain the information that these research institutions are involved by generating a dummy variable capturing their participation.

In about 200 cases we were left with multiple applicant firms. These firms very rarely had more than 2 applications or patents in the overall sample; hence we treated these patents as coming from one small player. Note that these cases represent less than 3 percent of the overall sample so that it is highly unlikely that our choices will affect our results in a major way. More specifically, the tabulations of highly active applicants are not affected.

The treatment of multiple oppositions is more straightforward. We treat opponents symmetrically. Hence, an opposition by two opponents against one patent jointly applied for by two firms will be treated as two opposition cases directed at one patent. Dealing with multiple opposition turns out to be quite important, since multiple opposition is surprisingly common in this industry, as we discuss in the next section.

---

[21] For example, the most active opponent in the sample appears as *HENKEL KGaA*, *HENKEL KGaA TFP / Patente*, *Henkel KGaA*, *Henkel KGaA Patente (TTP)* or *Henkel Kommanditgesellschaft auf Aktien*.

3.3 Patent Applications, Grants and Opposition in the Cosmetics Industry

A first result of our classification efforts is shown in Table 4. In this and the subsequent tables we use a "ranking" of applicants by total number of applications even if we consider the number of grants or opposition cases. In most of the tables we confine ourselves to the thirty most active firms. Each of these firms had submitted more than 30 patent applications in the time period considered here. Table 4 displays the total number of patent applications by firm. We also list the application activity for four time intervals of roughly five years each. These top thirty applicants account for 5,063 out of 8,501 application, i.e., for 59.6 percent. Note that the top applicant alone – *L'Oreal* – accounts for 13.8 percent of all applications. What is even more surprising is the time path of *L'Oreal*'s applications. Starting out in the late 1970s as an applicant of minor importance in the EPO system, *L'Oreal* is clearly the dominating player by the end of the 1990s. To some extent, this may reflect a slow shift from national applications to the centralized EPO application path. However, at least some part of the development is systematic, as a glance at USPTO applications shows.[22] Other firms like *Procter & Gamble* and *Unilever* have also built up their IP presence, while applicants like *Henkel* and *Wella* have roughly maintained their level of activity.

For a number of reasons, an analysis of applications is not sufficient. First, the rate at which firms see their applications actually turned into valid patents is quite heterogeneous, though the statistics may not be easily interpreted. Second, there is also considerable heterogeneity with respect to the frequency of opposition challenges. These points are supported by the data presented in Table 5.

To demonstrate the variation in the grant rate over firms, we first tabulate the number of applications with application dates prior to December 31st of 1995. As we pointed out in the discussion of the data in Table 2, some of the applications were still pending. However, the qualitative results from the following discussion hold up if one restricts the sample to earlier application years. The first column presents the number of granted patents, i.e. the patent stock of the respective firms.[23] The next column shows the grant rate, i.e. a measure to what extent the firm had been able to share of applications pending. The third column lists the share of applications that were still pending in July of 2001. Finally, the last column displays the share of granted patents that were subsequently challenged in the opposition proceeding at the European Patent Office.

Overall, applications submitted prior to the end of 1995 by the top 30 applicants yielded 2,259 patents. Compared to the total number of 3,715 patents emerging from these application cohorts, the top firms account for 60.8 percent of granted patents, only slightly more than their share of applications.[24] What is surprising, at first glance in any case, is the variation of grant rates. *L'Oreal* achieves a grant rate of 94.1 percent, followed by (among the top ten applicants) *BASF* with 87.8 percent and *Wella* with 82.4 percent. These results may not fully reflect differentials in performance – they are likely to be a function of different application strategies. For example, most (but not all) large German corporations first submit their patent

---

[22] These results are not reported here. We intend to provide a more thorough comparison with US data in a future revision of the paper.

[23] Note that this is not the full patent stock, but merely the patents emerging from the restricted set of application cohorts.

[24] This is not an "honest" comparison of concentration ratios. If we consider the top patent holders, their share of patent grants among all patents issued is about 66 percent.

applications to the national office in Germany that produces a search report for a fee of DM 520. Only the promising candidates are then forwarded to the European Patent Office within the priority year. Clearly, the EPO grant rate of such a firm will look more impressive than the grant rate of a firm submitting almost all of its applications directly to the EPO (such as *Procter and Gamble*). Thus, the variation in grant rates needs to be corrected for the underlying selection effects before any interpretation can be given.

The opposition rates in Table 5 show an amazing range of values, and this variation is not due to selection effects of the aforementioned kind. First, note that 16.4 percent of the patent grants were challenged. This rate of litigation is about twice as high as the opposition rate in the overall population of EPO patent grants. To safeguard against small sample effects, just consider the ten top-ranked applicants. *Procter and Gamble* and *Unilever* have opposition rates of 26.7 and 23.1 percent, respectively. Almost every fourth patent grant that these firms receive is challenged. The opposition rate of *Henkel KGaA* is relatively small by comparison (9.3. percent).

Table 6 lists the identity of the firms most active in initiating opposition proceedings. To be consistent with the data presented in the previous table, we restrict the sample to patent grants emerging from applications filed prior to the end of 1995. Henkel KGaA has initiated almost as many opposition cases (207) as it has been granted patents. Conversely, L'Oreal has been granted more than 500 patents, but has filed only 53 opposition cases. Clearly, the concentration of opposition activity is extremely high, with one firm (Henkel KGaA) accounting for 27.1 percent of oppositions filed against patent grants in this industry. In the same table we show the "terms of trade" for firms that experience more than 5 opposition filings. The ratio of oppositions filed against others to own patents opposed ranges from zero (for the Japanese firm Kao) to 9 times (for Henkel).

Before we analyze this phenomenon in more depth, another feature of opposition in this industry is noteworthy. Table 7 displays the frequency of opposed patents by number of opponents. Of the 573 opposition cases in our data, only 393 (68.6%) were initiated by single opponents. 113 cases involved two, 48 cases three, and 19 cases more than three opponents, respectively, for a total of 21 percent. Typically, multiple opposition is quite rare and occurs at a rate of about 11 percent in the population of all patent grants. The higher incidence in the cosmetics and toilet preparations industry may very well reflect the competitive nature of the business, and thus be consistent with the high rate of opposition cases relative to the number of patent grants.

Finally, in Table 8 we provide a crosstabulation of opposed and opposing parties. If we focus again on the top 30 applicants and study the origin of the oppositions they receive, we find some astonishing discrepancies in IP strategies. For example, *L'Oreal* receives 120 oppositions (one third of these from *Henkel KGaA*), but opposes only 44 patents held by the other top 30 applicants. Conversely, *Henkel KGaA* initiates opposition against patents of the other top 30 applicants 165 times (more than two thirds of all oppositions filed by *Henkel*). Another apparently aggressive player is *Goldwell* – this firm directs 82 of its total 97 oppositions against top-ranked firms, but receives only 15 challenges. Net targets of oppositions are again *Unilever* and *Procter & Gamble* – they receive 68, respectively 72, challenges and direct only 31, respectively 17, challenges at other firms.

3.4 Value Correlates

It is entirely conceivable that the simple model sketched in section 2 provides an explanation for the patterns described so far. After all, the patents may be of very different value; the players may have different positions as incumbents or entrants in the relevant segments of the market. In the following section we will try to employ reduced-form probit estimates of the incidence of opposition in order to account for these determinants. To do so we introduce here the variables we will use, and we comment briefly on "measurement innovations" that we apply to the date. Some of these are novel, others build on earlier work on opposition in Harhoff and Reitzig (2001) and Graham et al. (2002).

The main variables we use to control for variations in patent value are listed here:

- the number of designated EPC countries. Since designating a larger number of countries requires higher expenditures to maintain a patent, we expect this variable to have a positive coefficient. See Table 3 for some properties of the distribution of this variable. Note that the number of designated EPC countries is not a complete measure of the international extension of patent protection – it would be ideal to measure the number of jurisdictions or the aggregate GNP of countries for which patent protection has been sought world-wide. For this version of the paper, the respective data were not available.
- the number of claims in the application and a dummy variable for the case that there are exactly ten claims. The explanation for the introduction of the dummy variable becomes apparent in Figure 3. For patents with more than ten claims, each additional claim increases the cost of publication by 40 EURO. Apparently, patent applicants are sensitive to this cost rule.
- references to the patent literature. These references are part of the research report issued by the La Hague office of the EPO. The report describes the state of the art as documented by the research officer who then turns her report over to the examiner in the Munich office. Typically, the number of such references is counted. We can go beyond a simple count measure by taking advantage of the fact that the EPO follows WIPO rules in assigning each reference a classification. So-called A references are simple descriptions of the state of the art, while X and Y references signal the existence of material that is potentially harmful to the novelty claim of the patent. Similar to Harhoff and Reitzig (2001), we use these variables and compute the number of A references and the sum of X and Y references. While there is a residual group of other references, these two account for the lion's share of references. The classification system is described in detail by Michel and Bettels (2001). These authors also explain why the number of references to the patent literature in EPO and other European patents is considerably smaller (by a factor of 6 to 10) than in USPTO patent documents. In the US, the patent applicant has to provide a complete list of references that the examiner typically just accepts. In Europe, most applicants do not provide such a list of references, and the search process of examiners is relatively focused. In Figure 4, we plot a histogram of the number of references. One third of all patents have no references at all, and the mode of the distribution for patent with references is 3.
- the number of references to the non-patent literature. These references are mostly lists of articles in scientific journals. In some cases, they may also contain references to other printed material, such as the documentation or manuals that other firms have printed to

describe their products. Again, these references are classified according to the aforementioned scheme, and we use the same principle of operationalization as before. The extent to which such references are provided depends on the nature of the sector. In more science-based areas, the number of these references can be quite high. In our sample, only 60 percent of the patents have any references to the non-patent literature.

- citations received by other patents. Ideally, we would like to have a comprehensive measure reflecting the international linkages of patent system. Again, data constraints force us to use a measure generated within the EPO system. In order to construct a meaningful variable, we have to take the time lags into account that occur between the cited and the citing patent. A histogram of these lags is presented in Figure 6. Based on these data, we chose to include citations that occurred within five years of the application date. That constraint requires us to select patents in the following way: we require the grant to have occurred prior to Sept. 30, 2000 (so that opposition can be detected in our data). The application had to have been filed by December 31st, 1995 in order to satisfy the citation lag criterion. When we compute the number of "cites" under these conditions, we can employ X, Y, and A classifications in an interesting and novel way. Besides calculating the total number of cites, we also generated variables measuring how often the cited document had been referred to as an X, Y or A document. The first two classifications can become serious stumbling blocks for subsequent patent, hence we consider them to be a better indicator of patent value than the A type cites. Naturally, since the number of references in any EPO patent is typically low when compared to patent documents at the USPTO, so will the computed number of cites be relatively low. Indeed, about two thirds of the patents receive no cites at all (Figure 7).
- the decision of the patent applicant to file a PCT (international) application or to request an accelerated examination. Both decisions should signal above-average value of the patented invention. See Reitzig (2001).
- a dummy variable for applicants that are not corporations. This variable was manually coded from the applicant data drawn from EPOLINE.
- a dummy variable for applications where universities or national laboratories were among the applicants; these applications should typically be closer to fundamental research, thus further away from market applications, and therefore less likely to draw opposition from competitors.
- a set of dummy variables for grant years in order to account for unobserved economic fluctuations.
- dummy variables for the nine IPC sub-groups defined in Table 1.

4 Multivariate Analysis

In this section we estimate simple probability models of opposition, in order to explore how the pattern of opposition across firms is related to variations in the value correlates. Summary statistics for the sample considered here, which is restricted to patents applied for prior to 1996, are presented in Table 9. 511 patents out of our sample of 3,548 patents, or 14.4 percent, are opposed after grant.

The probit results follow in Table 10. We compare two specifications: first one in which we only use the variables described in section 3.4. In the second specification, we also include dummy variables for some of the larger patent applicants. In particular, we are interested to see if the patents owned by Henkel, Wella, Unilever, Procter and Gamble, and some of the other leading cosmetics firms differ with respect to their likelihood of being opposed after we have taken value-related covariates into account.

The results in the first columns are similar to those reported by Harhoff and Reitzig (2001) and Graham et al (2002) for other technologies: the number of designated states, the number of claims, having a large number of X or Y cites, being highly cited as an X or Y reference, requesting an accelerated exam, and filing a PCT application are all positively related to the probability of opposition. Citations of the A-type, whether forward or backward, have no predictive power, and patents owned by individuals are signficantly less likely to be opposed in this technology, unlike the previous studies.

There is clearly variation across our technology subclasses, with patents in the makeup, nail care, and perfume classes less likely to be opposed (the rate is about 8 percent lower) and those in haircare class much more likely to be opposed (the rate is 10 percent higher, other things equal). When we add dummies for the main players in our sample, the other coefficients change very little. However, it is clear that patents held by *Henkel* and *Wella* are less likely to be opposed than other firms, and those held by *Procter and Gamble* and *Unilever* much more likely to be opposed, even when we control for the technology subclasses. When we do not control for technology subclass (not shown), *Goldwell* also faces a higher opposition rate (about 12 percent higher than other firms). This reflects the fact that *Goldwell* patents primarily in haircare, where opposition is most active, so that the *Goldwell* dummy is not separately identified from the haircare dummy.

5 Outcomes

We have found that patents held by *Henkel*, *Wella*, and *Goldwell* (all firms with a major presence in the hair care and dye industry) are less likely to be opposed than the average patent, and also that patents held by *P&G* and *Unilever* are more likely to be opposed. In this section of the paper we look at the outcomes of these oppositions in an effort to determine whether the variation in opposition rates brings with it a corresponding variation in outcomes. If outcomes are more negative for the opposing firm when the opposition rate is higher, we might guess that these oppositions are "frivolous" or undertaken mainly for the purpose of creating uncertainty or strategic delay. On the other hand, if the outcomes are more positive for the opposer, that suggests that higher opposition rates occur because firms are more likely to oppose patents that are more likely to be invalid.

Table 12 reports the overall distribution of outcomes for patents in this industry, along with outcomes for all oppositions and for oppositions in pharmaceuticals/biotechnology for comparison. Note first of all that oppositions in the cosmetics industry are one quarter of all oppositions and are more likely to be unresolved as of 2000, mostly because they have grown relative to the others in recent years. Conditional on having reached a final outcome, oppositions in this industry are more likely to result in revocation of the patent (41 percent versus 32 percent in pharmaceuticals and 35 percent for all industries). They are less likely to result in amendment of the patent in question.

In Table 11 we show the final outcomes of the opposition broken down by whether the patentholder is a German or non-German firm, and whether the opposing firm is German or non-German. In the former case, over half of the patents held by German firms are held by *Blendax*, *Henkel*, *Goldwell*, or *Wella*, and in the latter case, almost all oppositions by German firms include at least one of these four players. Outcomes differe significantly depending on whether the patentholder or opposer is German. German patentholders are three times as likely to have opposition to their patents rejected and seem to achieve speedier resolution of their cases. German opposing firms are more likely to have the patent revoked. *Henkel* is particularly interesting: more than half (60%) of the oppositions for which we have outcomes resulted in the patent being revoked. *Henkel* is also the only one of these firms that was patenting significantly in the earlier part of the period (the 1980s). We do not yet know if these oppositions are succeeding because they are bringing this prior art to the attention of the EPO. It is noteworthy that *Henkel*'s primary businesses are in specialty chemicals; the haircare portion of the business was largely acquired in 1993 from *Schwarzkopf*. It is likely therefore that they are more familiar with the use of patents than the traditional consumer products firms like P&G and Unilever.

6 Conclusions and Further Research

It appears from our preliminary exploration that the primary reason for higher rates of opposition in IPC A61K 7 is the strategic behavior of a few large firms in the haircare industry, most of them German (*Henkel*, *Wella*, *Goldwell*, and *Blendax*). Their primary international competitors are *Procter and Gamble*, *Unilever*, *L'Oreal*, and a couple of Japanese firms, and it is against these firms that opposition in this technology class is concentrated. It may be that the shift in strategy of firms like l'Oreal towards protecting their intellectual property with patents has encouraged an increase in opposition by the German firms that had used this method of protection traditionally.

In our future work we will augment the data here with financial information on the competing firms and on the outcomes of the oppositions. We will explore 1) the determinants of the duration of these opposition proceedings, on the grounds that delay can be one of the strategic reasons for opposition; 2) the determinants of differences in outcomes from these oppositions; and 3) the relation between opposer and opposing firm using citation information on the individual patent being opposed.

7 Bibliography

Arora, A., 1997. "Licensing tacit knowledge: Intellectual Property Rights and the Market for Know-how," *Economics of Innovation and New Technology*, Vol. 4, pp. 41-59.

Bebchuk, L. (1984). "Litigation and Settlement under Imperfect Information," *RAND Journal of Economics*, Vol. 15, pp. 404-415.

Besanko, D., D. Dranove, M. Shanley (1996). *Economics of Strategy*. John Wiley & Sons.

Cooter, R. and D. Rubinfeld (1989). "Economic Analysis of Legal Disputes and Their Resolution," *Journal of Economic Literature*, Vol. 27, pp. 1067-1097.

Graham, S.J.H, B. H. Hall, D. Harhoff and D. C. Mowery (2002). "Post-Issue Patent Quality Control: A Comparative Study of US Patent Re-examinations and European Patent Oppositions," NBER Working Paper No. 8807 (February).

Hall, Bronwyn H., and Rosemarie Ham Ziedonis. 2001. "The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995," *Rand Journal of Economics,* Vol. 32, 101-128.

Harhoff, D. and M. Reitzig (2001). "Opposition against EPO Patent Grants – The Case of Biotechnology and Pharmacfeuticals," mimeo, University of Munich.

Harhoff, D., F. M. Scherer and K. Vopel (2002). "Citations, Family Size, Opposition and the Value of Patent Rights - Evidence from Germany," *Research Policy,* forthcoming.

Harhoff, D., P. Regibeau and K. E. Rockett (2001). "Some Simple Economics of Genetically Modified Food," *Economic Policy*, Vol. 16, No. 33, pp. 263-299.

Lerner, J. (1995). "Patenting in the Shadow of Competitors," *Journal of Law and Economics*, Vol. 38, pp. 463-496.

Meyer, M. (1999). "Does science push technology? Patents citing scientific literature," *Research Policy,* Vol. 29, No. 3, March 2000, pp. 409-434.

Michel, J. and B. Bettels, 2001. "Patent citation analysis – a closer look at the basic input data from patent research reports," *Scientometrics,* Vol. 51, pp. 181-201.

Priest, G. and B. Klein (1984). "The Selection of disputes for Litigation," *Journal of Legal Studies*, Vol. 8, pp. 1-56.

Reitzig, Markus. 2002. "Die Bewertung von Patentrechten – eine Analyse aus betriebswirtschaftlicher Sicht," Muenchen: Ludwig-Maximilians-Universitaet. Doctoral Thesis.

Selten, R. (1978). "The Chain-store Paradox," *Theory and Decision*, Vol. 9, pp. 127-159.

Somaya, D. (2001). "My Strategy Says: "See You in Court!" Determinants of Decisions not to Settle Patent Litigation in Computers and Research Medicines," University of Maryland.

Stauder, D. (1989). *Patent- und Gebrauchsmusterverletzungsklagen in der Bundesrepublik Deutschland, Großbritannien, Frankreich und Italien.* Schriftenreihe zum Gewerblichen Rechtsschutz (Vol. 89), Max-Planck-Institut für ausländisches und internationales Patent-, Urheber- und Wettbewerbsrecht. Köln.

Stauder, Dieter (1996). "Aspekte der Durchsetzung gewerblicher Schutzrechte: Fachkundiger Richter, schnelles Verfahren und europaweites Verletzungsgebot," in: Beier, A. (Ed.): Aktuelle Herausforderungen des geistigen Eigentums."

Stauder, Dieter, P. von Rospatt, M. von Rospatt (1999). "Protection transfrontalière des brevets europeéns," *Revue Internationals de Droit Economique*, Vol. 1, pp. 119-133.

Figure 1

Parameter Combinations (p,Π^D) in the Theoretical Model

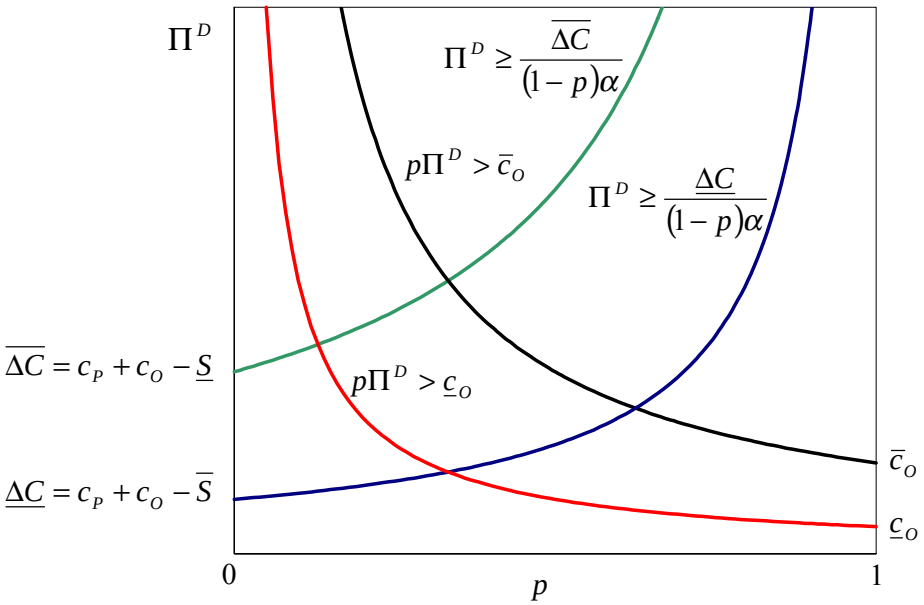

Figure 3

Number of Claims
(8,501 Patent Applications)

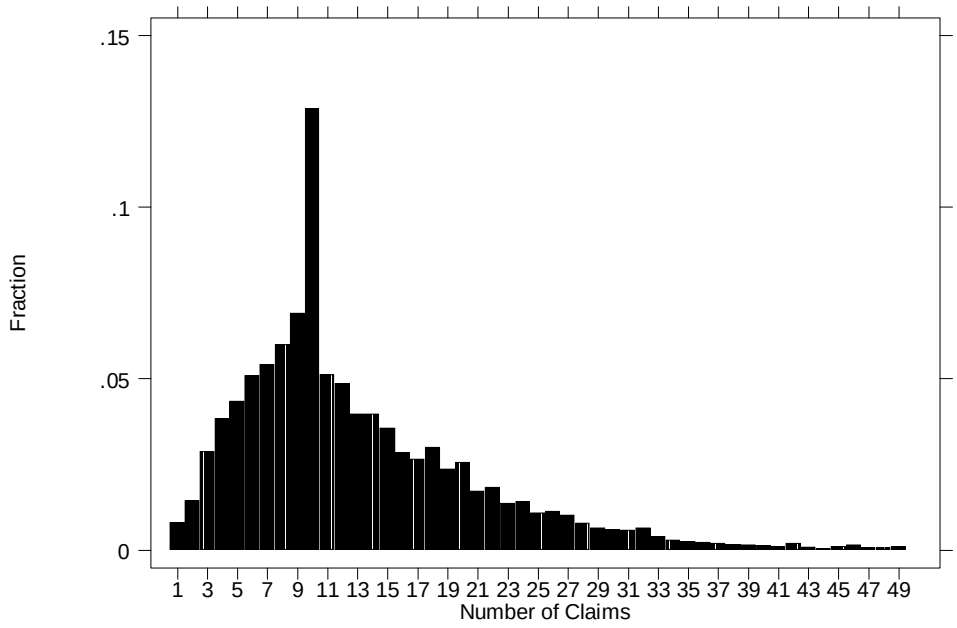

Figure 4

Distribution of References to the Patent Literature
(Truncation at 20 References)

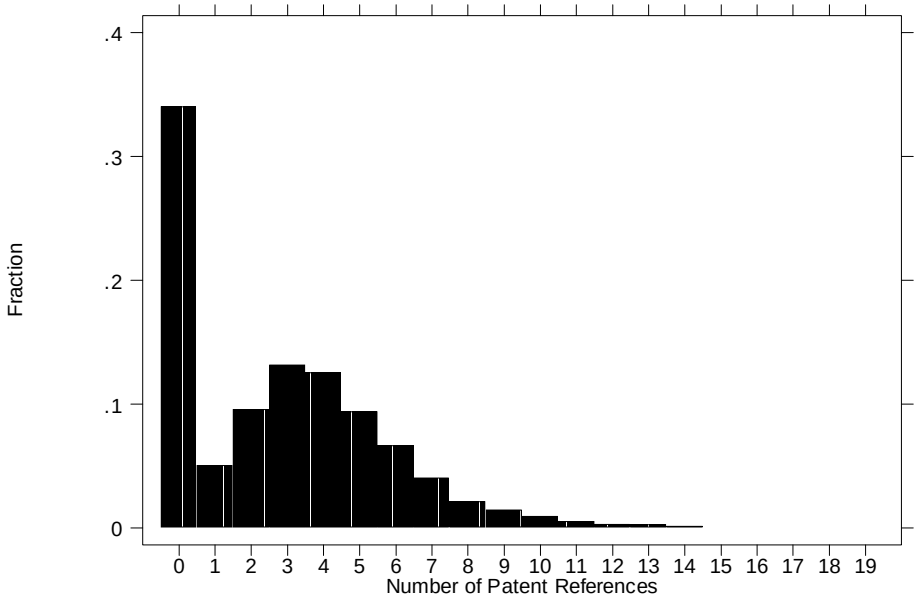

Figure 5

Distribution of References to the Non-Patent Literature
(Truncation at 20 Citations)

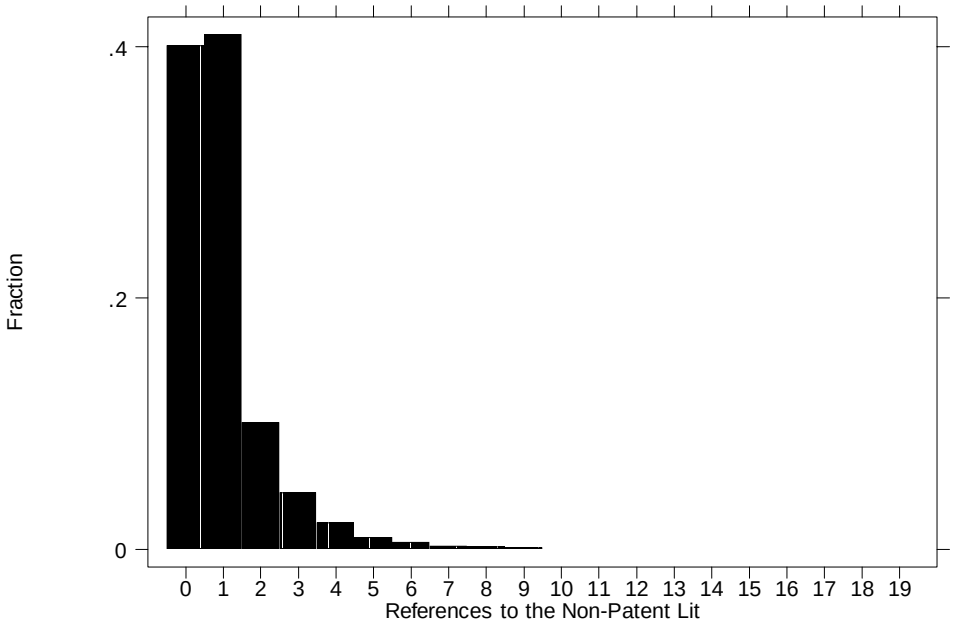

Figure 6

Citation Lags in the EPO Examination System
(Cited EPO Documents with Application Date in 1995 or Earlier)

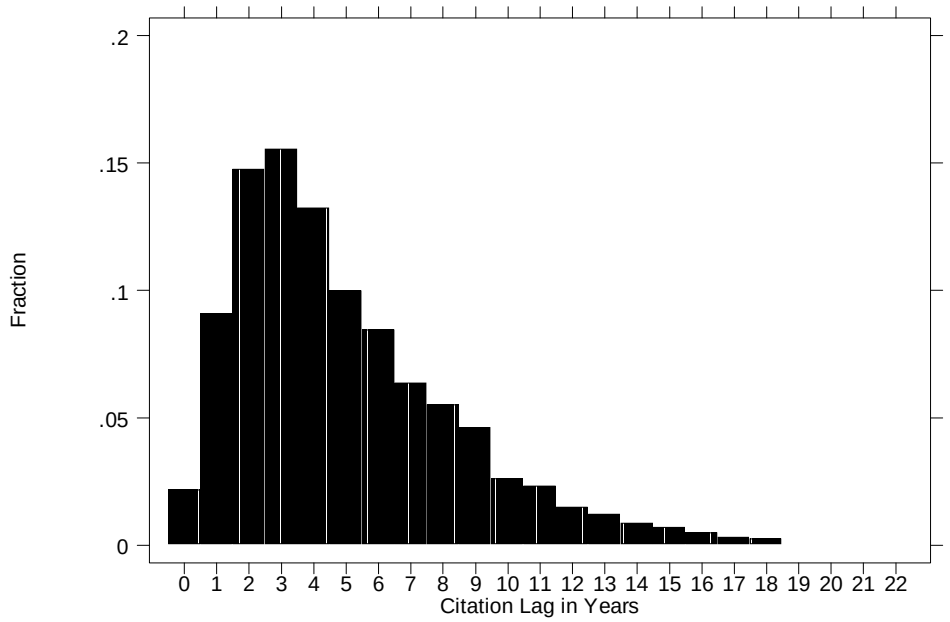

Figure 7

Distribution of Citations Received
in the EPO System Within 5 Years
(Zero Citations Included)

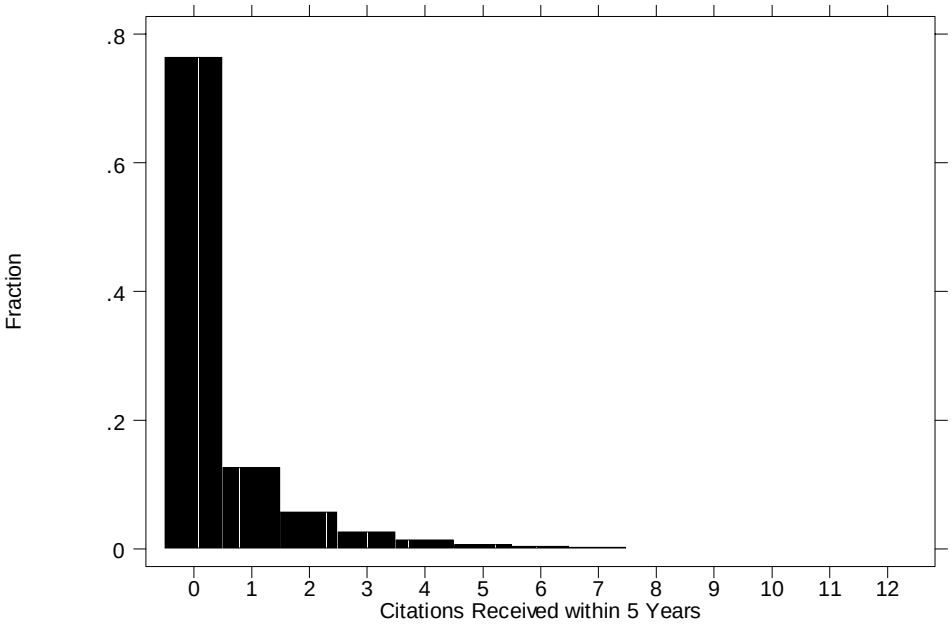

Table 1
IPC Classification for Cosmetics and Toilet Preparations Patents (IPC A61K7) and Aggregation to Groups

Subgroup	Description of 7-digit Subgroup	Group	Main Group
0	Cosmetics or similar toilet preparations (casings or accessories for storing or handling of solid or pasty toilet or cosmetic substances A 45 D 40/00)	**A**	Other
2	Make-up materials; Preparations for removing them; Body powders	**B**	Cosmetics/perfumes
21	Preparations containing skin colorant (face powders A 61 K 7/035; tanning preparations A 61 K 7/42)	**B**	Cosmetics/perfumes
25	for lips	**B**	Cosmetics/perfumes
27	Lipsticks	**B**	Cosmetics/perfumes
31	for cheeks, e.g. rouge	**B**	Cosmetics/perfumes
32	for eyes	**B**	Cosmetics/perfumes
35	Face or body powders for grooming, adorning or absorbing	**B**	Cosmetics/perfumes
4	Manicure or pedicure compositions	**B**	Cosmetics/perfumes
43	Nail coatings	**B**	Cosmetics/perfumes
47	Nail coating removers	**B**	Cosmetics/perfumes
6	Preparations, e.g. lotions or powders, for care of the hair; Preparations to promote hair growth or to aid in hair removal, e.g. shaving preparations	**C**	Hair
7	Hair powders	**D**	Hair
75	Preparations specially adapted for washing the hair, e.g. containing hair conditioning substances	**D**	Hair
8	Preparations for rinsing the hair	**D**	Hair
9	Preparations for waving or straightening the hair	**D**	Hair
11	Preparations for fixing the hair	**D**	Hair
13	Preparations for dyeing the hair	**D**	Hair
135	Preparations for bleaching the hair	**D**	Hair
15	Shaving preparations (soaps or detergent compositions, e.g. shaving soaps, C 11 D)	**C**	Hair
155	Depilatories	**C**	Hair
16	Preparations for cleaning the teeth or mouth, e.g. tooth-pastes; Mouthwashes	**E**	Other
18	Preparations containing fluorine compounds	**E**	Other
20	Preparations containing compounds releasing oxygen or chlorine	**F**	Other
22	Preparations containing ammonia, amines or derivatives thereof, e.g. urea	**F**	Other
24	Preparations containing hydroxy-carboxylic acids or derivatives thereof, i.e. compounds wherein the oxygen of the hydroxy group and the carbonyl of the carboxylic acid group are retained	**F**	Other
26	Preparations containing plant or animal extracts, e.g. chlorophyll (A 61 K 7/28 takes precedence)	**F**	Other
28	Preparations containing enzymes	**E**	Other
30	Preparations for cleaning dentures	**E**	Other
32	Anti-perspirants or body deodorants (deodorants for non-body applications A 61 L 9/01)	**F**	Other
34	Preparations containing zirconium compounds	**F**	Other
36	Preparations containing zinc compounds	**F**	Other
38	Preparations containing aluminium compounds	**F**	Other
40	Barrier compositions; Chemical agents brought into direct contact with the skin of living human or animal bodies for affording protection against external influences, e.g. sunlight, X- or other active rays, corrosive materials, bacteria, insect stings (chemical means for combating harmful chemical agents A 62 D 3/00)	**G**	Other
42	Topical sun or radiation screening or tanning preparations	**G**	Other
44	Preparations containing aromatic acids or derivatives thereof, e.g. aminobenzoic acid, methyl salicylate	**H**	Cosmetics/perfumes
46	Perfume compositions (essential oils, recovery thereof C 11 B 9/00)	**H**	Cosmetics/perfumes
48	Preparations for the care of the skin (A 61 K 7/02, A 61 K 7/40 take precedence)	**I**	Other
50	Washing or bathing preparations (soaps or detergent compositions C 11 D)	**I**	Other

Source: 7th Revision of the International Patent Classification
http://www.wipo.org/classifications/fulltext/new_ipc/index.htm (Febr. 5th, 2002)

Table 2
EPO Patents in Cosmetics and Toilet Preparations 1978-2000

Application Year	Grant (Share)	Refusal (Share)	Withdrawal (Share)	Other Cases (Share)	Pending (Share)	Total (Number)
1978	0.793	0.034	0.172	0	0	29
1979	0.696	0.043	0.261	0	0	92
1980	0.673	0.05	0.277	0	0	101
1981	0.743	0.049	0.208	0	0	144
1982	0.722	0.032	0.246	0	0	126
1983	0.662	0.025	0.312	0	0	157
1984	0.726	0.02	0.254	0	0	201
1985	0.647	0.025	0.324	0	0.004	238
1986	0.665	0.043	0.283	0.004	0.004	230
1987	0.605	0.045	0.347	0	0.003	291
1988	0.709	0.061	0.227	0.003	0	344
1989	0.682	0.045	0.243	0.031	0	424
1990	0.724	0.053	0.209	0.007	0.007	435
1991	0.696	0.053	0.251	0	0	451
1992	0.737	0.047	0.195	0.004	0.018	513
1993	0.711	0.044	0.203	0	0.042	547
1994	0.605	0.046	0.228	0	0.121	593
1995	0.503	0.025	0.204	0	0.268	678
1996	0.353	0.019	0.167	0	0.461	725
1997	0.173	0.008	0.102	0	0.717	968
1998	0.062	0.003	0.052	0	0.883	973
1999	0.046	0	0.037	0	0.917	109
2000	0.015	0	0.015	0	0.97	132
Total	4205	262	1607	20	2407	8501
Share of total	49.5%	3.1%	18.9%	0.2%	28.3%	100.0%

Table 3
Frequency of Designated EPC Countries
by Legal Status of Document

Country	Percent of Applications (N=8,501)	Percent of Granted Patents (N=4,205)	Percent of Opposed Patent Grants (N=574)
Germany	98.0	98.7	98.1
France	96.5	96.4	97.2
Great Britain	96.3	96.4	92.9
Italy	87.0	85.3	86.4
Netherlands	73.9	74.6	79.6
Switzerland	72.9	74.1	77.0
Lichtenstein	71.7	72.8	73.9
Spain	68.9	63.0	61.2
Belgium	65.9	65.4	70.4
Sweden	60.9	59.8	63.4
Austria	60.7	60.9	69.0
Greece	39.4	33.3	33.5
Luxembourg	37.7	30.8	32.4
Denmark	36.7	28.4	29.3
Portugal	26.7	15.6	14.8
Ireland	25.2	13.2	13.2
Finland	14.0	2.6	1.4
Monaco	13.8	6.9	6.1
Cyprus	4.3	0.1	0.0

Table 4
Application Activity over Time for the Leading Applicants

Rank	Applicant	TOTAL	1978-1985	1986-1990	1991-1995	1996-2001
1	L'OREAL	1,169	11	121	459	578
2	PROCTER & GAMBLE	663	65	93	203	302
3	UNILEVER	545	51	114	252	128
4	HENKEL	445	117	104	136	88
5	KAO	310	26	97	115	72
6	WELLA	228	30	56	56	86
7	BEIERSDORF	181	5	5	55	116
8	BASF	150	21	22	31	76
9	COLGATE-PALMOLIVE	129	1	24	58	46
10	SHISEIDO	122	0	25	39	58
11	COGNIS	104	0	0	8	96
12	DOW CORNING	95	9	25	50	11
13	GOLDWELL	80	1	6	31	42
14	BRISTOL-MYERS SQUIBB	77	2	20	35	20
15	GIVAUDAN	73	22	14	18	19
16	FIRMENICH	69	23	15	24	7
17	MERCK	66	8	7	23	28
18	GILLETTE	65	1	12	27	25
19	KABUSHIKI KAISHA	52	7	9	23	13
20	WARNER-LAMBERT	48	13	18	11	6
21	JOHNSON & JOHNSON	45	13	3	10	19
22	CIBA	44	10	3	9	22
23	RICHARDSON-VICKS	43	13	18	12	0
24	LVMH RECHERCHE	41	0	10	22	9
25	REVLON	41	10	8	16	7
26	BEECHAM	40	22	15	3	0
27	QUEST	39	0	3	19	17
28	INTERNATIONAL FLAVORS	36	15	3	10	8
29	HELENE CURTIS	32	6	10	16	0
30	PIERRE FABRE	31	7	3	11	10
Total		5,063	509	863	1782	1909

Note: The full sample consists of all patent applications submitted to the EPO from its inception in 1978 untill July 2001

Table 5
Granted Patents and Grant, Pending, and Opposition Rates by Applicant Firm
(Applications prior to 31 Dec. 1995)

Rank	Applicant	Granted Patents	Grant Rate (%)	Pending Rate (%)	Opposition (%)	Median Application Year
1	L'OREAL	556	94.1	2.4	14.2	1993
2	PROCTER & GAMBLE	172	47.6	12.2	26.7	1992
3	UNILEVER	286	68.6	7.2	23.1	1991
4	HENKEL	228	63.9	1.1	9.2	1989
5	KAO	183	76.9	4.6	19.1	1990
6	WELLA	117	82.4	0.0	13.7	1989
7	BEIERSDORF	31	47.7	1.5	19.4	1994
8	BASF	65	87.8	0.0	7.7	1990
9	COLGATE-PALMOLIVE	47	56.6	10.8	23.4	1992
10	SHISEIDO	43	67.2	18.8	9.3	1992
11	COGNIS	8	100.0	0.0	62.5	1994
12	DOW CORNING	57	67.9	3.6	3.5	1991
13	GOLDWELL	34	89.5	0.0	29.4	1993
14	BRISTOL-MYERS SQUIBB	31	54.4	7.0	19.4	1991
15	GIVAUDAN	48	88.9	1.9	8.3	1987.5
16	FIRMENICH	53	85.5	3.2	1.9	1989
17	MERCK	23	60.5	13.2	13.0	1991
18	GILLETTE	25	62.5	2.5	8.0	1992
19	KABUSHIKI KAISHA	30	76.9	5.1	0.0	1991
20	WARNER-LAMBERT	21	50.0	2.4	9.5	1989
21	JOHNSON & JOHNSON	19	73.1	7.7	21.1	1986.5
22	CIBA	15	68.2	4.5	13.3	1988
23	RICHARDSON-VICKS	25	58.1	2.3	4.0	1988
24	LVMH RECHERCHE	26	81.3	0.0	11.5	1992
25	REVLON	21	61.8	8.8	33.3	1990
26	BEECHAM	29	72.5	0.0	44.8	1985
27	QUEST	19	86.4	9.1	52.6	1992.5
28	INTERNATIONAL FLAVORS	20	71.4	0.0	0.0	1985
29	HELENE CURTIS	13	40.6	0.0	30.8	1990.5
30	PIERRE FABRE	14	66.7	9.5	14.3	1991
Total		2259	71.6	4.9	16.4	1991

Table 6
20 Most Active Patenting Firms in Cosmetics
1978-2000

Opponent	Number of Patents Granted	Number of Oppositions Filed	Patents Opposed	Ratio
HENKEL	221	207	23	9.00
DEGUSSA	5	12	2	6.00
GOLDWELL	33	93	16	5.81
BLENDAX	14	34	8	4.25
WELLA	110	60	21	2.86
COGNIS	5	10	5	2.00
BASF	65	15	8	1.88
MERCK	23	5	4	1.25
COLGATE-PALMOLIVE	43	16	13	1.23
JOHNSON & JOHNSON	16	8	7	1.14
BEIERSDORF	28	9	8	1.13
BRISTOL-MYERS SQUIBB	31	7	7	1.00
PROCTER & GAMBLE	161	41	80	0.51
L'OREAL	538	53	141	0.38
SMITHKLINE BEECHAM	40	6	18	0.33
BAYER	10	2	6	0.33
UNILEVER	274	25	91	0.27
REVLON	20	1	10	0.10
QUEST	19	1	14	0.07
KAO	177	0	43	0.00
Total for the top 20	1833	605	525	1.15
Total for all firms	4205	848	573	1.48

Table 7

Frequency of Opposed Patents by Number of Opponents

(Oppositions filed against patent grants
to applications submitted before Dec. 31st, 1995)

Number of Opponents	Number of Patents Opposed	Share (%)	Cumulative Share (%)
1	358	68.5	68.5
2	104	19.9	88.3
3	42	8.0	96.4
4	14	2.7	99.0
5	1	0.2	99.2
6	4	0.8	100.0
Total	523	100.0	-

Table 8
Crosstabulation of Opposed and Opposing Firms

(Oppositions filed against patent grants to applications submitted before Dec. 31st, 1995)

		Opponent																		
	Patent holder	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**Total**
1	**L'OREAL**	0	6	1	39	0	25	4	3	0	0	4	0	27	11	0	0	0	0	**120**
2	**PROCTER & GAMB**	12	0	8	28	0	2	0	0	6	0	0	0	11	0	0	0	1	0	**68**
3	**UNILEVER**	10	7	0	29	0	4	0	0	4	0	0	0	18	0	0	0	0	0	**72**
4	**HENKEL**	1	0	3	0	0	2	1	0	0	0	0	0	6	0	0	0	0	0	**13**
5	**KAO**	4	1	2	22	0	5	0	1	1	0	1	0	0	0	0	0	0	0	**37**
6	**WELLA**	4	0	0	2	0	1	0	0	0	0	0	0	6	0	0	0	0	0	**13**
7	**BEIERSDORF**	1	0	1	2	0	1	0	0	0	0	1	0	1	0	0	0	0	0	**7**
8	**BASF**	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	**3**
9	**COLGATE-PALMOL**	0	5	1	3	0	0	0	0	0	0	0	0	1	0	0	0	0	1	**11**
10	**SHISEIDO**	0	1	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	**5**
11	**COGNIS**	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	**3**
12	**DOW CORNING**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
13	**GOLDWELL**	2	0	0	7	0	6	0	0	0	0	0	0	0	0	0	0	0	0	**15**
14	**BRISTOL-MYERS**	1	0	0	3	0	1	0	0	0	0	0	0	2	0	0	0	0	0	**7**
15	**GIVAUDAN**	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
16	**FIRMENICH**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
17	**MERCK**	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
18	**GILLETTE**	1	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**4**
19	**KABUSHIKI KAI**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
20	**WARNER-LAMBERT**	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
21	**JOHNSON & JOHN**	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
22	**CIBA**	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**2**
23	**RICHARDSON-VIC**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
24	**LVMH RECHERCHE**	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**
25	**REVLON**	2	0	0	3	0	1	0	0	0	0	0	0	3	0	0	0	0	0	**9**
26	**BEECHAM**	1	1	0	7	0	0	0	0	0	0	0	0	3	0	0	0	0	0	**12**
27	**QUEST**	0	6	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**11**
28	**INTERNATIONAL F**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
29	**HELENE CURTIS**	0	1	0	3	0	1	0	0	1	0	0	0	2	0	0	0	0	0	**8**
30	**PIERRE FABRE**	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	**2**
	Total	**44**	**31**	**17**	**165**	**0**	**50**	**5**	**7**	**13**	**0**	**6**	**0**	**82**	**11**	**0**	**0**	**3**	**1**	**435**

Note: The unit of analysis are challenges (oppositions) against patent grants. Since there may be more than one opponent, the total number of challenges exceeds the number of patents.

Table 9

Variable	Count	Share=1	Count	Share opposed
Oppositon (0/1)	511	0.144	511	1.000
Individual as Applicant	187	0.053	14	0.075
University/National Institute	56	0.015	5	0.089
Accelerated Examination	177	0.049	44	0.249
PCT Application	872	0.245	119	0.136
Number of Claims = 10 (0/1)	422	0.119	69	0.163
IPC Group A - Cosmetics NEC	434	0.122	69	0.159
IPC Group B - Makeup, manicure	168	0.047	8	0.048
IPC Group C - Hair growth/removal	539	0.151	82	0.152
IPC Group D - Haircare	568	0.160	131	0.231
IPC Group E - Dental	366	0.103	62	0.169
IPC Group F - deodorants	188	0.053	23	0.122
IPC Group G - Sun/insect lotions	218	0.061	28	0.128
IPC Group H - Perfumes	255	0.071	10	0.039
IPC Group I - Soaps and skin care NE	813	0.229	99	0.122
Owner - Henkel	221	0.062	21	0.095
Owner - Goldwell	33	0.009	10	0.303
Owner - Wella	110	0.031	16	0.145
Owner - l'Oreal	538	0.151	80	0.149
Owner - Procter & Gamble	161	0.045	46	0.286
Owner - Blendax	14	0.004	4	0.282
Owner - Unilever	274	0.077	65	0.237

Other Variables

Variable	Mean	Std. Dev.	Min	Max
Number of Designated States	9.796	3.863	1	17
Number of Claims	12.179	7.606	1	79
Cites Type X or Y	0.341	0.741	0	5
Cites Type A	0.390	0.866	0	9
References to Patents Type X or Y	1.125	1.847	0	22
References to Patents Type A	1.456	1.895	0	23
References to the Non-Patent Literature Type X or Y	0.258	0.735	0	8
References to the Non-Patent Literature Type A	0.329	0.812	0	13

Table 10
Probit Models of the Incidence of Opposition
Marginal Effects (Change in Prob. for a One Unit Change in X)
(N=3,548)

Variable	DP/dx	Std. Error		DP/dx	Std. Error	
Number of Designated States	0.0026	0.0015	*	0.0012	0.0016	
Number of Claims	0.0018	0.0008	**	0.0019	0.0008	**
Number of Claims = 10 (0/1)	0.0311	0.0193	*	0.0217	0.0188	
Forward Cites Type X or Y	0.0262	0.0115	**	0.0223	0.0114	**
Forward Cites Type A	-0.0041	0.0121		-0.0071	0.0119	
Backward Patent Cites Type X or Y	0.0089	0.0040	**	0.0078	0.0039	**
Backward Patent Cites Type A	-0.0005	0.0042		0.0001	0.0041	
Backward Non-Patent Cites Type X or Y	0.0106	0.0081		0.0115	0.0080	
Backward Non-Patent Cites Type A	-0.0138	0.0085		-0.0137	0.0083	
Individual as Applicant	-0.0666	0.0191	***	-0.0621	0.0196	**
University/National Institute	-0.0538	0.0350		-0.0466	0.0367	
Accelerated Examination	0.0986	0.0342	***	0.1185	0.0386	***
PCT Application	0.0218	0.0193		0.0218	0.0194	
IPC Group A - Cosmetics NEC	0.0341	0.0224		0.0399	0.0227	*
IPC Group B - Makeup, manicure	-0.0774	0.0207	***	-0.0741	0.0210	**
IPC Group C - Hair growth/removal	0.0335	0.0209	*	0.0367	0.0211	*
IPC Group D - Haircare	0.1014	0.0235	***	0.1209	0.0255	***
IPC Group E - Dental	0.0489	0.0251	**	0.0351	0.0242	
IPC Group F - deodorants	-0.0054	0.0278		-0.0227	0.0253	
IPC Group G - Sun/insect lotions	0.0054	0.0270		0.0063	0.0269	
IPC Group H - Perfumes	-0.0905	0.0170	***	-0.0862	0.0172	***
HENKEL				-0.0646	0.0177	***
GOLDWELL				0.0298	0.0591	
WELLA				-0.0450	0.0246	
LOREAL				-0.0240	0.0171	
PROCTER				0.1302	0.0369	***
BLENDAX				0.1124	0.1166	
UNILEVER				0.0718	0.0260	***
Log likelihood	-1367.3			-1344.0		
Pseudo R-squared	0.0651			0.0810		
Chi-squared (p-value) vs. previous column				46.6 (.000)		

* significant at 10%, ** significant at 5%, *** significant at 1%

A full set of year dummies for 1981-2001 are included

The left-out category is patents in IPC class I (soap/skincare NEC), granted to other firms, in the years 1980/1981.

Table 11
Final Outcome of Oppositions

	Number			Share of outcomes			Share excl. pending		
	Total	Biotech/ pharma	Cosmetic Industry*	Total	Biotech/ pharma	Cosmetic Industry*	Total	Biotech/ pharma	Cosmetic Industry*
Opposition rejected	266	132	63						
Opposition rejected on appeal	85	42	0						
Opposition rejected - total	**351**	**174**	**63**	**17.4%**	**13.8%**	**12.3%**	**22.4%**	**19.1%**	**18.8%**
Patent amended	355	220	115						
Patent amended on appeal	163	126	1						
Patent amended - total	**518**	**346**	**116**	**25.6%**	**27.5%**	**22.7%**	**33.0%**	**38.1%**	**34.6%**
Patent revoked	366	173	113						
Patent revoked on appeal	184	113	23						
Patent revoked - total	**550**	**286**	**136**	**27.2%**	**22.8%**	**26.6%**	**35.1%**	**31.5%**	**40.6%**
Opposition closed/other	**150**	**103**	**20**	**7.4%**	**8.2%**	**3.9%**	**9.6%**	**11.3%**	**6.0%**
Opposition case pending	190	139	66						
Appeals case pending	262	209	110						
Case pending - total	**452**	**348**	**176**	**22.4%**	**27.7%**	**34.4%**			
Total	**2021**	**1257**	**511**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Outcomes are recorded only once where there were multiple oppositions.

Table 12
Opposition Outcomes
Number

Outcome	Non-German Patentholder	German Patentholder	Non-German Opposer	German Opposer	All firms
Opposition rejected	46	30	37	39	76
Patent amended	87	23	43	67	110
Patent revoked	117	25	49	93	142
Opposition pending	153	23	84	92	176
Other	6	0	2	4	6
Total	409	101	215	295	510

Shares

Outcome	Non-German Patentholder	German Patentholder	Non-German Opposer	German Opposer	All firms
Opposition rejected	11.2%	29.7%	17.2%	13.2%	14.9%
Patent amended	21.3%	22.8%	20.0%	22.7%	21.6%
Patent revoked	28.6%	24.8%	22.8%	31.5%	27.8%
Opposition pending	37.4%	22.8%	39.1%	31.2%	34.5%
Other	1.5%	0.0%	0.9%	1.4%	1.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%