

# Determinants of Duration of Patent Trials

by

KATRIN CREMERS

Centre for European Economic Research (ZEW), Mannheim

Preliminary Version, comments are welcome

Please do not quote

*June 29, 2006*

**Abstract:** This paper is aimed to shed light on how the duration of trials is determined: by the speciality of the infringing action inducing efforts of closing the suit, the general characteristics of the patent or the characteristics of the patentee. In particular, I tackle the question of whether the outcome of a patent litigation suit is influenced directly by the efforts the litigant undertake in order to terminate a legal patent dispute. This analysis goes one important step further than the existing literature by using detailed information about the course of the case. I particularly take the means of defense into consideration: filing an annulment suit, the procedural details of a hearing and requests of suspension. Existing work is concentrated on duration investigations in other areas of civil law than intellectual property rights (car accidents and medical malpractice suits). In this body of the literature evidence on infringement is solely based on standardized infringement actions. The property rights there are well defined in the sense that, similar to the U.S. patent system, opposition and annulment procedures are not available as legal means. The results of this chapter reveal that annulment suits as a means of defense of the potential infringer delays court adjudication but not settlement in German patent litigation suits. Only if suspension is requested, the hazard of termination of both types of patent suit termination is decreased. The results suggest that courts are experienced in handling complex litigation claims and expert reports. They therefore do not delay the decisions. A large number of originally filed patent claims lowers the hazard of court adjudication, however.

**JEL classification:** K41, O34

**Keywords:** Patent, Infringement, Litigation, Settlement

**Acknowledgement:** I am grateful to Dietmar Harhoff, Georg Licht, Bettina Peters, Konrad Stahl, and participants of the department seminar of Industrial Economics and International Management of the Centre for European Economic Research (ZEW) for valuable comments and discussion. Financial support by the German Science Foundation (DFG) under the grant SFB/TR 15 - 04 is gratefully acknowledged.

address: ZEW, Center for European Economic Research,  
Department of Industrial Economics and International Management  
P.O. Box 10 34 43, D-68034 Mannheim, Germany  
phone: +49-621-1235-297  
fax: +49-621-1235-170  
e-mail: [cremers@zew.de](mailto:cremers@zew.de)

# 1 Introduction

Enforcement of patents in the framework of lawsuits is a time consuming undertaking which is made in order to secure rents from an intellectual property right. First, intellectual property rights such as patents have to be enforced in order to obtain sustained benefits which are intended to recoup the investments in its development. This enforcement takes time and, up to a certain limit, the duration of patent suits has a positive implication for the efficiency of the patent system. The more effort a litigating party invests in enforcement disputes against a potential infringer, *ceteris paribus*, the longer it would take to solve the dispute. Documentary evidence must be prepared, in some cases with the help of experts. Providing the court with valuable and credible information delays the decision of the court as well as settlement agreements. Second, a long lasting patent suit creates real expenditures. Lawyer salaries or legal fees, and the loss of rents that would otherwise have been received from exploiting the patent must also be taken into consideration.

A court decision which either provides compensation to the owner of an infringed patent or which absolves an unjustly accused defendant is one solution to the case. Settling on the merits of the dispute is the other. Either conclusion may be influenced not only in terms of the type of outcome but also in terms of the length of time the patent is disputed by all involved parties and the judge. Not only private but also social costs evolve during a time of suit. Delayed civil suit termination is regarded as a grave economic and social problem.<sup>1</sup> On the one hand, during the course of a patent suit uncertainty and the loss of market share are a common sacrifice added to the general direct costs of a patent litigation suit such as legal fees and attorney salaries. Managerial and judicial resources are tied up. Uncertainty about the scope of the patent reduces the expected profits from the patent and infringement directly depletes the returns of the innovation rents. Furthermore, the expected value of the patented invention is diminished by the risk of losing the the trial. On the other hand, qualitatively valuable court decisions or profitable settlements disentangle the merits of the dispute and therefore solve this uncertainty.

In addition to the private consequences of varying suit duration, society faces additional welfare effects. Long lasting patent disputes erode incentives created by the patent system for innovation investments. At the same time inadmissible civil claims filed by patentees can diminish the incentives for potential competitors to invent around or improve similar technologies. Court decisions can partly solve the problems of the patent system which distorts market forces.<sup>2</sup>

In this paper, I analyze the behavior of the parties involved in patent litigation suits with

---

<sup>1</sup>See Vereeck and Mühl (2000) and Kessler (1996).

<sup>2</sup>See Menell and Scotchmer (2005) and Scotchmer (2005) for further arguments.

respect to the duration of the termination of the legal dispute. Based on a model developed by Spier (1992) and adapted by Fenn and Rickman (1999), I formulate hypotheses to explain the effect of ongoing time on the way a suit is terminated and to link the efforts the parties make during suits to the incentives provided by the enforcement system. In addition to the model I allow for suits to be closed by two mutually exclusive termination events - settlement agreements and court verdicts (adjudication). Moreover, for the investigation of the duration of both types of termination I relate the behavior of the parties to the legal environment and the characteristics of the patents involved in the dispute. The main findings are that complex and multiple claim suits take longer to solve via settlement while there is no effect on the duration of the adjudication process. Furthermore, I find that verdicts take much longer to reach in Düsseldorf.

This analysis extends the existing literature on the duration of civil suits, especially patent suits by drawing on detailed information about the course of the case. Danzon and Lillard (1983), Hughes and Snyder (1989), Kessler (1996), Spurr (1997), Hughes and Savoca (1999), and others empirically investigate the duration of personal civil injuries suits such as medical malpractice or car accidents. This work mainly builds on the work of Priest (1989) and Spier (1992 and 1994) who reveal the incentives of the parties to delay or to speed up suits. As for patent litigation suits, Somaya (2005) and Kesan and Ball (2005) examine U.S. data to analyze the timing of patent suits for the American system. Somaya (2005) provides a detailed empirical investigation of both competing termination routes and finds that strategic patenting behavior such as defensive strategies, exclusivity and trading aspects have an impact on the timing of settlement or adjudication. He uses a large data set of patent litigation to analyze patent strategies, such as blocking or fencing, and their impact on suits. Kesan and Ball (2005) investigate a smaller data set of two filing cohorts at a certain District Court.

Using a data set of three cohorts of filed patent litigation suits between 1993 and 1995 in Germany, described in the appendix, I apply a competing-risks proportional hazard model. The estimation results reveal that for the termination of a patent suit the direct efforts of the parties are particularly important. Settlement is delayed by requesting an expertise and filing a large number of different litigation claims. Annulment suits as a means of defense employed by the potential infringer delay court adjudication but not settlement. In the data I do not find that patent strategies as such affect the duration of one or the other outcome.

The remaining paper is organized as follows. In the next section I relate my analysis to the existing theoretical and empirical work and formulate hypotheses. Section 3 contains the data description. In section 4 I introduce the econometric model and discuss the results. Section 5 concludes.

## 2 Theoretical and Institutional Considerations

There are two lines of research accessing the determinants of lawsuit delays. First, models of bargaining and the sources of negotiation breakdown in different information settings generate predictions about the driving forces of settlement delay. Second, as soon as the patent disputes are filed to District courts they will be mediated by judges. The judges' motives and the institutional specificities also have an impact on the time of termination, by both settlement and verdict. In the following I describe the results of the research lines in order to develop hypotheses for the patent litigation trial in Germany.

### 2.1 Duration of Negotiations

In the economic literature the delay of termination of disputes is embedded in the research of settlement behavior during negotiations (P'ng 1983, Bebchuk 1984, Nalebuff 1987 Spier 1992). It is important to distinguish between investigations, theoretical and empirical, which analyze the delay to settlement only (Fenn and Rickman 1999, Kessler 1996), those which only consider adjudication outcomes (Lanjouw and Schankerman 2001, Nerkar A. and Paruchuri 2004) and those regarding the termination of litigation by settlement *and* court adjudication (Posner 1972, Priest 1989, Spurr 1997, 2000). However, all approaches rely on the assumption that litigation and, at later stages, court adjudication represents a failure of settlement negotiations. Thus I apply the model of Fenn and Rickman (1999) which is based on the work of Spier (1992).

A defendant decides in favor of settlement offer in each of the negotiation periods  $t$ ,  $t \in (1, T - 1)$  under conditions of incomplete information. The damages to be paid by the defendant are drawn from a uniform distribution  $[\gamma D, \gamma \bar{D}]$  with  $\gamma > 0$  as an indicator of the severity of the case. The probability of losing the case and paying the costs  $C$  is  $p$ . Both parties discount the future at the same rate  $\delta \in (0, 1)$ . The defendant makes settlement offers in each period in order to minimize his expected payout and takes into account the fact that plaintiffs with a lower type  $\gamma D$  would have accepted earlier offers. In a Perfect Bayesian Equilibrium the defendant determines the partition of the plaintiff types by a set of  $T$  settlement offers. This partitioning is crucial for the probability of settlement in each period.

$$D_t = \gamma \frac{D}{p} \delta^{-T} \sum_{i=1}^{t-1} \delta^i C, \quad t = 2, \dots, T \quad (1)$$

$$D_{t+1} = D_t + \frac{C}{p} \quad (2)$$

The benefits of settlement in an earlier period  $t$  are the costs to be saved in period  $t + 1$ . The defendant's share of benefits falls as the anticipated probability of the plaintiff winning (higher liability of the defendant) rises. This predicts the hazard rate as a function of the expected damages  $p\gamma\Delta D$  and the cost  $C$  of the next period. With  $\beta = \frac{p\gamma\Delta D}{C}$  the hazard rate of suit settlement is derived as follows:<sup>3</sup>

$$h(t, C, p, \gamma, \Delta D) = \frac{(1 - \delta)\delta^{t-T}}{(1 - \delta)\beta - \delta^{-T}(\delta - \delta^t)} \quad (3)$$

$\beta$  is the relation of the defendant's expected damages  $\Delta D$  and the cost  $C$  of the next period.  $C$  would be saved by settling in the current period. Assuming that  $h$  increases monotonically, equation 3 immediately leads to predictions about the hazard rate of settlement termination by settlement agreements. First, the higher the costs of trial the higher is the hazard rate of patent litigation suit termination by settlement is. Second, the more severe a suit is the lower is the hazard rate of patent litigation suit termination by settlement. The model does not explicitly predict the hazard rates for adjudication. However, since adjudication occurs after settlement negotiations have failed, court related activities of the litigants delay or speed up adjudication.

In another model context developed by Admati and Perry (1987) settlement delay may signal information about the bargaining strength of the litigants. The timing of offers and their revision reveal information about how strong the bargaining position is. A late settlement offer and a delayed refinement of settlement offers signal a larger bargaining power than the litigant might actually exercise. It follows that if the patentee thinks he has a weak patent he might prolong the time between the offers he makes and therefore delay settlement. As a result, I expect that disclosed bargaining power will speed up the termination of suits by adjudication.

## 2.2 Hypotheses

Based on the discussion in the previous section 2.1 I derive hypotheses about the factors driving the duration of patent suits terminated by two mutually exclusive types of suit termination. Legal costs are closely linked to the amount at stake, whereby high amounts lead to late settlement. This is stressed by Fenn and Rickman (1999) who find that a higher value of the incorporated stakes lead to lower settlement hazards. The amount in dispute is defined by the court. Related to this value the court fees as well as the private attorney fees are calculated.

**H1** The higher the amount in dispute, the lower is c.p. the hazard rate of settlement.

---

<sup>3</sup>The detailed model is presented in Fenn and Rickman (1999).

In an indirect sense forgone rents of a patent in future periods are part of the cost  $C$ . These rents are determined by the term of the patent. Thus, younger patents will lead to a speedy adjudication since there are more years of applicability of the rents. Somaya (2005) stresses this argument in the sense that patentees who aiming to achieve a strategic goal of exclusivity are particularly interested in speedier adjudication (in favor of the patentee).

The claims filed within the litigation process are a direct means to constitute the trial. The claim for omission and demand for compensation are the regular litigation claims filed.<sup>4</sup> Additionally the plaintiff can demand a presentation of accounts in order to calculate damages or to estimate restitution after unjust enrichment. Providing this information is associated with costs and a loss of reputation concerning the internal interest of the defendant's secrecy. In addition to the foregoing arguments, it is reasonable to assume that the more claims are filed the larger is the workload of the judges and the parties in terms of preparing the documents and the decision.

**H2** The more litigation claims are filed, the longer c.p. the patent litigation suit lasts. The hazard rate of both settlement and adjudication termination will be lower.

Litigants evaluate the merits of the case more closely when they request an expert opinion. They emphasize the severity and the importance of the patent involved. Finding evidence in these cases is more time consuming and directly delays the termination of the suit for both types. For settlement termination, an expertise will refine the information about the infringing action. The parties then face a different information structure which results in a new negotiation round. Settlement will be delayed. As far as adjudication is concerned, expert opinions speed up the decision making process for the court and help the it to reach a decision more quickly. I anticipate that the two effects will cancel each other out and that there will be no correlation between the request for an expert opinion and the hazard rate for adjudication.

**H3** In cases where an expert opinion is used to find evidence the hazard rate of settlement is c.p. lower. There is no effect of an expert opinion on the hazard rate for adjudication.

It follows directly from the model that impatient litigants favor early settlement and speedy adjudication since the discount of future compensations is high. Impatient litigants might be individuals and small companies which have no alternative but to tie up a relatively large

---

<sup>4</sup>A request for preliminary injunction forcing the defendant to refrain from all infringing activities might be followed by the collapse of the defendant's entire business. This can be one of the most damaging claims, particularly for small firms (Lanjouw and Lerner 2001 and Lanjouw and Schankerman 2004). I consider this effect in analyzing the baseline hazards separated for cases where preliminary injunctions have been requested.

amount of their resources in the litigation proceedings. However, as I find in earlier research ((Cremers 2004)) individuals are more likely to become involved in litigation in later stages than companies.

### 2.3 Court Delays and Procedural Details

Further arguments of delay in patent suit termination lie in the incentives the jurisdictional system provides. Court delay in trials causes a delay of settlement. Kessler (1996) and Vereeck and Mühl (2000) argue that the discount of the value of the case and the deterioration in the quality of the evidence lead to a lower propensity to settle for the defendant which offsets the higher propensity to settle for plaintiffs.

The independence of courts is politically desirable and in many jurisdictional systems a constitutional right.<sup>5</sup> Nevertheless, judges at court do have private incentives of their own in the sense that they also seek promotion to higher courts and to reduce their workload. Depending on whether the capability of judges is measured by the citations or the number of cases in which their decision have not been not overturned by an appellate court, the judge will decide on the merits or follow precedence cases. These reputation motives have been taken into account by Levy (2005) and Miceli and Coşgel (1994) arguing that these motives can create conflictive decision incentives. In the German litigation system an additional promotion-related incentive for judges involves the encouragement of settlements. Judges who achieve settlement between the litigants are regarded as capable and are therefore promoted to higher courts more quickly or promoted to higher salary groups.<sup>6</sup> It is clear that, all other factors being equal, this incentive will lead to higher settlement rates. But it is unclear whether these settlements would occur much earlier.

In Düsseldorf the District Court uses the first oral hearing as a procedural conference which fixes the conditions for the further negotiations. Only in the next session does the hearing involve the merits of the case. The Mannheim court immediately begins hearing finding evidence on the merits. I do not expect the settlement termination to have an impact on the duration of the suit. However, the adjudication will be per se delayed.

**H4** Suits at the Düsseldorf District Court have c.p. a lower hazard rate of suit termination by adjudication.

---

<sup>5</sup>See Landes and Posner (1975) and Salzberger (1993) ) who argue that judicial independence is a necessary precondition if unpopular decisions are to be shifted on to judges.

<sup>6</sup>These in-court settlement offers usually contain a lower damage payment for the defendant and therefore lower compensation for the plaintiff but an end of the suit which is combined with certainty and lower legal expenses.

At this point I draw the reader's attention to a discussion on the impact of legal doctrines and damage paying rules on the outcome and duration of patent litigation suits. Carpentier (2004) stresses that the punishment of delayed patent right enforcement (doctrine of laches) may cause efficient delays in the enforcement of patent rights to prevent overlapping suits.<sup>7</sup> A similar finding is reported by Schankerman and Scotchmer (2001) who evaluate the rules of damage payments in terms of the benefits of the parties. In this context the impact of endurance is shown as a factor affecting the length of a litigation suit as well. In cases where an interest rate is paid for the duration of the trial the adjudication should be delayed by the parties. The English rule which is applied in Germany forces the defeated party to bear all the costs. This leads ex ante to higher settlement rates than verdict drop outs ((Hughes and Savoca 1999)).<sup>8</sup> Daughety and Reinganum (2004) argue specifically that the use of a certain legal doctrine can produce externalities such as delay of settlement.<sup>9</sup> Arguments relating to the differences in the legal procedures cannot be used in this analysis given that, in the German system, there is no significant difference among the courts in applying these rules.

### 3 Data and Descriptive Statistics

I use a sample of all patent litigation suits filed during the time period between 1993 and 1995, as described in the appendix. From all 652 suits filed at the two District Courts, Mannheim and Düsseldorf, 306 suits remained in the sample for the analysis duration. Suits for which the date of termination did not appear correctly as the real end of the dispute had to be excluded.<sup>10</sup> Additionally, some of the litigation claim variables were not available or had been incorrectly observed. I tested whether there is a selection bias for the most important exogenous variables and found that those cases were not significantly different in their means.

174 suits were closed by settlement either before court or out of court.<sup>11</sup> Court adjudications terminated suits in 132 cases. Appeals are included in the sample.

Vereeck and Mühl (2000) condense the time of a trial into four periods: First, the negotiation time between the discovery of the infringement and filing a suit; second, the time between the

---

7

<sup>8</sup>I do not consider adjudication limits. They are a restriction to the settlement delay and reduce the duration endogenously.

<sup>9</sup>Djankov and Schleifer (2003) measure the procedures at courts in several countries and find that the level of formalism affects the duration of trials. But this is more of importance when comparing national systems of enforcement.

<sup>10</sup>Especially in Düsseldorf, closing dates are reported which lie after the end of the decision about the merits

<sup>11</sup>For the researcher there is no distinction observable between a settlement agreement with compensation payment (e.g license fees, damages) and a drop. For all out of court settlements there are no data available for compensation payments or changes or stop in the potentially litigating action (Shavell 2003).

decision to file and clarification of the administrative requirements in preparation for the trial; third, time between filing the suit and the start of the trial; fourth, the duration of the trial up to its termination by a settlement agreement, a court decision or the case being dropped. In this analysis I combine the third and fourth periods and define it as the duration of a patent suit and regard the time from filing the letter of claims to the District Court until the final notification of the end of the trial as the duration of the suit which is in this case also the duration of the trial.

Settlement takes on average 30 days longer than termination by court decision (Table 1). Independent of whether the suit has been terminated by settlement or by adjudication, suits in Düsseldorf last on average almost 9 months longer than at the Mannheim District Court. In both District Courts the average duration of trials differ, but not significantly, according to type of termination.

Table 1: Time Length of Suits by Kind of Termination and District Court

Termination by	at Mannheim Mean (SD)	at Düsseldorf Mean (SD)	Total Mean (SD)	Obs.
Adjudication	366.85 (432.41)	662.97 (534.84)	517.15 (507.50)	133
Settlement	399.51 (571.22)	632.17 (478.37)	540.72 (527.69)	173
Total	383.55 (506.50)	644.17 (499.81)	530.52 (518.33)	
Observation	134	172		306

Table 2 shows the means and standard errors of most exogenous variables explaining the duration of patent suits in Germany which were closed either by settlement or by court decision. The first panel displays the variables describing the characteristics of the suit. Plaintiff's activities are measured as the number of litigation claims (LIT\_CLAIMS) filed and the request for an expert opinion (EXPERT). EXPERT is coded as an indicator variable defining whether an expert opinion was requested or not. Defendants' efforts are recorded in terms of whether they file an annulment suit (DUMMY\_NULLITY) at the Federal Patent Court (BpatG). In cases where the defendant requested a stay after filing an annulment, the duration of the stay (DURATION\_OF\_STAY) is longer prior to settlement if the suit is closed by settlement rather than court adjudication. Patent characteristics are shown in panel two of table 2. There are more patent claims (CLAIMS) involved in suits which terminate with settlement rather than in those which were adjudicated. The higher value of AMOUNT\_IN\_DISPUTE for settled cases is in line with this finding since the AMOUNT\_IN\_DISPUTE is correlated with the number of

patent claims.<sup>12</sup>

Table 2: **Description of Main Exogenous Variables According to Type of Termination**, Mean (SD)

	Full Sample	Settlement	Adjudication	
DURATION_OF_STAY (days)	79.18 (281.86)	105.431 (317.19)	44.58 (223.55)	**
LITIGATION_CLAIMS	2.79 (1.65)	2.86 (1.61)	2.70 (1.71)	
EXPERTISE	0.16	0.13	0.20	**
DUMMY_STAY	0.14	0.18	0.09	**
DUMMY_NULLITY	0.25	0.30	0.17	***
DUMMY_HEARING	0.83	0.84	0.80	
AMOUNT_IN_DISPUTE (in Mio DM)	0.68 (1.97)	0.83 (2.58)	0.47 (0.47)	*
OPPOSITION	0.27	0.23	0.32	*
CLAIMS	9.98 (9.20)	10.73 (10.75)	8.99 (6.54)	*
SELF_REFS	0.02 (0.14)	0.03 (0.15)	0.015 (0.12)	
SELF_CITES	0.04 (0.24)	0.03 (0.16)	0.04 (0.32)	
REFERENCES	3.88 (3.39)	3.90 (3.37)	3.87 (3.44)	
CITATIONS	4.17 (5.59)	3.90 (4.70)	4.53 (6.56)	
FAMILY_SIZE	4.85 (5.08)	4.43 (5.07)	5.40 (5.05)	**
PATENT_AGE	9.05 (4.25)	9.10 (4.08)	8.97 (4.47)	
PORTFOLIO_RATIO	0.54 (5.38)	0.47 (5.04)	0.63 (5.81)	
PORTFOLIO_PL	623.21 (5382.45)	583.64 (5048.16)	675.37 (5813.08)	
PORTFOLIO_DF	205.45 (1383.41)	197.47 (1086.80)	215.97 (1701.71)	
INDIVIDUAL	0.31	0.27	0.36	*
Observations	306	174	132	

**Notes:** The Table shows the means of the main exogenous variables. \*, \*\*, \*\*\* indicate that the means of the sub samples settlement and adjudication differ significantly at the 10%, 5%, 1% significance level. Standard errors in parentheses.

<sup>12</sup>The numbers correspond to those in table ?? in the previous Chapter.

## 4 Competing Risk Analysis

In the following section I present the competing risk analysis of patent suit termination by settlement and termination by court adjudication.

### 4.1 Econometric Model and Estimation Techniques

For the competing risk analysis of the duration of patent litigation suits I use a semi-parametric, proportional hazard model. Termination of the suits can happen by one of two mutually exclusive events. I distinguish between settlement agreements  $S$  as one termination event and court adjudication  $A$  as the second termination event (Hughes and Savoca, Somaya 2000). Termination occurs at time  $T$  and is observable at the  $T^S$  and  $T^A$  for each suit.  $T$  is defined as  $T = \min(T^S, T^A)$ . Following the Cox model two type-specific hazards are estimated in the stratified version of the proportional hazard model (Cox 1972). I assume that the two types are mutually independent. From this assumption, it follows that the observable hazard function equals :

$$h^c(t; X = x) = \lim_{\Delta t \rightarrow 0} \frac{P\left(t \leq T^c < t + \Delta t | t \leq T = \min(T^S, T^A), X = x\right)}{\Delta t} \quad (4)$$

A result of the independence assumption is that I can estimate the hazards for each type in a single-risk model where the suits are terminated by competing risks (or types) of termination.

$$h^c(t) = \exp(-\beta' X) h_0(t) \quad \text{where} \quad c \in S, A \quad (5)$$

$X$  refers to the exogenous determinants influencing the hazard rates. It reflects the legal strategies the plaintiff and the defendant use to solve the dispute as well as the general characteristics of the patent involved.

Similar to Somaya (2005) and Kessler (1996) I apply this approach to avoid the determination of a time dependency of the hazard function up front. I can take into account the possibility that the baseline hazard rate may have a non-monotonic distribution with decreasing and then increasing time dependency or vice versa.<sup>13</sup> 12 Empirical findings on suit duration in civil law

---

<sup>13</sup>(In her model of strategic bargaining Spier (1992) predicts a U-shaped distribution with decreasing and then increasing time dependency of the hazard function in pre-trial negotiations.

are mixed as far as the distribution of the hazard rate is concerned.<sup>14</sup> I estimate baseline hazard function for each type of termination by stratifying the sample type of trial used - normal suit or request for preliminary injunction. In order to account for time varying variables such as annulment suits and time of suspension I report robust standard errors which are calculated using the variance-covariance estimator of Lin and Wei (1989). Since the sample includes only cases which were completed at the time of data collection (End of 1999 until Spring 2000) I introduce a downward finite sampling horizon bias.<sup>15</sup>

## 4.2 Estimation Results

The baseline hazards are displayed in figure 1. I applied a Kaplan-Meier estimator for the calculation according to the model in equation 5. All hazards reveal nonlinear patterns for settlement and adjudication. The overall hazard function for both types of suit termination (Graph A) appears differently from the separated hazards for settlement and court adjudication (Graph B). Settlement hazards do not vary much over time but drop sharply after about 5 years.

The hazard functions of suit termination by settlement and adjudication are deviating considerably between Düsseldorf (Graph C) and Mannheim (Graph D). In Düsseldorf the hazard function of adjudication is always below the settlement hazard function. . Cases in Düsseldorf always have a higher hazard of being terminated by settlement than by adjudication. The hazards in both cases increase up to a duration of about 4 years for settlement and 5 years for adjudication. After a duration of 5 years the hazards decrease while suits are subject to a greater hazard of termination by adjudication. This pattern suggests that there might be an adjudication limit which forces the court to decide on unfinished cases after a duration of more than 5 years.

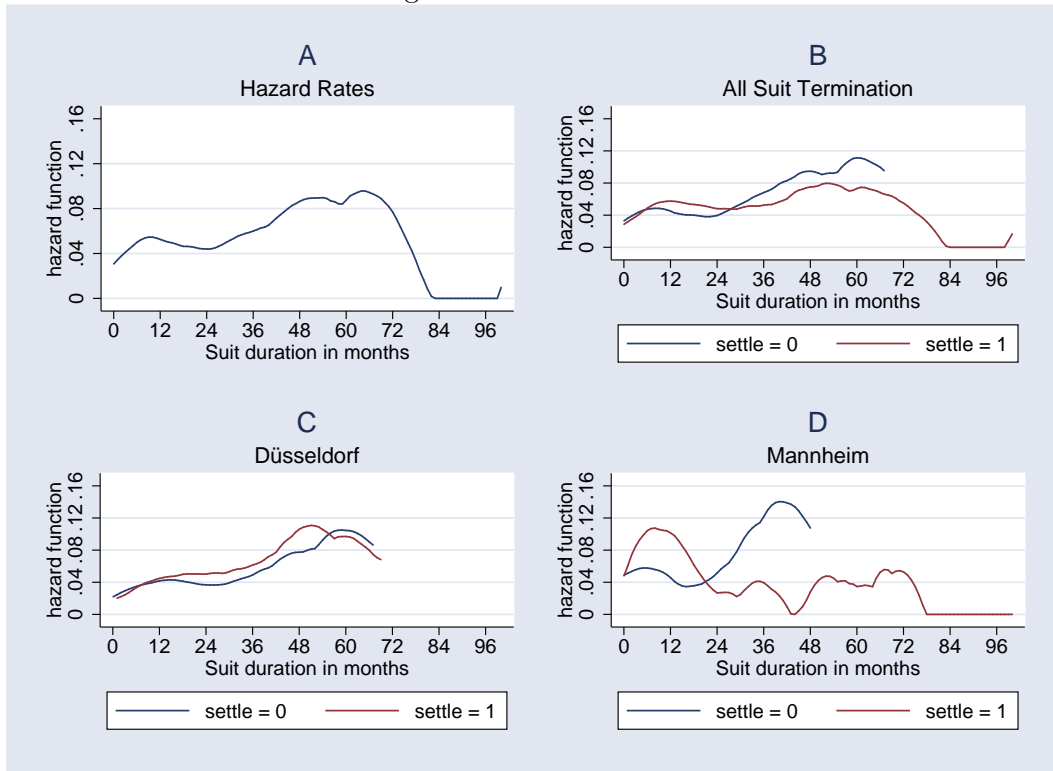
In Mannheim the hazard rate for settlement is higher than in Düsseldorf up to a duration of 2 years while it increases within the first year of suit duration only to decrease sharply thereafter. If the suit lasts longer than two years, the settlement hazard in Mannheim does not fit any particular pattern. Adjudication hazards increase and then decrease again after 3 years. The

---

<sup>14</sup>Fenn and Rickman (1999) found a monotonically increasing baseline hazard in their analysis of clinical negligence and employee claims while Kessler (1996) reports a declining baseline hazard in a study of the settlement of automobile bodily injury insurance claims.

<sup>15</sup>The share of unfinished suits is estimated by the judges at somewhat under 2 per cent. Following Scherer and Harhoff (2000) who stress the general skewed distribution of value parameters in the universe of patents, I presume that long lasting suits may involve very specific patents. However, evidence was not provided within the case documents because of confidentiality.

Figure 1: Baseline Hazard Functions



results for Düsseldorf suits mainly confirm the prediction of the model. Settlement hazards increase over time. The adjudication hazards follow this course at a lag of a few months. The settlement hazards in Mannheim have completely different characteristics. These differences are probably due to differences in the oral hearing systems in Mannheim and Düsseldorf.

Table 3 shows estimated covariate effects for settlement termination and adjudication. I tested two model specifications. In the first model I included only the variables which explain the active efforts of the parties and the court discrimination variable. In the second model I tested legal activities together with patent and party characteristics as control variables.

In the first model (Model 1) I estimate the hazard rates of termination by settlement and by adjudication corresponding to the hypotheses in sections 2.1 and 2.3. I assume that the duration of a trial is driven by the efforts parties invest in enforcing the intellectual property right or determining infringing actions. The AMOUNT\_IN\_DISPUTE is the value the court attaches to the patent under dispute. I only find an effect on the settlement or on the adjudication type of termination when I control for the patent and patentee characteristics (Model 2). Settlement is prolonged by a higher AMOUNT\_IN\_DISPUTE. This result confirms hypothesis 1. The hazard rate for adjudication is larger than one and thus indicates that court decisions are reached more quickly if the value of the patent involved appears to be high and the costs involved in the suit are higher.

Table 3: Hazard Rate Model Estimates by Kind of Suit Termination

	Model 1		Model 2	
	Settlement	Adjudication	Settlement	Adjudication
AMOUNT_IN_DISPUTE <sup>1</sup>	0.967 (0.026)	1.056 (0.041)	0.931* (0.036)	1.091** (0.047)
LIT_CLAIMS	0.892** (0.050)	1.021 (0.071)	0.923 (0.065)	0.996 (0.077)
EXPERTISE	0.399*** (0.097)	0.926 (0.230)	0.338*** (0.083)	1.137 (0.326)
DUMMY_STAY	0.554*** (0.127)	0.323*** (0.109)	0.476*** (0.111)	0.315*** (0.106)
DUMMY_NULLITY	0.988 (0.192)	0.632* (0.165)	0.943 (0.186)	0.621* (0.178)
DUMMY_HEARING	0.496* * * (0.121)	0.406*** (0.113)	0.501** (0.144)	0.317*** (0.090)
DÜSSELDORF	1.096 (0.204)	0.547*** (0.111)	0.875 (0.212)	0.628* (0.158)
OPPOSITION			0.807 (0.191)	0.535* (0.189)
OPP <sub>x</sub> MA			0.277** (0.159)	1.839 (0.866)
CLAIMS			0.998 (0.010)	0.957** (0.018)
REFERENCES			0.992 (0.025)	1.032 (0.026)
CITATIONS			0.978 (0.016)	1.010 (0.012)
FAMILY_SIZE			0.944** (0.024)	1.013 (0.024)
PATENT_AGE			0.991 (0.028)	0.977 (0.030)
PORTFOLIO_RATIO			0.999 (0.013)	1.003 (0.014)
PORTFOLIO_PL			1.011 (0.044)	1.069 (0.048)
PORTFOLIO_DF			1.002 (0.045)	0.902** (0.043)
INDIVIDUAL			0.982 (0.199)	1.333 (0.301)
<b>Wald-statistic (<math>\chi^2</math>(degrees of freedom))</b>				
Ownership Indicator	–	–	1.55(2)	1.80(2)
Relative Ownership	–	–	7.52(3)*	4.60(3)
Observations	306	306	306	306
log Likelihood	–743.29	–525.95	–723.64	–512.36

**Notes:** The Table shows the estimation results of the Cox proportional hazard-rate models. The reference suit is a case filed by a German company against a German company. \*, \*\*, \*\*\* indicate that the parameter is significantly different from zero at the 10%, 5%, 1% significance level. Robust standard errors in parentheses.

The number of litigation claims filed at the beginning of the suit (LIT\_CLAIMS) is an indicator of the severity of the potential infringement. The coefficient of LIT\_CLAIMS is less than one and significant at the 5 per cent significance level. This is in line with hypothesis 2. However this effect vanishes if the control variables for patent and litigant characteristics are included. Requesting an expert opinion (EXPERTISE) has a large and significant negative impact on the hazard ratio in the settlement equation. The information revealed by the expert's report resets the information basis and probably discloses the type of infringement and the strength of the patent. As hypothesis 3 states, termination by settlement is delayed by requesting an expert's opinion. As expected, no effect on the adjudication hazard is observed.

The indicator variable DÜSSELDORF is coded one if the suit was filed at the Düsseldorf District Court and zero if it was filed in Mannheim. In the adjudication equation of Model 1 for DÜSSELDORF the coefficient is smaller than one which tells us that the hazard rate of adjudicated trials is lower in Düsseldorf compared to Mannheim. This is in line with hypotheses H4. The coefficient of DÜSSELDORF represents the differences between the personalities of the judges and their experience and capability of interpreting the law. Applying Model 1 I find no effect for DÜSSELDORF in the settlement equation. The duration of an adjudicated suit is significantly slowed down by the fact that it is filed in Düsseldorf. Contrary to the results displayed in figure 1, Graph C and D, I do not find the difference in the hazard function in the pattern between Mannheim in Düsseldorf to be significantly different.<sup>16</sup>

Variables which describe legal means which are used during trial and which directly influence the course of the case are the filing an annulment suit (DUMMY\_NULLITY), a request for a suspension after filing an annulment suit (DUMMY\_STAY), and the holding of a hearing (DUMMY\_HEARING). These are tested to ascertain whether they influence both types of patent suit termination. In cases where a hearing is conducted the coefficients are significantly smaller than one, which indicates a lower hazard rate. A filed annulment suit has no effect on the hazard rates of the settlement equation, either in Model 1 or in Model 2. However, adjudication is delayed by an annulment suit which is indicated by a lower hazard rate. The effect remains weakly significant over the two model specifications. The fact that the defendant applies for a suspension of the litigation suit while the annulment case is pending lowers the hazard rate significantly for both types of termination however. This is straightforward because the suspension time adds directly to the duration of the suit.

In columns three and four of table 3 I control for several patent and party characteristics (Model 2). Whether a patent has been involved into an opposition procedure (OPPOSITION) leads to a decrease in the hazard rate for adjudication termination. . Even though the effect

---

<sup>16</sup>The specification of the Cox proportional hazard model leads to different results compared to the Kaplan-Meier estimator when considering other covariates.

is only weakly significant, it may indicate that primary questionable patents are either more important and therefore worth fighting for or that the scope of the patent is still not defined conclusively. Both arguments lead c.p. to longer adjudication delays. I can only show an effect of prior opposition for the Mannheim District court suits. Case evidence strongly supports in-court settlements at the Mannheim District Court. This is in line with a higher in-court settlement rate in Mannheim.<sup>17</sup> In cases in which prior legal steps have been taken, such as opposition, these settlements are harder to achieve in Mannheim, even though the settlement hazard does not significantly differ between the District Courts. The coefficient of the number of claims (CLAIMS) is significant lower than one in the adjudication equation. Although more patent claims define the scope of the patent more precisely, they make it more complicated to produce evidence and may end up delaying court decision. This confirms the result that a large number of litigation claims do not delay the decision of the judge because he is more familiar with them compared to the patent claims. Patent claims are different for each patent and cause more specific attention of the judge.

The length of settlement negotiations during trial is not strongly affected by the patent value. Only the number of jurisdictions where the patent was applied for (FAMILY\_SIZE) has a significant negative impact on the hazard rate of settlement termination. While the number of references made to prior patents (REFERENCES) or received by subsequent patent application at the German or European Patent Office (CITATIONS) are strong indicators for patent value, they do not show significant coefficients for the hazard rates in either kind of suit termination. This result differs from the findings of Somaya (2005) who reports a smaller hazard rate for citation in the settlement equation. Neither do I find any evidence that the portfolio size ratio has an impact on the hazard rates in the settlement equation. However, for adjudication the portfolio size of the defendant (PORTFOLIO\_DF) reveals a coefficient smaller than one indicating that the hazard rate for adjudication is smaller for those defendants compared to the baseline hazard. This is a surprising result bearing in mind that portfolio size is often interpreted as technological strength linked to bargaining power.<sup>18</sup> This bargaining power is mainly brought to bear in settlement negotiations. However, at this very last stage of negotiations in court parties may fail to settle more often in cases where the defendant has a large portfolio size and thus adjudication will close the suit, but very late. Summing up, the competing risk analysis reveals that the links of patent characteristics to the suit termination by settlement differ from those to the adjudication termination. These differences reflect different underlying decision rules.

---

<sup>17</sup>See Table ?? in section ??.

<sup>18</sup>See Lanjouw and Schankerman (2001, 2003, 2004) and related studies.

## 5 Conclusion

In this paper I analyze the determinants of patent suit termination in the two District Courts of Mannheim and Düsseldorf. While the theoretical literature mainly concentrates on the duration of negotiations which are terminated by settlement I distinguish between suit termination by mutual settlement agreements and court adjudication. This paper complements and expands related work by Somaya (2005) for U.S. data on patent litigation suits and Fenn and Rickman (1999) on health care negligence suits. I included information on the litigation claims and the means used by the parties to solve or delay the termination of the suit which are particular for the German system. I found significant differences in the determinants between the factors influencing the delay of court adjudication and settlement.

The hazard rate for the settlement hazard decreases with the complexity of the case. As for adjudication termination, neither a large number of filed litigation claims nor a request for expert's reports significantly delays the duration of the case. Only direct means of delay such as a suspension of the suit after filing an annulment case reduce the hazard rate for both types of patent suit closures. Adjudication hazard is found to be generally lower in cases where an opposition procedure has been filed prior to the litigation suit. Questionable patents remain questionable in the long run or attract greater interest from potential imitators. However, settlement hazards are only lower for cases in Mannheim which faced a prior opposition.

The amount in dispute is defined by the court and indicates, on the one hand the expected value of the patent and, on the other hand, the legal costs related to this value. These two types of termination have opposite effects on the hazards. While hazards are lower for settlement the hazards for adjudication increase with the amount in court. This result indicates that higher costs speed up adjudication. If settlement is reached, the costs are divided beneficially for both parties and not simply borne by the defeated party.

Delayed suit termination increases the costs of plaintiffs disproportionately to the increased benefits they enjoy. This and increased public cost are socially harmful. It has not been unambiguously proven, however, that policies introduced to reduce the duration of suits lead to a socially beneficial result. As Priest (1989) and Posner (1972) argue along with Spurr (2000) (1997, 2000), who empirically tested for medical malpractice trials in the U.S., delay reduction programs reduce the time of suit termination in the short run but lead to an increase in the number of cases filed. Assuming no change in the infringement rates, more cheap suits would be filed.

One limitation of the analysis is the short time period to which available data relates. Court congestion and cases with the same patents certainly have an impact on the length of patent suits. I have not discussed whether a settlement agreement is socially beneficial. Settlement agreement

may lead to a license contract and subsequently to collusive behavior. The consequences are not welfare enhancing as long as there is no anti-trust policy incorporated ((Shapiro 2003)). This is even exaggerated by very long trials. Furthermore, the static view of the social effects of a delay of court decisions clearly shows that the social effects of long trials are negative in terms of the court costs borne by the public purse and in terms of the uncertainty of trial outcomes. In "a more than one period world" the demand for cases would decrease because the plaintiff's private litigation costs would increase with the court delay. The assumption that the two types of suit termination are independent is crucial for the competing risk analysis. However, introducing adjudication deadlines into the model may violate this assumption. Taking this problem of correlation of hazards into account will be the subject of future research.

## References

- Admati, A. and Perry, M. (1987). Strategic Delay in Bargaining., *Review of Economic Studies* 54, 345–364.
- Bebchuk, L. A. (1984). Litigation and Settlement Under Imperfect Information, *RAND Journal of Economics* 15(3), 405–415.
- Carpentier, X. (2004). Efficient Delays in Patent Right Enforcement: Sequential Innovations and the Doctrine of Laches, *Discussion paper*, FDPE, Helsinki School of Economics.
- Cox, D. (1972). Regression Models and Life Tables (with discussion), *Journal of the Royal Statistical Society B* 34, 187–220.
- Cremers, K. (2004). Determinants of Patent Litigation in Germany, *Technical Report Discussion paper 04-72*, ZEW.
- Danzon, P. and Lillard, L. (1983). Settlement Out of Court. The Disposition of Medical Malpractice Claims, *Journal of Legal Studies* 12, 345–377.
- Daughety, A. F. and Reinganum, J. F. (2004). Economic Theories of Settlement Bargaining, *Department of Economics, Vanderbilt University, Working Papers* .
- Djankov, S., L. P. R. L.-d.-S. F. and Schleifer, A. (2003). Courts, *Quarterly Journal of Economics* 118(2), 453–517.
- Fenn, P. and Rickman, N. (1999). Delay and Settlement in Litigation , *The Economic Journal* 109, 476–491.
- Hall, B. H., Jaffe, A. B. and Trajtenberg, M. (2000). Market Value and Patent Citations: A First Look, *Working Paper No. 7741*, National Bureau of Economic Research (NBER), Cambridge, MA.
- Hughes, J. W. and Savoca, E. (1999). Accounting for Censoring in Duration Data: An Application to Estimating the Effect of Legal Reforms on the Duration of Medical Malpractice Disputes, *Journal of Applied Statistics* 26(2), 219–228.
- Hughes, J. W. and Snyder, E. A. (1989). Policy Analysis of Medical Malpractice Reforms: What Can We Learn from Claims Data?, *Journal of Business & Economic Statistics* 7(4), 423–431.
- Kesan, J. and Ball, G. (2005). How are patent cases are resolved? An empirical examination of the adjudication and settlement of patent disputes, *Technical Report LE 05-027*, University of Illinois, College of Law.

- Kessler, D. (1996). Institutional Causes of Delay in the Settlement of Legal Disputes, *Journal of Law, Economics and Organization* 12(2), 432–460.
- Landes, W. and Posner, R. (1975). The Independent Judiciary in an Interest-Group Perspective, *Journal of Law and Economics* 18, 875–901.
- Lanjouw, J. O. and Lerner, J. (2001). Tilting the Table? The Use of Preliminary Injunctions, *Journal of Law and Economics* XLIV, 573–603.
- Lanjouw, J. O. and Schankerman, M. (2001). Characteristics of Patent Litigation: A Window on Competition, *RAND Journal of Economics* 32, 129–151.
- Lanjouw, J. O. and Schankerman, M. (2004). Protecting Intellectual Property Rights: Are Small Firms Handicapped?, *Journal of Law and Economics* XLVII, 45–74.
- Levy, G. (2005). Careerist Judges and the Appeals Process, *RAND Journal of Economics* 36(2).
- Lin, D. and Wei, L. (1989). The robust inference for the Cox proportional hazard model., *Journal of the American Statistical Association* 84, 1074–1078.
- Menell, P. and Scotchmer, S. (2005). Intellectual Property, *in*: Polinsky, M. and Shavell, S. (eds), *Handbook of Law & Economics*, Amsterdam: Elsevier.
- Miceli, T. and Coşgel, M. (1994). Reputation and Judicial Decision Making, *The Journal of Economic Behavior and Organization* 23(2), 31–51.
- Nalebuff, B. (1987). Credible Pretrial Negotiation, *RAND Journal of Economics* 18(2), 198–210.
- Nerkar A., Khaire, M. and Paruchuri, S. (2004). Business Method Patents as Real Options: Value and Disclosure as Drivers of Litigation, *Working paper*, Columbia University.
- P’ng, I. P. L. (1983). Strategic Behavior in Suit, Settlement and Trial, *Bell Journal of Economics* 14(2), 539–550.
- Posner, R. (1972). An Economic Approach to Legal Procedure and Judicial Administration, *Journal of Legal Studies* 2, 399–.
- Priest, G. L. (1989). Private Litigants and the Court Congestion Problem, *Boston University Law Review* 69, 527–559.
- Salzberger, E. M. (1993). A Positive Analysis of the Doctrine of Separation of Powers, or: Why Do We Have an Independent Judiciary?, *International Review of Law and Economics* 13, 350–352.

- Schankerman, M. and Scotchmer, S. (2001). Damages and Injunctions in Protecting Intellectual Property, *RAND Journal of Economics* 32, 199–200.
- Scherer, F. and Harhoff, D. (2000). Technology policy for a world of skew-distributed outcomes, *Research Policy* 29, 559–566.
- Scotchmer, S. (2005). *Innovation and Incentives*, MIT Press, Cambridge, MA.
- Shapiro, C. (2003). Antitrust Limits to Patent Settlements, *RAND Journal of Economics* 34(2), 391–411.
- Shavell, S. (2004). *Foundations of the Economic Analysis of Law*, Belknap Harvard University Press.
- Somaya, D. (2005). Patent Strategy, and its Impact on the Method and Timing of Patent Suit Termination, *Working paper*, University of Maryland, Robert H. Smith School of Business.
- Spier, K. E. (1992). The Dynamics of Pretrial Negotiation, *Review of Economic Studies* 51, 93–108.
- Spurr, S. J. (1997). The Duration Litigation, *Law & Policy* 19(3), 285–315.
- Spurr, S. J. (2000). The Duration of Personal Injury Litigation, *Research in Law and Economics* 19, 223–246.
- Stauder, D. (1989). *Patent- und Gebrauchsmusterverletzungsverfahren in der Bundesrepublik Deutschland, Großbritannien, Frankreich und Italien. Eine rechtstatsächliche Untersuchung*, Schriftenreihe zum gewerblichen Rechtsschutz, Carl Heymanns Verlag, Köln.
- Vereeck, L. and Mühl, M. (2000). An Economic Theory of Court Delay, *European Journal of Law and Economics* 10(3), 243–268.

# Appendix

## Data on Patent Litigation in Germany

### 5.1 Court data collection

For the empirical analysis of patent litigation cases, I used a database extracted from files contained in court archives. In Germany computerized data are not available, neither on litigation in general nor on patent litigation in particular. All large district courts with specialized chambers for IPR suits<sup>19</sup> were solicited for access to their archives. Two of the three most important district courts –Duesseldorf and Mannheim– agreed to give access to their written case records. Stauder (1989) found that more than 60 percent of patent and utility cases are finished within their second year and 95% after six years. Around one year is necessary for the court of first instance. Since the archives contain only records of finished cases, I chose the filing years 1993-1995 at the courts. These filing cohorts are not so far removed chronologically as to prevent the matching of comprehensive information about the parties with information from other databases.<sup>20</sup> Virtually all cases filed during this period of time are included within the data set. In Mannheim data collection lasted from May to July in 1999; in Düsseldorf it lasted from October 1999 to February 2000.

Even though the chambers at the district courts are specialized, they bear a wide range of different legal arguments: disputes over general contracts, license suits, and IPR cases including patents, utility patents, copyrights, and trademarks. For IPR cases, infringement is just one topic of legal disputes; all kinds of contract issues must be decided on. Therefore, it was necessary to identify the patent and utility infringement cases among all cases filed at those chambers. For the purpose of this research, I chose the legal rights of patents and utility patents because they are relatively strong compared to trademarks and copyrights and they identify technological inventions based on R&D efforts. The procedures for legal disputes on infringement are very similar for both types of property right. The subject line on the front page of the files served as the main indicator: I searched for words and phrases such as “patent,” “patent infringement,” “utility patent,” “injunction,” “preliminary injunction,” “presentation of accounts,” “license agreement,” and “employee invention.” The first screening revealed about 950 cases of infringement. A second screening, reading the statement of claim and the defendant’s answers were read, disclosed whether the subject matter was really an infringing action. I kept only clear cases of patent and utility infringement. For the analysis, I included both requests for preliminary injunction and regular filings in the investigation. I discarded all suits regarding

---

<sup>19</sup>Mannheim, Düsseldorf, Munich, Frankfurt

<sup>20</sup>A cohort contains patents with the same year of application.

disputes over license contracts, legal arguments about compensation for employees' inventions, and other cases with involving patents and utility patents but evincing no infringement. After the second screening 715 infringement cases were left within the sample. By definition of jurisdictional responsibility, challenge suits are not treated at the district courts. However, there are suits dealing with license disputes where patent claims and license contracts are in question, suits dealing with unauthorized warnings against infringers who actually have not infringed, and suits dealing with advertising with patent rights which are not actually covered by patent claims. These types are similar to challenge suits but are heard by the civil courts; for this reason I retained them within the data set. For the third step of the detailed investigation, 715 cases of pure patent or utility litigation had to be screened meticulously. The correspondence of the parties, including the statement of claims and the response of the defendant, was checked. This process yielded information about the requested claims and the arguments of the parties. The court decisions and rulings revealed the outcome and the costs of the cases.

The information extracted from the written case files was divided into three main categories: the proceedings of the suit, the parties, and the patent at issue. The first category covers a brief description of the stages of the infringement case. It includes the dates of the filing, the oral hearing, and the ruling. Almost all case files reported the outcomes, including the outcomes of any first and second appeals. Cost figures were also collected, with paid damages added to the costs. The second category covers the names and the locations of the parties involved in the trials. At least one party was located within the jurisdiction of the court. The third category covers information on the patents involved, such as the age of the patent at time of filing as well as the field of technology (IPC).

The degree of detail about the patents kept in the court records differs between the two courts. In Mannheim, the records normally include the patent document or disclosure as well as witnesses' documents and experts reports. At the District Court in Düsseldorf, only the statement of claim, the subsequent correspondence between the parties and the court, and the judgement of the court are kept in the permanent files. I divided the information extracted from the written case files into three main categories: the proceedings of the suit, the parties, and the patent at issue. In order to complete the information about the patents involved in the disputes, data from PATDPA, which is an official database of the German Patent Office (DPA) and one of the EPO's databases, EPOLINE, were added.<sup>21</sup>

---

<sup>21</sup>As mentioned above, the records of the Regional Court in Mannheim normally include documents providing information about the patent, such as the name of the applicant, IPC classification, dates of application, granting, publishing, and so on. For the Düsseldorf records, the statement of claims contains most of this information, but the records are often incomplete in this regard. A patent number, either issued by the EPO or the DPA, was accessible in 95% of the suits. In cases where patent numbers could be matched, the information was updated using the PATDPA or EPOLINE databases.

## 5.2 Publicly available data

In order to complete the information about the patents involved in the disputes, data from the German Patent Office (DPA) and the European Patent Office (EPO) were added. Information on application dates, granting dates, IPC classifications, and the applicants and inventors are available from the databases PATDPA and EPOLINE. PATDPA is the database of the German Patent Office and lists all patent applications with all of the information included in the patent document. Additionally, all bibliographic data, such as fee payments, oppositions and their results, changes of patentee, and lapsing of the patent in the public domain are viewable in this file. PATDPA contains around 2.5 million patents and utility patents. It covers patent data from 1976 to 1998. Beginning in 1978, the electronic form contains reliable information on patents and utilities. However, the information on the renewal data is not complete. A similar database, ELPAC, is available at the European Patent office. It includes all patent applications submitted to the EPO with roughly the same variables, encompassing 1.2 million patent applications since 1978. The important information about backward and forward citations was extracted via a comprehensive search of the databases.<sup>22</sup>

As mentioned above, the records of the Regional Court in Mannheim normally include documents providing information about the patent, such as the name of the applicant, IPC classification, dates of application, granting, and publishing, and so on. For the Düsseldorf records, the statement of claims contains most of this information, but the records are often incomplete in this regard. A patent number, either issued by the EPO or the DPA, was accessible in 95% of the suits. In cases where patent numbers could be matched, the information was updated by using the PATDPA or ELPAC databases.<sup>23</sup>

Since an official business register does not exist for Germany, I added the complementary information on corporations using the database of the leading German credit rating agency, the Verband der Vereine für Creditreform (Creditreform data) in Neuss. Merging these data with the litigation data affords a more detailed picture of the corporations involved. Industry codes according to the European NACE classification were added as well as firm size, measured by number of employees.

---

<sup>22</sup>A detailed description of the creation of the citation data file and the correction for truncation is given by Hall et al. (2000).

<sup>23</sup>The concomitance of the European and German system and their interdependence is fact to be considered in the variable definition especially creating citation data.

### 5.3 Creation of the control group

For an investigation of the differences between patents litigated and those not, it is necessary to create a control group of patents. Therefore I have selected an appropriate data set from the population of all German patents and European patents granted between 1978 and 1995.<sup>24</sup> I have stratified the control group by the year of application and the main IPC classification at the four-digit level. For each patent in the group of litigated patents, one matched patent was drawn randomly from the universe of German and European patents. When randomly chosen patents are used as the control group, matched patents consists of those that were not subject to a legal litigation suit. There is still a possibility that a patent chosen for the control group was subject to an earlier or later dispute or to a dispute at one of the other nine district courts, but it is fairly small (about one percent) and can be disregarded. I could not find comprehensive data in the database for patents in the litigated group which had application dates prior to 1978. To ensure a one-to-one match, I excluded those patents from the investigation group. Finally, the sample of litigated patents contains 824 patents with application dates from 1978 to 1993. Finally, the reference group of non-litigated patents consists of 824 patents. All relevant variables including citation data and information on patentees and technology fields are included for these patents.

---

<sup>24</sup>Since all European patents granted in Germany are encompassed in PATDPA, I have drawn the matched patents solely from the PATDPA; some additional information, however, came from other data bases such as ELPAC and EPOLINE.