

Invalid but Infringed? An Analysis of Germany's Bifurcated Patent Litigation System*

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ABSTRACT

We analyze the impact of bifurcation in Germany's patent litigation system where infringement and validity of a patent are decided independently by different courts. This creates situations in which a patent is held infringed that is subsequently invalidated. Our conservative estimates indicate that 12% of infringement cases in which the patent's validity is challenged produce such 'invalid but infringed' decisions. We show that having to challenge a patent's validity in separate court proceedings means that more resource-constrained alleged infringers are less likely to do so. We also find that firms that were found to infringe an invalid patent react by filing more oppositions immediately after the infringed patent is invalidated.

KEYWORDS: Litigation, innovation, patents, bifurcation, Germany

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1 Introduction

Patents are probabilistic property rights: there is inherent uncertainty regarding a patent's validity and scope (Lemley and Shapiro, 2005). Although patents are granted by patent offices only after undergoing substantive examination, there is no guarantee that a granted patent is in fact valid.¹ In most legal systems, such as the U.S. or UK, infringement and invalidity of a patent are decided simultaneously where infringement is only possible if the patent is upheld in the same proceedings.² In a bifurcated legal system such as in Germany, in contrast, separate courts decide on infringement and validity independently from one another. In practice, the infringement action is often decided and enforced before validity has been determined. In other words, in a bifurcated system, infringement is often decided under the presumption that a granted patent is indeed valid. But because patents are probabilistic rights, this can lead to situations in which a patent is held infringed that is eventually invalidated. Our objective is to explore implications of the probabilistic nature of patents for the optimal design of patent enforcement systems. More specifically, we analyze whether bifurcation produces legal uncertainty by holding invalid patents infringed and explore potential implications of this uncertainty.

In Germany, jurisdiction for patent infringement lies with twelve regional courts, while patent validity is decided solely by the patent offices (European Patent Office – EPO – or German Patent and Trademark Office – DPMA) during the opposition phase, or by the German Federal Patent Court (BPatG). Commonly, claims for invalidity are filed in response to the alleged infringement of a patent which means the invalidity action at the BPatG usually follows the action for infringement. Deciding on the issue of infringement, German courts presume validity of a patent and in most cases proceed with a decision on infringement regardless of a pending invalidity challenge.³ This means a patent may be found infringed and hence an injunction granted – that is often preliminary, yet fully enforceable – before the validity of the patent has been determined. The duration of this so-called ‘injunction gap’ can be considerable. This can produce a paradoxical situation in which a patent can be legally enforced although it is subsequently invalidated.

Table 1 lists a number of cases that have received attention in the media as the patents in dispute were held infringed but later invalidated by the BPatG or the EPO.⁴ A patent dispute between HTC and IPCom provides an example of a patent (EP1186189) that was found infringed in first instance, but subsequently revoked by the BPatG. IPCom was granted a preliminary injunction against HTC in early 2009, which would have forced HTC to stop selling its 3G mobile phones in Germany. HTC appealed against the injunction and in late 2010, the BPatG revoked IPCom's patent. Another recent example of a decision on infringement while the decision on validity was still pending is the injunction forcing Apple to de-activate its email push service in its iOS handhelds in Germany (EP0847654).⁵ These cases are not

¹Mann and Underweiser (2012) for example show that the U.S. Federal Circuit has held nearly 60% of patents considered since 2003 invalid.

²This assumes that the alleged infringer raises invalidity as a defense, which is common practice in these legal systems (see Cremers et al. (2013) for evidence on the UK).

³German courts stay infringement proceedings pending an invalidity proceeding only if there is strong reason to believe the validity challenge will be successful (see Section 2).

⁴Table A-4 in the Appendix provides more examples.

⁵On appeal, however, the Higher Regional Court Karlsruhe decided to stay the proceeding until a decision in the parallel revocation proceeding becomes available.

confined to disputes between large players in the much-cited ‘smartphone patent wars.’ For example, there is the case between Dr. Johannes Heidenhain GmbH and iC-Haus GmbH, a medium-sized German company, at the Regional Court Düsseldorf. Disregarding a pending opposition of a European patent (EP1168120) at the EPO, the court found the patent infringed in December 2007 and ordered iC-Haus GmbH to disclose sensitive business and financial information. The EPO invalidated the patent in March 2013.

We collect detailed case-level data from German courts to construct a comprehensive, novel dataset on infringement and invalidity proceedings for 2000-2008. We use the data to quantify the extent of divergent decisions beyond the anecdotal level and to show that bifurcation has the following effects:

First, bifurcation reduces the likelihood that an alleged infringer challenges a patent’s validity. Because challenging the validity of a patent requires a separate action, firms may refrain from doing so despite the potential invalidity of a patent. This may be the case especially for resource-constrained firms, which we can test empirically. The implications of this ‘screening effect’ are twofold: on the one hand the share of cases where an infringed patent is invalidated is downward biased, on the other the strong presumption of validity that is built into the bifurcated enforcement system becomes self-reinforcing.

Second, the possibility of infringing a patent despite its eventual invalidation and a lower likelihood of facing a counterclaim for invalidation favor disproportionately the patentee suing for infringement. If patents serve as an incentive mechanism to encourage investments in innovation, such strong rights to enforce a patent against alleged infringers may be even socially desirable. However, bifurcation can also create uncertainty. The main argument is that the likelihood to be found to infringe an invalid patent is higher in a bifurcated system than in a system where validity and infringement are assessed in the same proceedings. While the time lag between the decisions on infringement and validity in itself creates uncertainty for firms, more fundamentally, the increased likelihood of being found to infringe an invalid patent creates additional uncertainty for firms when navigating the patent landscape. Potentially, this could have important effects on the innovative activity as well as patenting behavior of firms and their performance. For example, firms that have fallen into the injunction gap might adapt their assessment of the likelihood of facing an injunction despite the invalidity of allegedly infringed patents. Such changes in perceptions are obviously unobservable to us.⁶ However, we can test whether they manifest themselves in changes in firms’ opposition behavior. That is, we test whether firms that have been found to infringe a patent that is later invalidated oppose more patents immediately following this experience.

Our empirical analysis confirms the anecdotal evidence – bifurcation creates ‘invalid but infringed’ situations in which a court finds infringement of a patent that is subsequently invalidated. We find that 12% of infringement cases with parallel invalidity proceedings produce such divergent decisions. In a total of 142 cases, patents were held infringed that were (partially) invalidated. Our analysis also shows that the length of the potential in-

⁶There is, however, anecdotal evidence. For example, in April 2012, Microsoft announced the relocation of its European logistics center from Germany to the Netherlands citing the threat of a possible injunction due to the alleged infringement of a Motorola patent (Various news sources including [Reuters](#), the [Wall Street Journal](#), and the [Financial Times](#), 2 April 2012.) Microsoft appeared to consider the risk of facing an injunction to be considerably higher in Germany than in the Netherlands, presumably because of the bifurcated enforcement system.

Table 1: 'Invalid but Infringed' – anecdotal evidence

#	Infringement Date	Patentee Court	Alleged infringer	Patent	Technology	Invalidation Date	Court
1	30-Apr-02	LG DU Elmag SpA	Hymmen-Hackemack GmbH	DE19700636	Process engineering	25-Apr-02	BPatG
2	13-Feb-07	LG DU Datalogic S.p.A.	Sick AG	EP0851376	Barcode	13-Mar-08	BPatG
3	10-Jul-07	LG DU Dürkopp Adler AG	AMF Reece CR, s.r.o.	DE69019972	Electronics	21-Jan-10	BPatG
4	31-Jul-07	LG DU VistaPrint Technologies Ltd.	unitedprint.com AG	EP0852359	Web-to-print	13-Nov-08	BPatG
5	27-Feb-09	LG MA IPCom GmbH & Co. KG	HTC Corp.	EP1186189	Telecommunication	1-Dec-10	BPatG
6	11-May-10	LG DU austriamicrosystems	Melexis GmbH	EP0916074	Electronics	9-Dec-10	BPatG
7	13-Feb-07	LG DU Pilz GmbH & Co. KG	Sick AG	EP1362269	Electronics	21-Jan-08	EPO
8	11-Dec-07	LG DU Dr. Johannes Heidenhain GmbH	iC-Haus GmbH, Hengstler GmbH	EP1168120	Electronics	14-Sep-10	EPO

junction gap is substantial. In cases where validity was challenged before the BPatG, the infringement decision was on average enforceable for more than a year before the patent was revoked in first instance. In cases in which validity was challenged before the DPMA/EPO, the length of the injunction gap is almost three times as large. This offers clear evidence that the injunction gap is a reality which offers scope for patentees to temporarily enforce invalid patents.

We also find evidence that smaller firms are less likely to file a revocation action at the BPatG when they are sued for infringement. The effect is robust to controlling for various time varying and invariant patent-, litigant-, and case-level characteristics. This suggests that more resource-constrained firms are less likely to challenge a patent's validity. This offers direct evidence on the self-enforcing, strong presumption of validity underlying the bifurcated enforcement system.

Our analysis of the impact of bifurcation on firms' opposition behavior shows that alleged infringers are more likely to file oppositions after they have experienced an injunction gap. We interpret this as evidence that firms attempt to preempt similar situations in the future by eliminating potentially threatening patents early on. This finding is consistent with the fact that German firms are overall responsible for a disproportionately large share of oppositions at the EPO and suggests that this is at least partly a reflection of the uncertainty created by the bifurcated enforcement system.

Our research contributes to the existing literature on the design of patent enforcement systems by offering for the first time quantitative evidence on the implications of bifurcation. This is not only of direct relevance to Germany, where by far the largest number of patent cases in Europe are litigated,⁷ but also plays an important role in the current heated discussion about the design of the Unified Patent Court (UPC) in Europe. For example, a group of large firms across industries, including Adidas, Apple, Deutsche Post DHL, Google, and Samsung,⁸ issued a [joint statement](#) in February 2014 voicing concerns that “[...] the potential exists for a court to order an injunction prohibiting the importation and sale of goods even though the patent may ultimately be found invalid. This result unduly reduces competition, can increase the cost of products in the market and reduce product choices, all negatively impacting consumers.” Apart from its relevance for Germany and the European UPC, our research may provide important lessons also for countries that rely on similar bifurcated enforcement systems, including China, Japan, and Korea. It also informs jurisdictions that currently do not separate infringement and validity decisions. In the U.S., for example, the validity of [roughly a third](#) of litigated patents in 2013 was challenged through an Inter Partes Review (IPR) before the U.S. Patent and Trademark Office.⁹ Because an IPR has to be concluded within one year whereas infringement cases usually drag on a lot longer, one could argue that this has pushed *de facto* the U.S. system towards bifurcation, albeit bifurcation in which validity is decided first.¹⁰ Instituting bifurcation where validity

⁷Cremers et al. (2013) show that depending on how cases are counted (e.g. counting infringement and invalidity cases as separate cases or not) the total number of patent cases in Germany is between 12 and 29 times larger than in the UK.

⁸The complete list is: Adidas, AFDEL, Apple, ARM, BlackBerry, Broadcom, Bull, Cisco Systems, Dell, Deutsche Post DHL, ESIA, Google, HP, Huawei, Microsoft, Samsung, SFIB, Telecom Italia, and Vodafone.

⁹IPR was introduced by the America Invents Act (AIA) in September 2012 as a way of challenging validity administratively post-grant.

¹⁰A party that has challenged a patent's validity through IPR cannot raise the same objections subsequently in court. This creates significant barriers to challenging validity again in court if a patent survives IPR.

is decided first may in fact produce potential benefits of separating invalidity and infringement decisions (see Section 3) while avoiding the problems associated with the German type of bifurcation.

Taking a broader perspective, our evidence underscores the probabilistic nature of patents. We show that patents that are presumed to be valid by a court when deciding on infringement often turn out to be invalid upon closer scrutiny. Patents involved in court disputes are only the tip of the patent iceberg and clearly a non-random selection.¹¹ Regardless, our evidence supports the view that legal rights in form of patents are inherently associated with enormous uncertainty. We also show that bifurcation compounds the undersupply of validity challenges in court that exists in non-bifurcated systems (Farrell and Merges, 2004). This means that the strong presumption of validity of a probabilistic right, which is built into the bifurcated enforcement system, plays out to the patent owner's advantage. This offers empirical evidence relevant for the long-standing, largely theoretical debate on the optimal design of patent enforcement systems (Aoki and Hu, 1999; Ayres and Klemperer, 1999; Crampes and Langinier, 2002; Boyce and Hollis, 2007).

The remainder of this paper is organized as follows: the next section provides a detailed description of the German patent system with particular focus on the interplay of infringement and invalidity proceedings. Section 3 discusses the benefits of a system with a strong, built-in presumption of validity but also the legal discrepancies that it can create which may translate into uncertainty for firms. Section 4 describes the data used in our analysis. Section 5 presents our findings and Section 6 offers some concluding thoughts and suggestions for further research.

2 Germany's Bifurcated Patent System

This section explains the design of the German patent enforcement system with a focus on the legal framework that can lead to divergent decisions in infringement and invalidity proceedings.

2.1 Court System

Regional courts (*Landgerichte* – LG) have jurisdiction over patent infringement.¹² There are twelve regional courts that serve as first instance courts in infringement proceedings.¹³ A panel of three judges decide on infringement. The judges are trained legal professionals that very rarely have any technical training (Ann, 2009). Decisions of the regional courts can be appealed before a higher regional court (*Oberlandesgericht* – OLG). In exceptional cases, a further appeal can be brought before the Patent Division of the German Federal Court of Justice (*Bundesgerichtshof* – BGH) in third instance.

The validity of a patent is challenged through opposition procedures at the patent office that has granted the patent right (European Patent Office – EPO – for EP patents or

¹¹In fact, one might expect these patents to be more likely to be valid than non-litigated patents.

¹²Infringement claims must be based on a patent granted by the DPMA (DE) or the EPO with effect for Germany (EP).

¹³Namely, the Regional Courts Berlin, Braunschweig, Düsseldorf, Erfurt, Frankfurt, Hamburg, Leipzig, Magdeburg, Mannheim, Munich, Nuremberg-Fürth and Saarbrücken. Each regional court has at least one chamber primarily designated to patent cases.

Deutsches Patent- und Markenamt – DPMA – for DE patents) and invalidity proceedings before the German Federal Patent Court (*Bundespatentgericht* – BPatG). The responsibilities of the BPatG are twofold. It serves as the appeals court for decisions of the DPMA concerning DE patent applications, and it hears invalidity actions for DE and EP (with effect for Germany) patents. As a specialized court, the BPatG deploys legally as well as technically trained judges.¹⁴ Appeals to the decisions by the BPatG are directly brought before the Patent Division of the BGH that reviews infringement proceedings. The structure of the German court system is summarized in Figure A-1 in the Appendix.

Infringement

A patentee initiates infringement proceedings by filing an infringement action. The patentee can seek different forms of legal relief; for example, a cease and desist order to halt the infringing act, the recall and destruction of infringing goods, rendering of account to identify distribution channels and calculate damages, or damages for losses suffered (cf. Kühnen (2012)). The patentee can also request a preliminary injunction against the alleged infringer. However in practice, preliminary injunctions are rare because they require clear-cut evidence regarding the infringing act, the validity of the allegedly infringed patent and urgency (Kühnen, 2012).¹⁵

The main oral hearing takes place roughly between five to twelve months after the action was filed. Main oral hearings rarely exceed one day and often last for only a few hours. In case of a parallel invalidity proceeding, the judges may grant the request to stay the proceedings until a decision on the patent's validity is available (see Section 2.2 below). If the infringement action is not stayed, the judges hand down a written judgment usually four to ten weeks after the main oral hearing, which concludes the proceedings in first instance. Alternatively, the litigants may settle at any time during the proceedings. The 'winner' can demand the reimbursement of legal costs from the losing party.¹⁶

In the proceedings, the defendant may dispute the infringement allegations, but the possible invalidity of a patent does not constitute an admissible defense. The alleged infringer has to challenge the patent's validity through a separate opposition or invalidity action.

Invalidity

The alleged infringer may challenge a granted patent through opposition or, subsequently, an invalidity action. An opposition to an EP (DE) patent can be filed at the EPO (DPMA) within the first 9 months (3 months) after grant of the patent. After this period, the alleged infringer may still join pending opposition procedures. It is noteworthy that the EPO and DPMA may continue the opposition proceedings *ex officio* and decide on validity even

¹⁴The panel consists of five judges: three technically trained judges as well as two legally trained judges.

¹⁵An injunction might be granted, for example, if the suspected infringer is about to start selling a product that clearly infringes a patent that is most likely valid and where selling the infringing product would result in substantial losses for the patentee. That said, although there has been a recent increase in the number of preliminary injunctions (Müller-Stoy and Wahl, 2008), they are still a relatively rare occurrence in patent litigation (Böhler, 2011).

¹⁶Legal costs include court fees, attorney-at-law as well as patent attorney fees, and further expenses, such as travel or translation costs. Attorneys may charge their clients significantly higher fees than those eligible for reimbursement, thus legal costs are not always shifted entirely to the losing party.

if the opponent withdraws the opposition. If invalidated, the patent is considered void counting from its grant date.¹⁷ Each litigant usually bears his own costs of the opposition proceedings.

After the end of the opposition phase, or – in case of an opposition – after the end of the opposition proceedings, validity can be challenged only through an invalidity action at the BPatG. Although an invalidity action can be filed by any person or legal entity, almost all revocation actions are filed in response to an infringement action.¹⁸

Unlike in opposition proceedings, the plaintiff has full discretion to withdraw his action at any time. As in the case of oppositions, if the BPatG invalidates a patent, it is invalid since its grant date. Similar to infringement actions, the winning party in the invalidity action can demand the reimbursement of legal costs from the losing party.

2.2 Interaction of Infringement and Invalidity Proceedings

If a patent is invalidated, any pending infringement proceedings based on the patent will be dismissed.¹⁹ This allows for situations where decisions on infringement can be (preliminarily) enforced based on a patent that is subsequently invalidated. The occurrence of such divergent decisions crucially depends on (a) the timing and (b) duration of infringement and invalidity proceedings:

- a) Mostly filed as a defensive reaction to an infringement action, invalidity actions usually start after the corresponding infringement proceedings.²⁰ Figure 3 shows the time lag between the filing of infringement and invalidity actions in our data. We find that more than 55% of parallel invalidity proceedings are initiated at least four months after the infringement proceeding.
- b) Invalidity proceedings take significantly longer than infringement proceedings in first instance (see Figure A-2), thus increasing the temporal spread between the decisions. Taking into account a possible appeal, litigants have to expect a maximum of five to seven years until a final judgment on an invalidity action is handed down. Opposition proceedings also take significantly longer than infringement proceedings. The litigants may request accelerated opposition proceedings, still, the length of an opposition is on average 20 to 30 months.²¹

In combination, a) and b) imply in practice that decisions on invalidity follow infringement decisions with a considerable lag.

The alleged infringer may request to stay the infringement proceedings until a decision on validity is available (see Figure 1). In their decision to grant a stay, the judges of the

¹⁷Note that for EP patents, the decision has effect in all states where the opposed patent is in force.

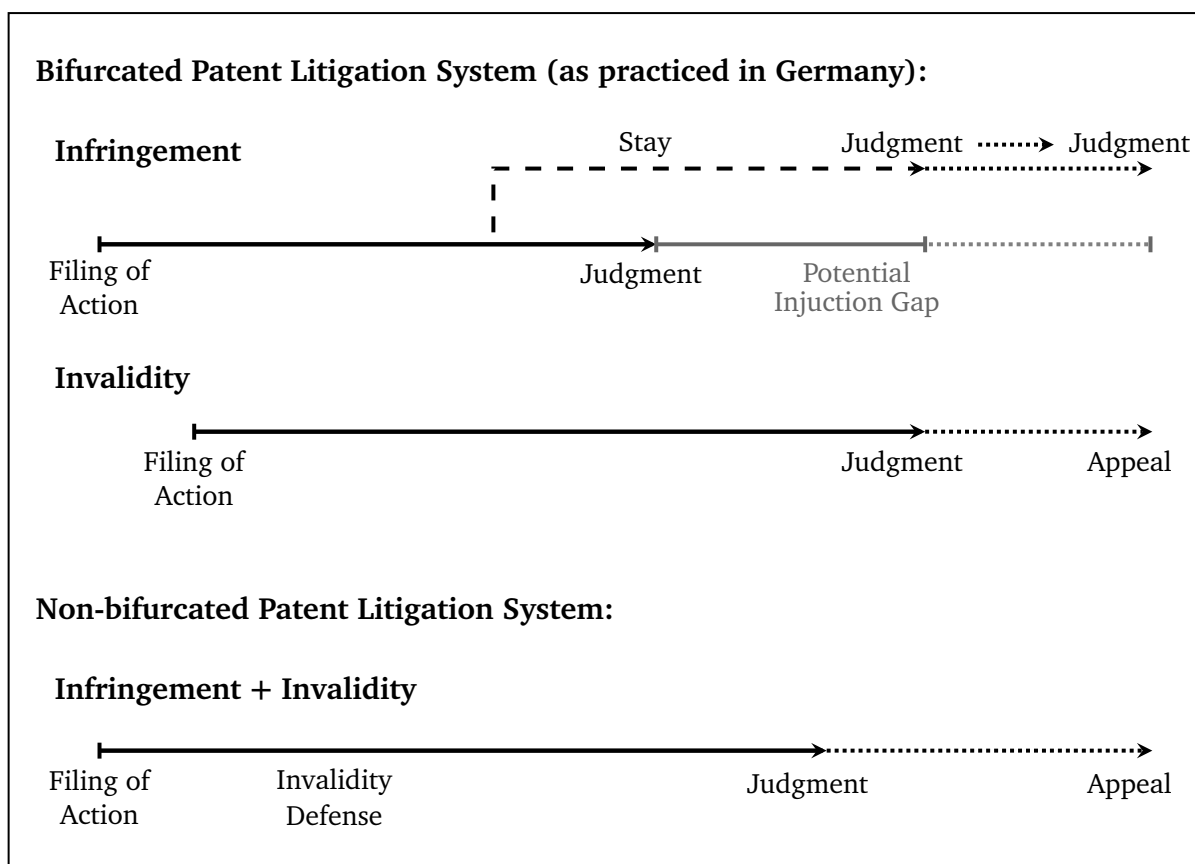
¹⁸von Hees and Braitmayer (2010) estimate that this is the case for 90% of all revocation actions.

¹⁹If the patent is only partly invalid, the subject matter in the pending infringement proceedings has to be reconsidered on the basis of the amended patent. However, if the infringement proceeding is no longer pending, the alleged infringer has to demand a reconsideration of the case on the basis of the amended patent by filing a separate restitution action. A restitution action is only admissible if the decision on infringement dates back less than five years.

²⁰This is often due to the time required to prepare the case, in particular the search for prior art that can be used to challenge the patent's validity (Kühnen, 2013).

²¹Harhoff et al. (2007) reports a median length of opposition proceedings at the EPO of about four years (including appeal).

Figure 1: Timing of infringement and invalidity proceedings in bifurcated and non-bifurcated systems



infringement courts attempt to strike a balance between the inherent conflict of interest between plaintiff and defendant.²² On the one hand, the alleged infringer may suffer irrecoverable damage if she is found to infringe an invalid patent. On the other hand, the delay of the judgment on infringement can be considerable if a stay is granted. In this case, the patentee would be prevented from timely enforcement.

In practice, infringement courts rely on a strong presumption of validity which means that infringement proceedings are only stayed if there is an overwhelmingly large probability that the patent will not be upheld in its current form. This means that even though the judges at the infringement courts do not consider the validity of the patent in their judgment on infringement, they have to form an opinion on the likelihood of invalidity to decide on a stay (Fock and Bartenbach, 2010). This poses a considerable challenge as infringement court judges are rarely technically trained and limited resources restrict a thorough investigation of the patent's validity. Usually, the corresponding invalidity proceedings are not yet at a stage where they could provide guidance on the likelihood of invalidity.²³ Infringe-

²²For example, judges take the expected length of a stay into consideration when deciding whether to stay infringement proceedings (Kaess, 2009). Other factors taken into consideration can be found in Harguth and Carlson (2011) and Kühnen (2012).

²³With the Patent Law Revision Act introduced in 2009 the BPatG is now supposed to provide an interim assessment of the patent's validity as soon as possible. The infringement court, however, is not bound by the assessment. Note that our data predate this revision of the law.

ment court judges are therefore forced to stay at their own discretion. For example, a stay is usually not granted if the prior art forwarded in the revocation proceedings has already been considered in the patent examination or any prior invalidity proceedings.

Independently of the actual timing of the infringement and revocation proceedings, the mere jurisdictional separation (save for the final appeal before the BGH) in the bifurcated system creates an opportunity for the litigants to construe the patent claims differently. This is the so-called ‘Angora Cat’ approach: the patentee will try to make a patent’s claims look as broad as possible when infringement is determined, the patent looks like a blow-dried, combed, fluffy cat; whereas when validity is determined, the patent’s claims are presented as narrow as possible, the claims look like a wet, rolled-up cat. This means that patents may be found to be valid based on a narrow claim construction, while infringement is found on a broad construction, which – if applied to validity – would have led to the invalidation of the patent.²⁴ While this ‘squeeze’ may also occur in systems where validity and infringement are decided simultaneously, inconsistent claim construction is more likely to be detected. An analysis of the ‘Angora Cat’ approach requires detailed legal comparison of the claim construction in infringement and revocation proceedings, which is beyond the scope of our analysis.²⁵

3 Effects of Bifurcation

Proponents of bifurcation argue that exclusive jurisdiction on patent validity offers the advantage of specialization. The court charged with validity cases can train and deploy technical judges and accumulate experience specifically in the assessment of patent validity. This should result in a coherent and well-founded claim construction and therefore increase legal certainty regarding the validity of patents. Another argument in favor of bifurcation is the ‘screening effect.’ Separate patent invalidity proceedings increase the costs and risks for the alleged infringer. If the alleged infringer expects a patent to be upheld, she will refrain from filing an invalidity action as defense to avoid further expenses and instead concentrate on fighting off the infringement allegations. One might argue, therefore, a bifurcated system deters validity challenges with relatively low chances of success. Perhaps the most important argument is that a strong presumption of validity, which puts considerable faith in the pre-grant examination of patent offices, allows a fast assessment of infringement claims because validity is not assessed simultaneously. In combination, fast decisions on infringement, the screening of counterclaims for invalidity, as well as the specialized institutions that decide on the technical question of validity, promise to lead to fast, legally sound, and relatively cheap enforcement of patents (see e.g. Hilty and Lamping (2011)).²⁶

²⁴Keukenschrijver (2010) suggests that this is a common tactical maneuver in patent disputes. Vary (2012) offers the example of EP1186189 asserted by ICom against HTC as a point in case.

²⁵In our data, a squeeze appears as a case in which infringement is found of a patent that is upheld by the BPatG. That is, without additional information, it is impossible to determine whether a different claim construction was applied at the regional court and the BPatG.

²⁶Some proponents of the bifurcated system also argue the temporal spread between the decision on infringement and validity may benefit the alleged infringer if an action is stayed when it should not have been stayed. This could work to the alleged infringer’s advantage if the regional court had most likely found infringement, but the delay caused by a stay allows the alleged infringer to settle on favorable terms. The issue only arises in the case the regional court finds infringement, but mistakenly decides to stay the case assuming

Opponents of bifurcation, however, argue that a bifurcated system is prone to legal discrepancies due to the separation of infringement and revocation proceedings. We discuss this and several other arguments below.

3.1 Divergent Decisions

Even though infringement and invalidity proceedings are heard and decided by different courts, the decision on the patent’s validity has consequences for the decision on infringement – provided infringement was found. Once a patent is invalidated, this decision erodes the legal basis for any claims for infringement. At the same time, because decisions on infringement are usually made faster than decisions on validity, a court might establish infringement although the patent is later invalidated. In fact, if infringement is found in first instance, any injunction resulting from this decision is enforceable regardless of an appeal or any pending validity challenge. This means the greater the temporal spread between infringement and validity decisions, the longer a patent may be wrongfully enforced. Even if the patent is invalidated in first instance, the patentee can continue to enforce the patent as long as the decision does not become binding. The injunction gap may, therefore, extend beyond the the first instance invalidity decision. This again creates strong incentives to appeal the infringement decision while awaiting the outcome of the validity proceedings. The result is considerable legal uncertainty over the outcome of the infringement dispute, potentially considerable delays in enforcement, substantially increased litigation costs, and the possibility of an injunction gap (an enforceable finding of infringement despite of an invalid patent – area A in Table 2).

Table 2: Divergent decisions

		Invalidity	
		No	Yes
Infringement	No		
	Yes		A

Notes: The figure shows the share of cases where infringement was either found (Yes) or not (No) and where the patent was either invalidated (Invalidity - Yes) or not (Invalidity - No). Area A shows the share of ‘invalid but infringed’ cases.

Two measures that counteract these factors are readily cited by the proponents of bifurcation (Pitz, 2011). First, the strict separation between infringement and validity can be weakened by staying infringement proceedings until the revocation or opposition outcome becomes available. As mentioned above in Section 2.2, the problem with this mechanism is

that the patent is likely to be invalidated. This is a Type II error, a court does not reject a request for a stay when it should do so. This effect works in the opposite direction of the Type I error, that is, the regional court does not grant a stay when it should do so. If, conditional on filing an invalidity case, the likelihood that the patent in question is invalid exceeds the likelihood of the patent being upheld, the likelihood of a Type I error exceeds that of a Type II error. This suggests that any potential benefits to infringers from a system that minimizes the Type II error are lower than that of minimizing the Type I error.

that the infringement court has to form an opinion on the likelihood of the validity challenge without proper assessment. This may work in cases where the question of validity is rather obvious, but it is doubtful that the court's educated guess correctly anticipates for what the technically trained judges at the BPatG (and DPMA/EPO) need an extensive investigation. Second, the alleged infringer subject to a divergent decision can obtain relief through appeal or a claim for restitution in case the patentee has exercised an injunction on the basis of the finding for infringement (Kühnen, 2009). In this situation, the alleged infringer has also the right to demand compensation for accrued losses. Compensation may reduce the direct harm caused by an injunction but some injunctions such as rendering accounts to a competitor (as in the *Dr. Johannes Heidenhain GmbH vs. iC-Haus GmbH* case mentioned in the Introduction) may cause irreparable damage. Moreover, the mere possibility to be found to infringe an invalid patent, if only for the time between infringement and validity decision, creates legal uncertainty among firms. A firm may decide for its own business dealings that a given patent is likely invalid – which is eventually confirmed by the BPatG (or DPMA/EPO) – but it could still face a harmful injunction for the time being because invalidity is not admissible as defense in infringement proceedings.

We assess the frequency of divergent decisions (i.e. the size of area A in Table 2) in the German bifurcated patent system empirically by analyzing the timing of parallel proceedings, the occurrence of divergent decisions and any observable trends over time, as well as the share of divergent decisions that became legally binding.

3.2 Screening

Proponents of bifurcation also argue that separate revocation proceedings act as a filter deterring the filing of validity challenges with low probability of success. However, it is easy to turn the argument on its head. There is a possibility that patents are not invalidated and held to be infringed that would have been invalidated if scrutinized through an invalidity or opposition proceeding. Hence, the failure to challenge validity may harm the alleged infringer directly but also has consequences beyond the dispute as the patentee maintains the ability to sue other parties with the valid patent. The main question is, therefore, why an alleged infringer would refrain from challenging validity in a bifurcated system if chances of seeing the patent invalidated are relatively large. For bifurcation to pivot the decision to file a validity challenge, the additional cost involved in pursuing an essentially separate court action and the added length of the dispute with the associated uncertainty about the ultimate outcome may weigh heavier on certain types of firms than others. There is plenty of evidence that smaller firms are more resource constrained (Carpenter and Petersen, 2002; Hall, 2002). This may imply that in particular smaller firms are less likely to challenge the validity of a patent even when they are accused of infringement.

Figure 3 illustrates the consequence of such a screening mechanism. We see fewer patents' validity being challenged, which biases downward the number of cases for which the patent is found to be infringed although it would not be upheld if its validity were challenged. That is, the share of cases where infringement was found but where the patent was eventually invalidated (area A) is downward biased because area B is never subject to an invalidity proceeding.

We investigate the existence of screening by estimating how the propensity to challenge validity before the BPatG depends on the size of the allegedly infringing firm. We as-

Table 3: The screening effect of bifurcation

		Challenged		Not challenged	
		No	Yes	Invalidity	
Infringement	No				
	Yes		A	B	

Notes: The figure shows the share of cases where infringement was either found (Yes) or not (No) and where validity was either challenged before the BPatG or the DPMA/EPO (Challenged) or not (Not Challenged) and where the patent was either invalidated (Invalidity - Yes) or not (Invalidity - No). Area *A* shows the share of ‘invalid but infringed’ cases whereas area *B* shows the share of cases that would fall into the ‘invalid but infringed’ category but validity is not challenged because of the screening mechanism described in Section 3.2.

sume that smaller firms are more resource constrained than larger firms. Hence, finding smaller firms to be less likely to challenge the validity of an allegedly infringed patent while controlling for time varying observable and time invariant unobservable patent-, case-, and litigant-characteristics, offers evidence for the existence of a screening effect of bifurcation.

3.3 Changes in Opposition Behavior

Since we find that the ‘invalid but infringed’ situation arises in a substantial number of cases (see Section 5.1), the question is whether the occurrence of an injunction gap affects firms beyond the immediate consequences of facing an injunction on an invalid patent.

A possible effect could be a change in the firms’ opposition behavior. While oppositions can be a reaction to the allegation of infringement, they are also considered common precautionary means against newly granted patents of competitors. Compared to invalidity proceedings, oppositions are cheap and for EP patents centralized at the EPO (Mejer and van Pottelsberghe de la Potterie, 2012). However, the main rationale is that firms can decrease uncertainty in the patent landscape prior to their own investments to commercialize a technology. In this way, firms can prevent future infringement allegations that may lead to unfavorable outcomes due to bifurcation.

We therefore test whether the opposition behavior of firms changes immediately after they experience an injunction gap. We have data on the entire opposition history of firms at the EPO and check if firms’ filing activity changes within a one-year window following the decision on validity (i.e. once they learn that they have been subject to an injunction for the infringement of a patent that was later invalidated). To account for any general tendency to change opposition filings following litigation, we match a control group of firms that was also involved in both infringement and invalidity proceedings, but where proceedings did not yield divergent decisions. This allows us to obtain difference-in-difference estimates of any effect of the injunction gap on opposition filings.

4 Data

We use data on patent infringement and revocation proceedings filed at German courts between 2000 and 2008. We also use data on opposition proceedings at the EPO and DPMA for the same time period. We combine the case-level information with patent- and litigant-level data.

4.1 Data Sources

Regional Courts – Infringement

We collected data on infringement actions directly from the three regional courts that deal with the majority of patent infringement cases in Germany: the Regional Courts of Düsseldorf, Mannheim, and Munich I. We obtained detailed information on proceedings filed during the time period 2000 to 2008. This provides us with a nine-year window but also minimizes the number of cases that were still pending during the data collection.²⁷

The information extracted for each case concerns procedural aspects, the identity of the litigants and their legal representatives, and the patents at issue. Regarding procedural aspects, we have data on the dates of filing, oral hearing, and judgment. We also obtained information on how the proceedings in each instance ended, that is, by judgment, settlement or withdrawal. We also have information on the claims made by the plaintiff and the litigation value set by the court. Furthermore, the data include information on the names and addresses of the plaintiffs and defendants, which allowed us to match corporate litigants to firm-level databases, including Bureau van Dijk's ORBIS, Compustat and THOMSON One. This provides us with data on firm characteristics, including the number of employees, total assets, turnover and industry.²⁸ We also collected information on the legal representatives of litigants. We used this information to create a binary variable that indicates whether a litigant was represented in court by a 'top' law firm.²⁹

With the patent application (or publication) numbers referenced in the case files, we retrieved detailed information on the litigated patents from EPO's Patstat.³⁰ Patstat provides us with information on application and publication dates, IPC classes, applicants and inventors, family size, as well as forward and backward citations. On basis of the patent numbers we constructed the respective patent families to obtain other European national as well as EPO equivalents in order to identify cases where a particular patent dispute spreads across multiple national jurisdictions.³¹

²⁷Data collection started in Mannheim in spring 2010, in Munich in December 2010 and in Düsseldorf in December 2011. On average seven junior lawyers (*Referendare*) were employed as research assistants at each court to record the data directly from the dockets. Most research assistants had already passed the qualifying examination that authorizes them to practice law in Germany. They also received specific training for the data collection. Because case files are stored at the courts only in paper format, our research assistants had to digitize the relevant information directly at the regional courts. To retrieve all information in a systematic manner, we created a common data template.

²⁸The data also allow us to distinguish between natural and legal persons, such as firms, research institutions, universities, and so on.

²⁹We identified top law firms in patent litigation according to a ranking published in 2009 by the professional journal *JUVE Rechtsmarkt*.

³⁰We use the Patstat version October 2012.

³¹Details on the identification of multi-jurisdictional patent disputes can be found in Cremers et al. (2013).

Federal Patent Court – Revocation

We also have information on revocation proceedings before the BPatG and its appeal court, the BGH. Both courts publish all decisions on validity since 2000 on their websites. We also obtained information on the filing date as well as withdrawn actions in both instances from the register of the German Patent and Trademark Office. This allowed us to construct the course of the revocation proceedings without having to access the case files at the court. That said, we do not have any information on the party challenging the patent because the published decisions are anonymized. Therefore, we link infringement and revocation proceedings based on the patents involved. Earlier studies (cf. Stauder (1983)) and interviews with practitioners support our assumption that generally, the alleged infringer files the revocation action as a counterclaim to an infringement action.

To account for revocation proceedings that are parallel to the infringement proceedings, but which were filed either before or after the infringement claim was filed, our data on revocation proceedings cover the entire 1983 to 2012 period.

EPO and DPMA – Opposition

We have data on any prior or parallel opposition of the patents involved in an infringement action. For DE patents we have information on the opposition proceeding, i.e. the opposition's filing and end dates as well as outcome, from the register of the DPMA. We constructed data on oppositions at the EPO based on legal status information from Patstat covering 1981 to 2012. In contrast to the data from the DPMA, the data for oppositions at the EPO have information on the identity of the opponent, that is, the party filing the opposition.

We linked the opposition data in the following ways with the litigation dataset. First, we added information on any opposition to the patents involved in an infringement proceeding to identify parallel invalidity proceedings in form of oppositions and to construct each patent's history of validity challenges. Second, we manually identified the litigants from the infringement proceedings among all opponents of EP patents to capture the opposition behavior of the alleged infringers over time. We also matched the opponents with firm-level data from Bureau van Dijk's ORBIS.

4.2 Sample Description

The patent litigation actions collected at the Regional Courts of Mannheim, Düsseldorf, and Munich cover around 80% of all patent infringement cases during the period 2000 to 2008.³² In total, we have data for 5,121 litigation cases. We identify and drop cases from our dataset that involve a patent, but that are not directly concerned with infringement.³³ We also drop cases involving utility models because the bifurcation principle only applies to invention patents. Furthermore, to avoid misinterpretation of case outcomes, we also remove a small number of negative declaratory actions and cases where the court decides only on issues regarding the enforcement of a previous judgment (e.g. the amount

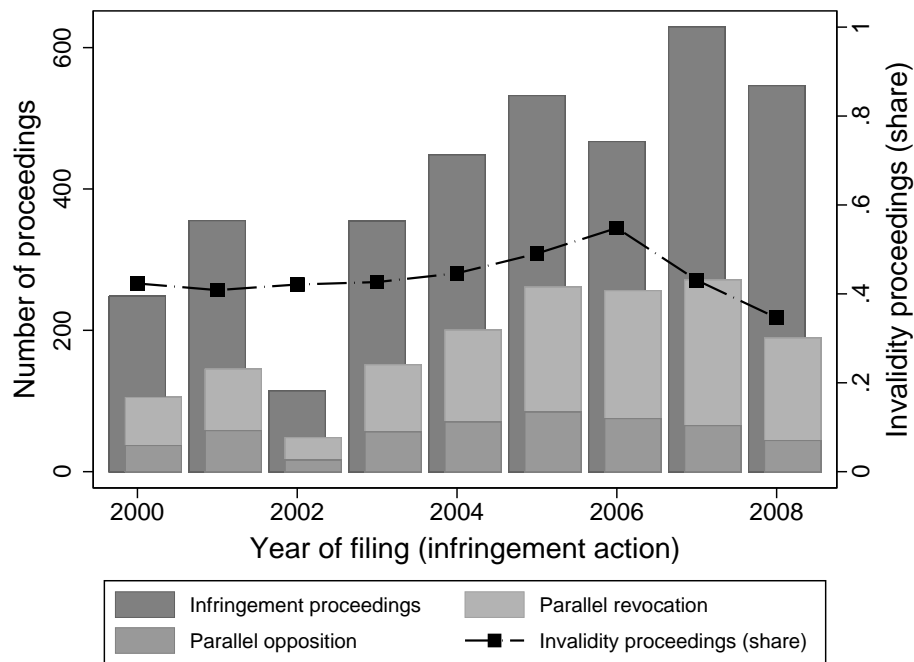
³²We estimate that roughly one half of the remaining 20% of cases are spread over the other nine regional courts. However, these courts are of minor importance and reputation.

³³This includes employee invention disputes, licensing and patent transfer disputes, as well as patent arrogations and false marking.

of damages granted). The resulting sample contains 3,375 patent infringement cases. As some actions are filed on the basis of more than one patent, our sample contains 3,711 patent-case observations.

For the time period 2000-2008 our data count 1,822 revocation actions filed at the Federal Patent Court.³⁴ We also have recent data on all oppositions filed at the EPO between 1981 and 2012. These data cover oppositions to the grant of 68,259 EP patents.³⁵

Figure 2: Incidence of infringement and parallel invalidity proceedings



Source: own data and calculation

Figure 2 shows the number of infringement and revocation actions as well as oppositions by year. There has been an increase in case numbers over time.³⁶ The figure also shows that the majority of parallel invalidity proceedings are revocation actions at the BPatG. Only 31.6% of validity challenges are oppositions. The share of infringement cases with parallel revocation proceedings or oppositions is around 44.3% over the entire 2000-2008 period.

³⁴As parallel revocation proceedings may be filed either before or after this time frame, we identified all revocation actions filed against patents involved in an infringement proceeding and added these to our data. For more details and a breakdown of court cases by court see Cremers et al. (2013).

³⁵For oppositions to the grant of DE patents, we obtained only data for our sample of patents that are involved in infringement actions.

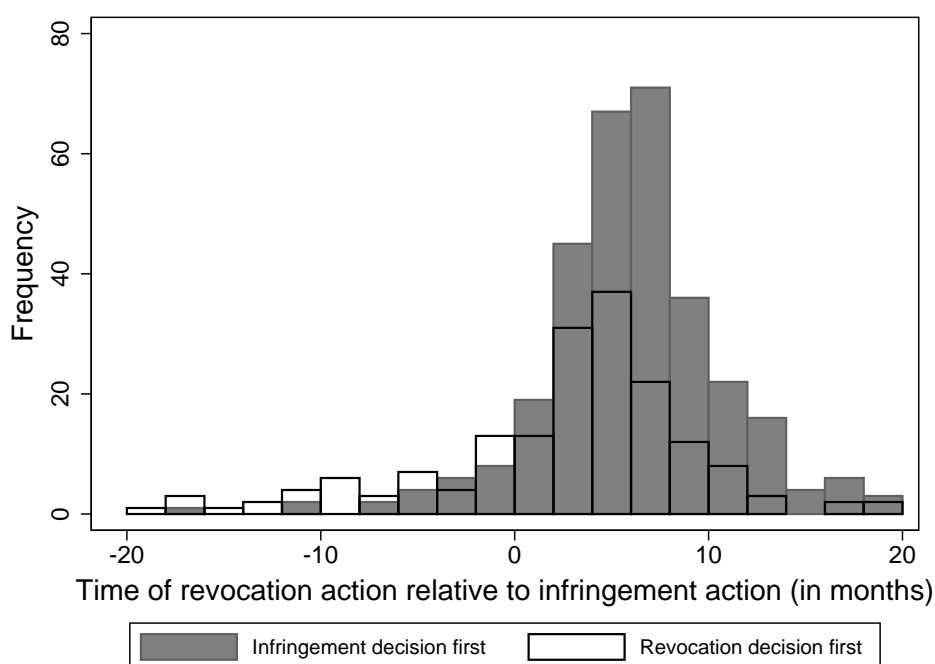
³⁶The dip in 2002 is due to an internal decision at the regional court in Düsseldorf to remove and destroy files and only store decisions in the court archive. Fortunately, this decision affected only our data for 2002.

5 Results

5.1 Divergent decisions

As a first step, we assess the frequency of cases where a patent was ‘invalid but infringed.’ One of the factors mentioned in Section 2 above that contributes to the occurrence of divergent decisions is the temporal spread between infringement and revocation proceedings. The Figure 3 shows the distribution of gaps between the filing of infringement and revocation actions. The figure shows that in most cases the revocation action followed its corresponding infringement action. As revocation proceedings take on average longer, too (see Figures A-2 in the Appendix), the infringement decision is usually handed down first, despite the possibility to have the infringement proceeding stayed. Figure A-4 in the Appendix shows the distribution of gaps between infringement actions and oppositions. Here, oppositions are largely initiated before the infringement action, suggesting that oppositions are used preemptively rather than reactively. Still, the (first instance) decision on validity is taken on average 6.7 months *after* the (first instance) decision on infringement. This shows that there is substantial scope for an injunction gap, that is, in case a patent is found to be infringed, the patentee has on average 6.7 months to enforce the patent even if the patent is invalidated once the BPatG (revocation) or DPMA and EPO (opposition) hand down their decision.

Figure 3: Timing of infringement and revocation actions in parallel proceedings



Source: own data and calculation

Table 4 cross-tabulates the (first instance) infringement and invalidity outcomes for all 1,154 parallel cases where the decision on infringement was handed down first.³⁷ The gray-

³⁷Table A-1 in the Appendix shows the cases where invalidity was decided first.

shaded cells in Table 4 show that there is a sizeable number of cases where the patent was first found to be infringed and later invalidated by the BPatG or the DPMA/EPO. If we also consider cases where the patent was partly invalidated or infringed, there is a total of 142 cases. For comparison, in only 75 cases patents that were found to be (partly) infringed were upheld in the invalidity proceeding. This means that slightly more than 12.3% of cases (including cases that settled) produce divergent decisions – the patent is first found to be infringed but later invalidated.³⁸ We also observe 167 cases where the patent was found (partly) infringed and the parallel invalidity proceeding subsequently ended with a withdrawal of the action.³⁹

Table 4: Comparing outcomes of infringement and invalidity proceedings where infringement was decided first

Outcome LG	Outcome parallel invalidity proceeding				Total
	valid	partly invalid	invalid	withdrawn	
infringed	55 42.6%	50 24.0%	53 25.2%	120 19.8%	278 24.1%
partly infringed	20 15.5%	21 10.1%	18 8.6%	47 7.7%	106 9.2%
not infringed	23 17.8%	45 21.6%	55 26.2%	70 11.5%	193 16.7%
settlement	31 24.0%	92 44.2%	84 40.0%	370 61.0%	577 50.0%
Total	129 100.0%	208 100.0%	210 100.0%	607 100.0%	1154 100.0%

Notes: Dark gray-shaded area shows clear divergent decisions. Light gray-shaded area shows presumed divergent decisions. The sample consists of all infringement proceedings with a parallel invalidity proceeding and where the first instance infringement outcome is first. In case of multiple invalidity decisions, the fastest decision is chosen. The unit of observation is the patent in the infringement proceedings.

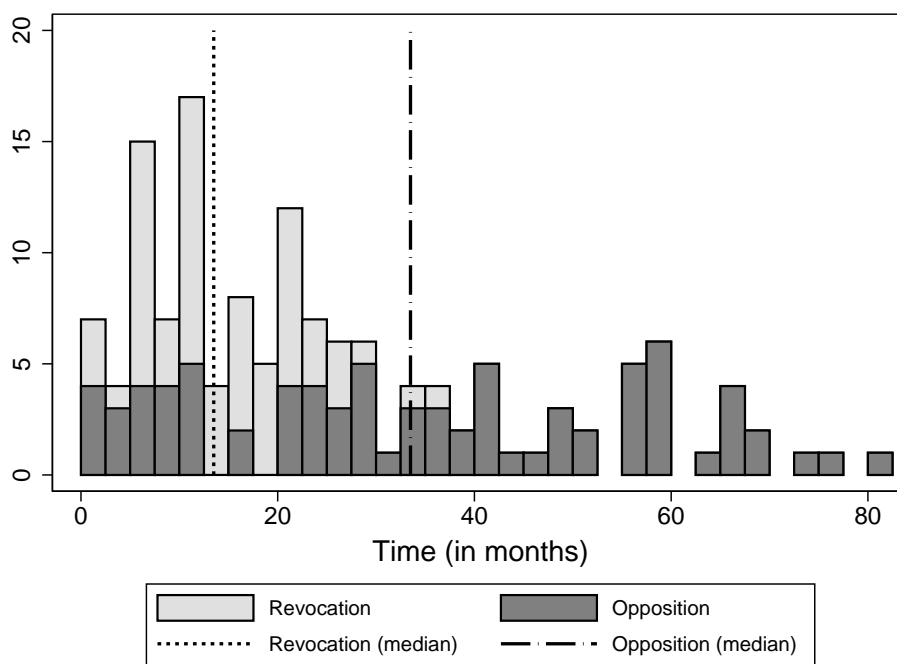
Figure 4 shows the length of the injunction gap for the 142 cases with divergent decisions. The figure distinguishes between invalidity decisions through the opposition divisions of the DPMA and EPO and the BPatG. The median injunction gap for cases in which the infringed patent was eventually revoked by the BPatG is about 13.5 months. Hence, parties that have won the infringement case have little over a year to enforce a patent that should not have been granted in the first place.⁴⁰ The length of the injunction gap is significantly longer for cases in which the patent was invalidated through opposition procedures. The median is 33.5 months. As shown in Figure 4, the main reason for this is that there are a considerable number of opposition proceedings that take a lot longer to reach a final decision than revocation proceedings at the BPatG.

³⁸Figure A-5 in the Appendix shows the occurrence of divergent decisions over time.

³⁹Table A-3 in the Appendix shows that the majority of these cases ended in a settlement shortly after the infringement decision.

⁴⁰Considering that appellate revocation proceedings take several years, the actual injunction gap until the decision on the patent's revocation is binding may be considerably longer.

Figure 4: Length of injunction gap for divergent decisions



Source: own data and calculation

Notes: The figure shows all divergent decisions regardless of whether parties have (preliminarily) enforced the infringement judgment.

As explained in Section 2, the judgment by the infringement court is (preliminary) enforceable despite a pending decision on validity. The only way to prevent an injunction from taking binding effect is to appeal the judgment. In fact, we observe an appeal rate of 54.0% for cases with a parallel revocation proceeding compared to 26.2% for cases with no parallel revocation proceeding (see A-2 in the Appendix).⁴¹ Table 5 takes a look at the final outcomes of cases with divergent decisions (Figure A-6 in the Appendix shows a more detailed breakdown). The table shows that in 43.7% of cases with divergent decisions in first instance, the divergent decision is upheld upon appeal. In 13 cases, the court upheld the patent on appeal, which means the defendant in the infringement proceeding is indeed infringing a (partly) valid patent.⁴² It bears mentioning that a substantial number of cases is settled during appeal. It is difficult to interpret these numbers, but the fact that the share of settled infringement cases (37.3%) is three times as large as the share of settled invalidity cases (12.0%) suggests that firms that have been found to infringe a patent are likely to settle (presumably on terms favorable to the patentee).

Table 6 shows a comparison of case-, litigant-, and patent-level characteristics between defendants in infringement cases that were subject to divergent decisions and all other cases

⁴¹This hints at the possibility that the appeal rate is higher in a bifurcated system than in a non-bifurcated system. An appeal to an infringement decision may be useful – regardless of its prospects of success – in order to delay an injunction while the decision on validity is still pending.

⁴²We have only incomplete information on the timing of the infringement decision in second instance relative to the invalidity decision. It may be the case that the appeals court did not wait until the decision on validity was available, although infringement proceedings are more likely to be stayed in second instance.

Table 5: Final outcome to divergent decisions

Infringement outcome	Invalidity outcome			Total
	reversed	settled	binding	
reversed	2 1.4%	0 0.0%	6 4.2%	8 5.6%
settled	8 5.6%	11 7.8%	34 23.9%	53 37.3%
binding	13 9.1%	6 4.2%	62 43.7%	81 57.0%
Total	23 16.2%	17 12.0%	102 71.8%	142 100.0%

Notes: Sample: The sample consists of all infringement proceedings with a divergent decision. The unit of observation is the patent in each infringement proceeding. The observable outcome of oppositions is by definition binding. Settlements are broadly defined and include withdrawn appeals.

White area: divergent decisions eventually reversed by the respective appeals court.

Light gray-shaded area: divergent decisions where at least one appeal proceeding ended with a settlement.

Dark gray-shaded area: divergent decisions that remained unaltered due to lack of appeal or an affirmative decision by the appeals court.

with ‘non-divergent’ outcomes. The litigation value does not differ significantly between divergent and non-divergent decisions, that is, there is no evidence for disproportionately many low-value cases ending up in an injunction gap. That said, we find that validity challenges in cases with divergent decisions are filed on average three months later than in cases with non-divergent decisions. This can be interpreted in different ways (e.g. longer preparation of a validity challenge increases chances of success), in any case it shows that the temporal separation of infringement and invalidity proceedings contributes to divergent outcomes. When we look at the size of the defendants in the infringement cases in the two groups, there appear to be slightly more small firms in the divergent decision group on the one hand and more large firms in the non-divergent decision group on the other. We also see a larger share of patents on ‘instruments’ in the group of divergent decisions. Most of these cases involve patents on medical device technology. At the same time, there are a lot fewer firms in ‘electrical engineering’.⁴³ Interestingly, we do not observe a significant difference in the representation of top law firms before court.

5.2 Screening

Figure 2 shows that slightly less than a third of infringement cases (counted at the patent-level) are associated with an invalidity action. This figure is low compared to enforcement systems where infringement and invalidity are decided simultaneously in the same proceedings. In non-bifurcated litigation systems, a counterclaim for invalidity is a standard defense to alleged infringement. Therefore, the low figure in our German data hints at self-selection among litigants.

⁴³Covering infringement actions filed between 2000 to 2008, our data do not contain the recent cases related to the smartphone patent wars cited in the Introduction.

Table 6: Comparison of alleged infringers by decision

Variables	Decision type		SE mean diff.	Signif.
	Non-divergent	Divergent		
	Mean	Mean		
Alleged infringer				
Micro	0.11	0.13	0.029	
Small	0.14	0.25	0.032	**
Medium	0.22	0.25	0.037	
Large	0.52	0.38	0.045	**
Germany	0.85	0.88	0.031	
Europe (excl. Germany)	0.10	0.08	0.026	
World (excl. Europe)	0.05	0.04	0.019	
Top legal representative	0.55	0.63	0.044	
Proceeding				
Litigation value (in th €)	1190.75	995.65	246.790	
Lag of revocation action (in months)	3.76	6.46	0.907	**
Lag of opposition (in months)	-6.83	-6.84	1.570	
Technological area				
Electrical engineering	0.28	0.14	0.039	***
Instruments	0.13	0.22	0.031	**
Chemistry	0.15	0.20	0.033	
Mechanical engineering	0.29	0.29	0.041	
Other	0.15	0.15	0.032	
Observations	998	142		

Notes: The sample consist of all infringement proceedings with parallel invalidity proceedings regardless of the timing of the decisions. The unit of observation is the patent in each infringement proceeding. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

As discussed in Section 3.2 above, proponents of bifurcation argue that the added costs and complexity of filing a claim for invalidity with the BPatG provides a mechanism that deters validity challenges that have a low probability of success and hence helps a speedy resolution of the infringement case.⁴⁴ Alternatively, one could argue that the added costs and complexity impede firms that are more resource-constrained from contesting validity despite reasonable chances of seeing the patent revoked. Moreover, the fact that the validity challenge loses some of its ‘effectiveness,’ as the invalidity decision is usually handed down after the infringement decision, may deter firms from filing an invalidity action in the first place.

We test this hypothesis by estimating the propensity that the alleged infringer files an invalidity action at the BPatG. That is, we predict the probability that the validity of a patent involved in an infringement case is also challenged at the BPatG. We include a number of patent-, case-, and litigant-characteristics among the regressors (for summary statistics see Appendix Table A-2). The regressions also include year, patent technology class, and court dummies. Table 7 shows the results.

Our focus is on the size of the alleged infringers, which have to decide whether to challenge the validity of the allegedly infringed patents before the BPatG. We distinguish between four size categories: micro, small, medium and large.⁴⁵ The results for our preferred specification in Column (4) show that medium-sized and large firms are about 13% more likely to file an invalidity action at the BPatG than micro-sized alleged infringers. This suggests that after accounting for various time varying and invariant patent- and case-characteristics, smaller defendants in infringement proceedings are less likely to challenge the validity of the patent at issue. In contrast, there is no evidence that the size of the plaintiff in the infringement proceedings, that is the patentee, plays any role in the decision to challenge the patent’s validity. This supports the view that the decision *not* to file a parallel action at the BPatG is at least partly determined by resource constraints on the alleged infringer’s side.

The results also show that firms that are not registered in Germany are less likely to challenge a patent’s validity. Firms in a European country other than Germany are 8.1% less likely to file a parallel action and firms outside of Europe are 14.8% less likely than German firms to file an invalidity action. This may be explained by larger costs involved for parties outside of Germany in pursuing an additional action at the BPatG. For example, since the court action is conducted in German, translation costs accrue and in most cases representation has to be assigned to a German law firm. In line with this reasoning, we find that cases in which the alleged infringer is represented by a top law firm to be 13% more likely to have a parallel revocation proceeding.

To explore this ‘screening’ effect of bifurcation further, we use propensity score matching. We estimate the propensity that a parallel revocation action is pursued at the BPatG by a small or large defendant in an infringement case. In contrast to Table 7, for the propensity matching estimation, we collapse the data into two firm size categories: micro-small and medium-large. The results in Table 8 echo the probit results of Table 7.⁴⁶ Large and

⁴⁴If the infringement case is heard by a regional court other than the Regional Court Munich, this also means that the alleged infringer has to litigate in two different geographical venues (the BPatG is in Munich).

⁴⁵The size categories are defined according to the [EU definition](#), which relies on information on a firm’s number of employees, turnover, and total assets.

⁴⁶Figure A-7 in the Appendix shows that treated and control units have common support.

Table 7: Probit regression results: incidence of revocation action

	(1)		(2)		(3)		(4)	
	Action filed		Action filed		Action filed		Action filed	
Alleged infringer								
Small (d)	0.104*	(0.04)	0.104*	(0.05)	0.094*	(0.05)	0.089	(0.05)
Medium (d)	0.122**	(0.04)	0.130**	(0.04)	0.125**	(0.04)	0.128**	(0.04)
Large (d)	0.152***	(0.04)	0.187***	(0.04)	0.146***	(0.04)	0.138***	(0.04)
Europe (excl. Germany) (d)					-0.089**	(0.03)	-0.083**	(0.03)
World (excl. Europe) (d)					-0.166***	(0.04)	-0.149***	(0.04)
Top legal representative (d)							0.131***	(0.02)
Patent holder								
Non-practicing entity (d)			-0.011	(0.04)	-0.006	(0.04)	0.005	(0.04)
Small (d)			0.015	(0.05)	0.023	(0.05)	0.024	(0.05)
Medium (d)			0.017	(0.05)	0.023	(0.05)	0.024	(0.05)
Large (d)			0.030	(0.04)	0.024	(0.05)	0.027	(0.05)
Europe (excl. Germany) (d)					-0.002	(0.03)	-0.019	(0.03)
World (excl. Europe) (d)					-0.122***	(0.03)	-0.117***	(0.04)
Top legal representative (d)							0.003	(0.03)
Patent characteristics								
Forward citations (in first 5 years)	0.001	(0.00)	0.002	(0.00)	-0.002	(0.00)	-0.003	(0.00)
EP (d)					-0.063*	(0.03)	-0.095**	(0.03)
Accelerated examination requested (d)							0.125***	(0.03)
Grant lag (diff. from mean in days)							-0.000**	(0.00)
Age of patent (in years)			-0.005	(0.00)	0.012	(0.01)	0.026*	(0.01)
Age of patent (in years, squared)					-0.001	(0.00)	-0.001*	(0.00)
Invalidity history								
Patent solidified through opp. proc. (d)	0.099***	(0.03)	0.098***	(0.03)	0.085**	(0.03)	0.070*	(0.03)
Patent challenged through rev. proc. (d)	-0.229***	(0.03)	-0.175***	(0.04)	-0.162***	(0.04)	-0.175***	(0.04)
Patent solidified through rev. proc. (d)			-0.248***	(0.05)	-0.236***	(0.05)	-0.232***	(0.05)
Proceeding								
Parallel opposition proceeding (d)			-0.190***	(0.04)	-0.202***	(0.04)	-0.222***	(0.03)
Litigation value (in th €)			-0.000	(0.00)				
Litigation value (in th €, log)					0.032**	(0.01)	0.035***	(0.01)
Multi-jurisdictional litigation (d)							0.104	(0.06)
Controls								
Year effects	Yes		No		No		Yes	
Technology effects	Yes		Yes		Yes		Yes	
Court effects	No		Yes		Yes		Yes	
Patent characteristics	Yes		No		Yes		Yes	
Pseudo R^2	0.045		0.047		0.070		0.100	
Observations	2,289		2,238		2,237		2,234	

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The sample consists of all infringement proceedings with a duration of at least 120 days. The unit of observation is at the patent-case level, that is each patent in each infringement proceeding is treated as a separate case. Baseline patent holder size: micro. Baseline alleged infringer size: micro.

medium-sized firms have a higher likelihood of pursuing an invalidity action than micro and small firms, all else equal. This result holds regardless of the way we match treated and control units (propensity score or nearest neighbor) and the number of matched controls (1 or 5). The lower part of Table 8 also shows results when restricting the sample to European alleged infringers. The average treatment effects are slightly larger in magnitude but overall very similar to the results obtained for the full sample.

Table 8: Estimation of average treatment effects

	Propensity Score Matching		Nearest Neighbor Matching	
	nn=1	nn=5	nn=1	nn=5
Matches per observation				
Full sample (N=2,193)				
ATE action filed	0.08	0.08	0.09	0.10
Std. err.	0.02	0.03	0.03	0.03
P-value	0.000	0.000	0.009	0.000
Matches minimum	1	5	1	5
Matches maximum	5	7	3	7
European alleged infringers (N=2,069)				
ATE action filed	0.08	0.09	0.10	0.11
Std. err.	0.04	0.03	0.03	0.03
P-value	0.026	0.002	0.005	0.000
Matches minimum	1	5	1	5
Matches maximum	3	7	3	7

Notes: The sample consists of all infringement proceedings with a duration of at least 120 days. The unit of observation is at the patent-case level, that is each patent in each infringement proceeding is treated as a separate case. Cases with a patent belonging to a technological class with fewer than five patents in the entire sample are excluded. ATE: average treatment effect. Treatment model: logit. Distance metric: Mahalanobis.

These results provide evidence in favor of a screening effect of bifurcation. More resource constrained firms are less likely to challenge validity in response to an infringement claim. In line with our discussion in Section 3.2, this means that the 12.3% of ‘invalid but infringed’ cases shown in Section 5.1 are downward biased. Fewer patents are in fact invalidated than in the absence of the additional costs engendered by bifurcation. This also contributes to the strong presumption of validity in a self-enforcing way.

5.3 The Effect of Divergent Decisions on Oppositions

Empirically it is difficult to gauge the effect that a divergent decision has on the firms concerned. If the infringement decision is indeed enforced while the decision on invalidity is pending, it is reasonable to expect some direct negative effect on the alleged infringer. Apart from any direct effects of an injunction, firms may also adjust their expectations about facing an injunction despite the invalidity of a patent. Such uncertainty about the likelihood of infringing a patent right may affect a firm’s behavior beyond the immediate direct effect

of the injunction. Not unlike a burnt child dreading the fire, we analyze whether firms try to avoid repeated exposure to divergent decisions by adjusting their opposition behavior.

This means there is reason to believe that a bifurcated litigation system increases a firm's incentives to reduce uncertainty by attempting to eliminate patents early on through oppositions. Figure A-8 in the Appendix shows that German entities are in fact responsible for more than half of all opposition proceedings before the EPO between 1997 and 2013. This suggests that German firms oppose disproportionately more patents at the EPO than firms from other countries.

Oppositions are a relatively cheap and effective means to clear potentially harmful patents early on. Once they are found to infringe an invalid patent, firms may file more oppositions against patents to preempt the risk of future infringement allegations. We test for an increase in opposition filings by conducting an event-study analysis: we regress the number of oppositions by a firm that has faced an injunction gap on a dummy variable that is equal to one once the decision on validity is handed down and it becomes apparent that the regional court had held an invalid patent infringed (diff-specification). We use a ± 6 months window to assess changes in opposition behavior. To account for any general tendency for firms to change their opposition behavior following an infringement dispute, we match the set of firms that were subject to divergent decisions to the set of firms that filed a validity challenge but were not subject to divergent decisions. The interaction term of the dummy variable indicating whether a firm was subject to a divergent decision and the dummy variable indicating the timing of the decision provides therefore a differences-in-differences estimate of any effect on firms' opposition activity (diff-in-diff specification).

Table 9 shows the main results. We find a positive coefficient for the interaction term as well as for the 'post-invalidity decision' dummy. This suggests that firms that were accused of patent infringement generally increase their oppositions following the conclusion of the proceeding. This increase in oppositions is, however, stronger for firms that were found to have infringed an invalid patent. Figure A-8 in the Appendix visualizes this by plotting the coefficients on the interaction term. The results in Table 9 focus on a ± 6 month window; Table A-3 in the Appendix shows differences in means before and after a trial is decided also for ± 2 and ± 12 month windows. The figures for the alternative event windows are consistent with the data shown for the ± 6 month window.

These findings are in line with Adam and Spence (2001) who argue the disproportionate share of oppositions at the EPO by German firms is due to the need to preempt infringement actions in the German bifurcated patent enforcement system.⁴⁷ Our results, therefore, suggest that the relatively large number of oppositions by German firms is at least in part a manifestation of the uncertainty created by bifurcation.

⁴⁷There are two alternative, although not mutually exclusive explanations for the observed increase in opposition activity (Harhoff, 2005). First, oppositions may not only serve to preempt specific infringement allegations, but also to develop a reputation for toughness, i.e. to go the whole nine yards in challenging a patent's validity. Second, the alleged infringer may have obtained information (e.g. prior art) during the invalidity proceeding that can be used as evidence against other patents. Note that because the alleged infringer does not file a disproportionate number of oppositions against the patentee of the infringement proceeding, some form of retaliation is an unlikely reason for the increase in opposition activity.

Table 9: Opposition behavior pre/post-invalidity decision

	diff-specification		diff-in-diff specification	
	(1) Oppositions	(2) Oppositions	(3) Oppositions	(4) Oppositions
±6 months				
Post-invalidity decision	0.426*** (0.10)	1.504*** (0.43)	0.531*** (0.16)	0.532*** (0.16)
Post-inval. x infringed			1.047** (0.39)	1.048** (0.39)
No. of filed patents				-0.001 (0.00)
Opponent fixed effects	Yes	Yes	Yes	Yes
Time effects	No	No	Yes	Yes
Opponents with divergent decision	20	20	20	20
Opponents with non-divergent decision	97	0	97	97
Observations	702	120	702	702

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Fixed effect negative binomial regression. Dependent variable number of oppositions filed by alleged infringer. Date of invalidity decision defined as publication of decision by the BPatG (for revocation proceedings) and the DPMA/EPO (for oppositions). Alleged infringers with no oppositions after invalidity decision excluded.

6 Conclusion

Overall, our results suggest that the German bifurcated patent system favors strongly the patentee in litigation. We show that the bifurcated system creates a substantial number of cases where an invalid patent is held infringed. We also show that fewer patents are challenged than what we would expect based on the consideration of litigation systems where infringement and validity are dealt with jointly. This means that the number of ‘invalid but infringed’ cases is presumably biased downwards. Our discussion of the Angora cat approach of claim construction provides another argument for why the observed number of divergent decisions is likely to be downward biased, yet there is no empirical evidence as to how strong this effect is in practice.

Our results also indicate that the possibility of facing an injunction for infringing an invalid patent creates legal uncertainty. We find evidence for such legal uncertainty by looking at changes in firms’ opposition behavior following directly a divergent decision. We find that alleged infringers that were subject to a divergent decision file more oppositions immediately following the court case.

Our results provide empirical support to the criticism that has been directed at bifurcation (Hilty and Lamping, 2011; Münster-Horstkotte, 2012). That said, the problems revealed by our analysis should be compared to possible benefits of bifurcation – in particular, the impact of technically trained judges at the BPatG on validity decisions and the possible reduction in litigation costs due to less need for technical expert witnesses. Indeed, the costs of litigation in Germany are remarkably low compared to for example the UK, but technically trained judges could also be incorporated in a court system in which validity

and infringement are decided jointly.⁴⁸ It is also possible that recent reforms that increased case loads at the BPatG and its appeal court, BGH, aggravated the problems. Regardless, our results suggest that the current system is in danger of overly favoring patent holders. One way of addressing the problems highlighted by our analysis could be an acceleration of proceedings at the BPatG. Alternatively bifurcation could be abandoned altogether. While we do not present a counterfactual analysis of such a drastic step, our analysis still suggests that bifurcation does not emerge as a favored solution to the litigation system design problem.

⁴⁸In fact, low litigation costs are also a characteristic of the French and the Dutch patent litigation systems (Cremers et al., 2013).

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A Appendix: Figures

Figure A-1: Court structure in Germany's patent litigation system (Cremers et al., 2013, amended)

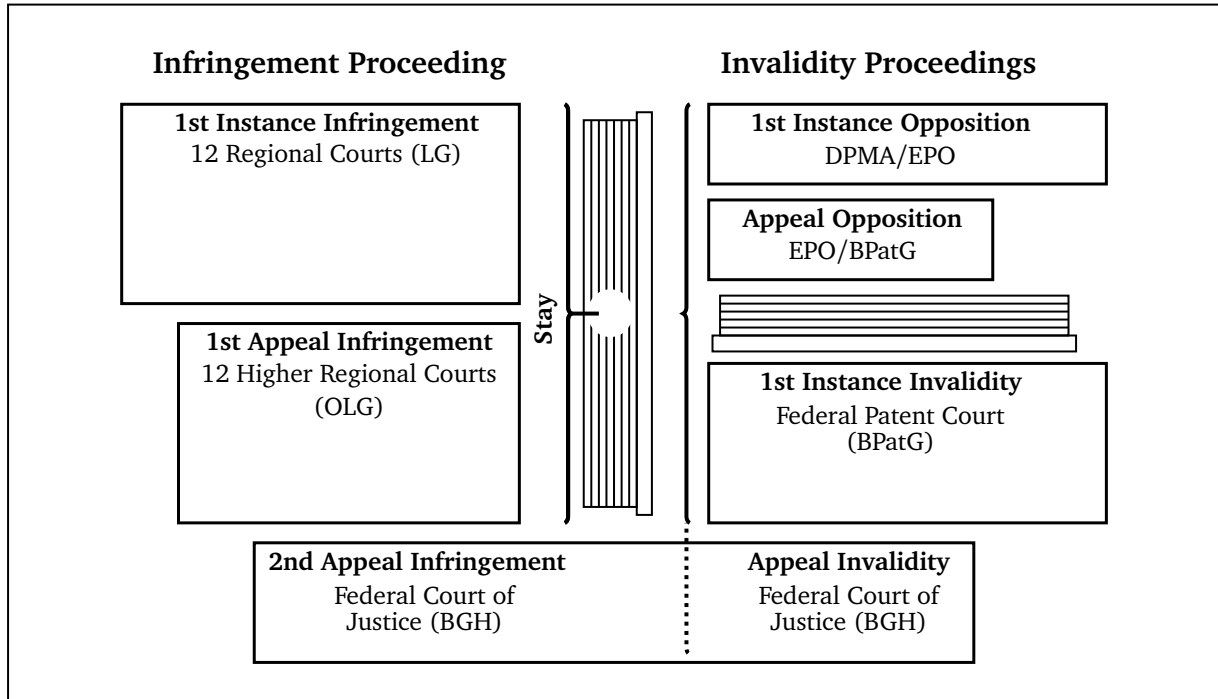
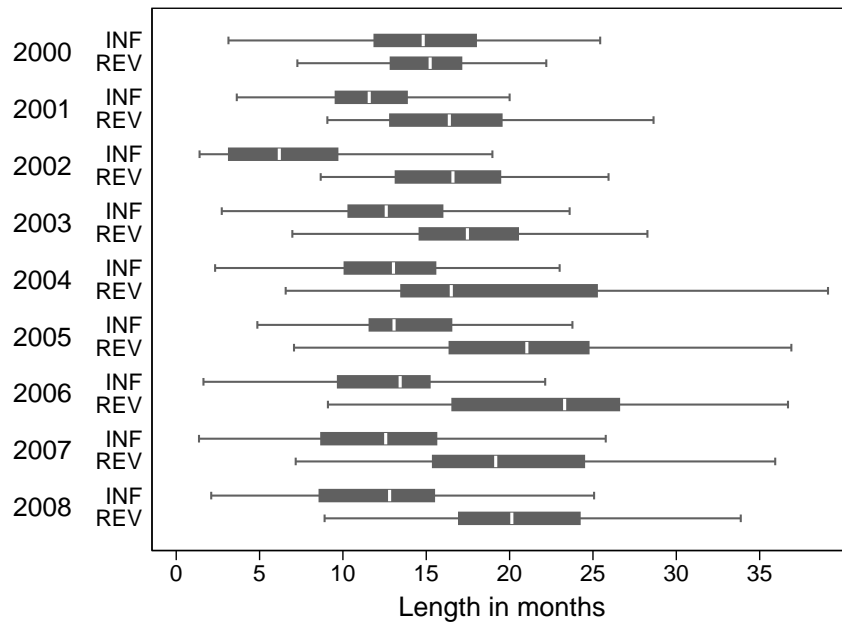
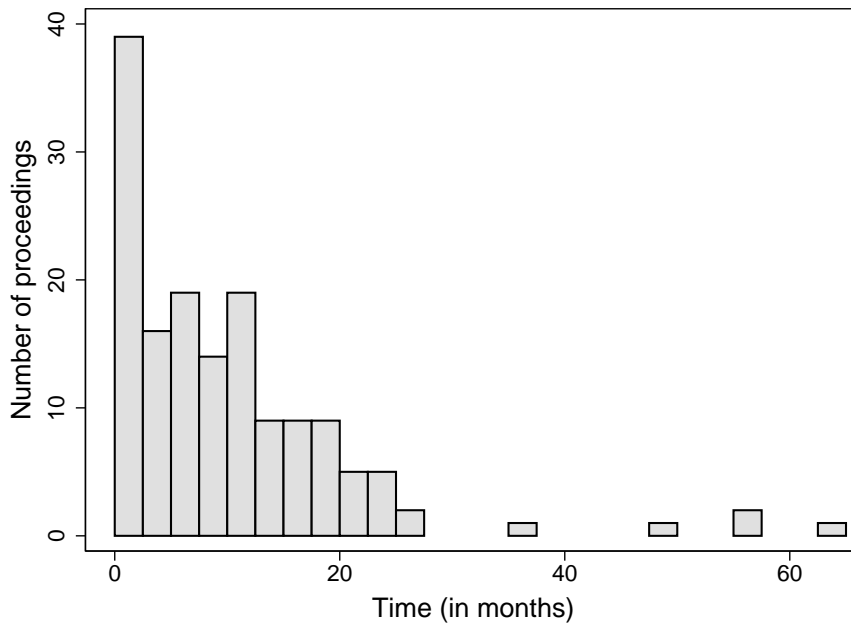


Figure A-2: Length of (first instance) infringement proceedings and invalidity proceedings by year



Source: own data and calculation

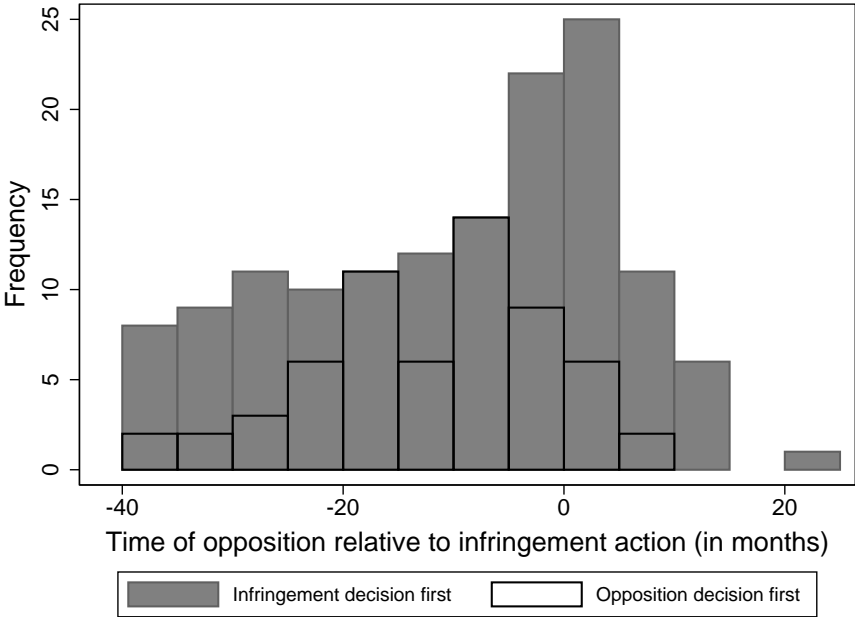
Figure A-3: Time between infringement decision (first instance) and settlement in parallel invalidity proceeding



Source: own data and calculation

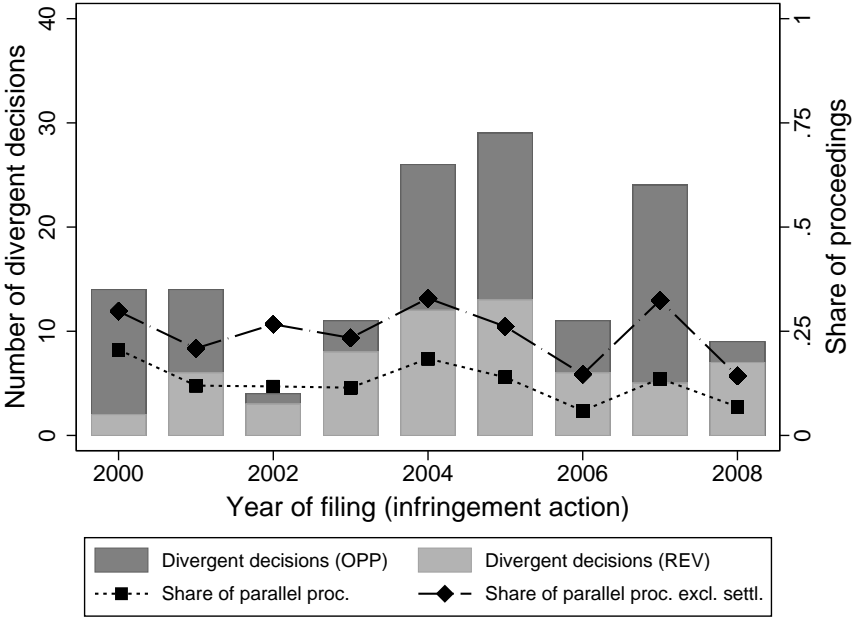
Notes: Only parallel proceedings with outcome "infringed" or outcome "partly infringed".

Figure A-4: Timing of infringement and oppositions in parallel proceedings



Source: own data and calculation

Figure A-5: Number and share of divergent decisions over time



Source: own data and calculation

Notes: Only parallel proceedings with outcome in infringement proceeding first. Share of parallel proceedings excluding settlements includes settlements in the infringement but not invalidity proceeding.

Figure A-6: Appeals and settlements of divergent decision cases

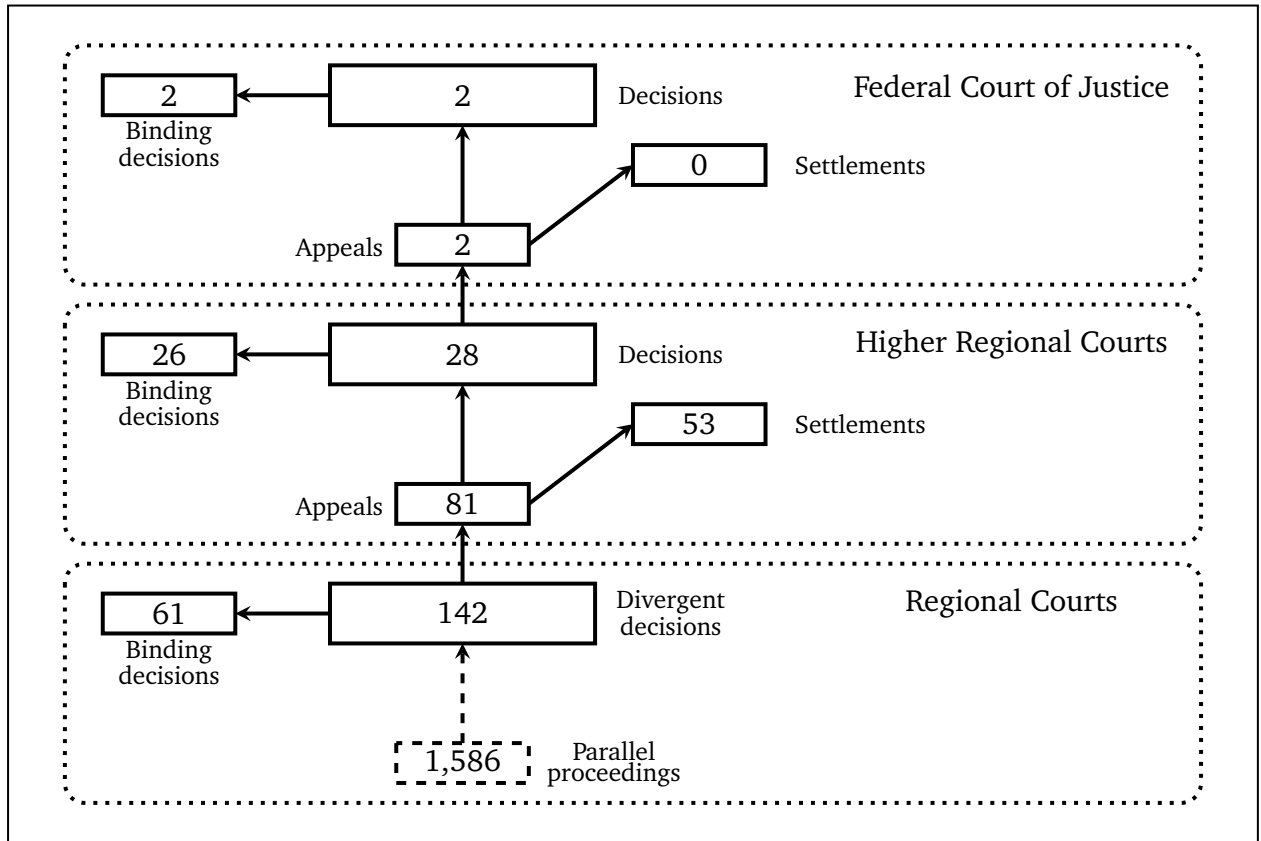


Figure A-7: Distribution of estimated propensity scores

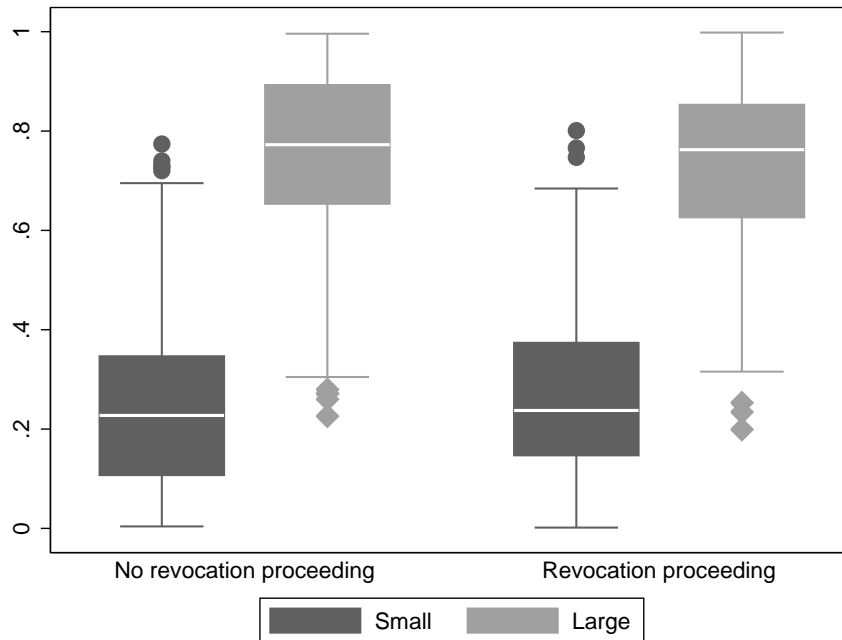
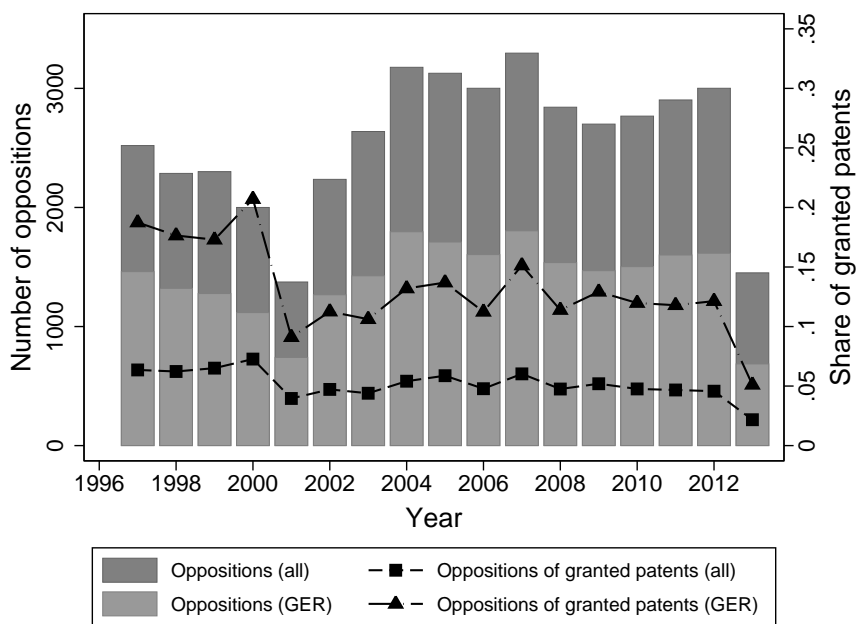


Figure A-8: Oppositions filed against EP patents 1997-2013



Source: own data and calculation

Notes: Figures on granted patents by country and year according to the annual reports of the EPO. GER represents the subsample of all granted patents (filed oppositions) with the first applicant (opponent) originating from Germany. Oppositions are counted on patent level. Data for oppositions filed in 2013 truncated.

B Appendix: Tables

Table A-1: Comparing outcomes of infringement and invalidity proceedings where invalidity was decided first

Outcome LG	Outcome parallel invalidity proceeding				Total
	valid	partly invalid	invalid	withdrawn	
infringed	22 31.9%	14 16.3%	5 4.0%	41 27.0%	82 19.0%
partly infringed	8 11.6%	9 10.5%	3 2.4%	2 1.3%	22 5.1%
not infringed	9 13.0%	19 22.1%	29 23.2%	8 5.3%	65 15.0%
settlement	30 43.5%	44 51.2%	88 70.4%	101 66.4%	263 60.9%
Total	69 100.0%	86 100.0%	125 100.0%	152 100.0%	432 100.0%

Notes: Gray-shaded areas show divergent decisions. The sample consists of all infringement proceedings with a parallel invalidity proceeding and where the first instance infringement outcome is first. In case of multiple invalidity decisions, the fastest decision is chosen. The unit of observation is the patent in the infringement proceedings. Occurrence of divergent decisions explained by multiple patents in same proceeding, appeal to invalidity decision, or missing defense by alleged infringer.

Table A-2: Summary statistics grouped by parallel invalidity proceeding

Variables	No parallel invalidity proceeding				Parallel invalidity proceeding			
	Mean	Std. err.	Min	Max	Mean	Std. err.	Min	Max
Patent characteristics								
No. of inventors	1.88	1.35	0	9	1.87	1.40	0	19
Backward citations	4.76	2.92	0	27	5.42	3.45	0	32
Forward citations (in first 5 years)	3.31	4.94	0	44	5.33	6.18	0	51
Non-patent literature	0.83	1.97	0	21	1.66	2.48	0	18
IPC count	2.24	1.90	1	9	3.33	2.95	1	9
Family size	11.59	16.33	1	183	20.72	24.84	1	69
Non-patent literature ratio	0.12	0.23	0	1	0.18	0.23	0	1
EP	0.77	0.42	0	1	0.78	0.42	0	1
PCT filing	0.21	0.41	0	1	0.19	0.39	0	1
Year of patent application/priority	1992.49	4.87	1980	2004	1992.30	4.37	1979	2005
Accelerated examination requested	0.12	0.33	0	1	0.13	0.34	0	1
Grant lag (difference from mean in days)	68.61	724.38	-1193	4641	22.92	604.18	-1303	4004
Age of patent (in years)	12.20	4.78	1	25	12.50	4.48	1	23
Technology area								
Electrical engineering	0.32	0.47	0	1	0.38	0.49	0	1
Instruments	0.10	0.31	0	1	0.12	0.32	0	1
Chemistry	0.12	0.32	0	1	0.13	0.34	0	1

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Table A-2 – continued from previous page

Variables	No parallel invalidity proceeding				Parallel invalidity proceeding			
	Mean	Std. err.	Min	Max	Mean	Std. err.	Min	Max
Mechanical engineering	0.29	0.45	0	1	0.23	0.42	0	1
Other	0.17	0.38	0	1	0.14	0.35	0	1
Invalidity history								
Patent solidified through opposition proc.	0.14	0.35	0	1	0.16	0.37	0	1
Patent challenged through rev. proc.	0.12	0.33	0	1	0.05	0.21	0	1
Patent solidified through invalidity proc.	0.04	0.19	0	1	0.01	0.07	0	1
Proceeding								
Parallel opposition proceeding	0.04	0.20	0	1	0.02	0.15	0	1
Year of infringement action	2004.77	2.53	2000	2008	2004.92	2.36	2000	2008
Litigation value (in th €)	1286.10	3011.48	0	38348	1091.50	2819.15	0	35000
Length of proceeding (in months)	10.87	11.11	0	128	17.51	16.88	0	128
Parallel opposition proceeding	0.04	0.20	0	1	0.02	0.15	0	1
Multi-jurisdictional litigation	0.03	0.16	0	1	0.04	0.20	0	1
LG Düsseldorf	0.68	0.47	0	1	0.58	0.49	0	1
LG Mannheim	0.23	0.42	0	1	0.36	0.48	0	1
LG Munich	0.09	0.29	0	1	0.06	0.24	0	1
LG judgment appealed	0.26	0.44	0	1	0.54	0.50	0	1
Patent holder								
Non-practicing entity	0.19	0.39	0	1	0.29	0.46	0	1
Micro	0.12	0.32	0	1	0.10	0.29	0	1
Small	0.10	0.30	0	1	0.09	0.28	0	1
Medium	0.16	0.37	0	1	0.14	0.34	0	1
Large	0.62	0.48	0	1	0.68	0.47	0	1
Germany	0.69	0.46	0	1	0.64	0.48	0	1
Europe (excl. Germany)	0.19	0.39	0	1	0.31	0.46	0	1
World (excl. Europe)	0.12	0.32	0	1	0.06	0.24	0	1
Top legal representative	0.68	0.47	0	1	0.60	0.49	0	1
Alleged infringer								
Micro	0.14	0.35	0	1	0.16	0.36	0	1
Small	0.18	0.38	0	1	0.14	0.35	0	1
Medium	0.26	0.44	0	1	0.23	0.42	0	1
Large	0.43	0.49	0	1	0.47	0.50	0	1
Germany	0.72	0.45	0	1	0.83	0.38	0	1
Europe (excl. Germany)	0.18	0.38	0	1	0.10	0.30	0	1
World (excl. Europe)	0.10	0.30	0	1	0.07	0.25	0	1
Top legal representative	0.38	0.49	0	1	0.52	0.50	0	1

Table A-3: Comparison of oppositions by alleged infringers at the EPO

	Before	After	Std. err. of mean diff.
Opponents with non-divergent decisions			
±2 months			
Filed patents	11.00	13.26	3.150
Filed oppositions	0.22	0.26	0.074
±6 months			
Filed patents	34.60	36.99	8.970
Filed oppositions	0.75	0.81	0.241
±12 months			
Filed patents	72.16	71.63	17.653
Filed oppositions	1.52	1.67	0.489
Opponents with divergent decisions			
±2 months			
Filed patents	7.05	9.46	4.840
Filed oppositions	0.10	0.34	0.128
±6 months			
Filed patents	19.07	22.56	11.638
Filed oppositions	0.27	0.85	0.238
±12 months			
Filed patents	39.95	45.07	23.404
Filed oppositions	1.17	1.41	0.462

Notes: The sample consist of all alleged infringers having filed at least one opposition against an EP patent twelve months before or after a decision in the parallel invalidity proceeding.

Table A-4: Invalid but Infringed – Example cases

Proc.	First instance						Appeal			Patent	
	Case number	Filing date	Litigation value	Decision	Decision date	Case number	Outcome	Appeal date	Publication. No.	Application date	Technology
INF REV	DU 4 O 219/00 2 Ni 42/00 (EU) et al.	01-Apr-00 02-Nov-00	511,300	infringed revoked	10-May-01 27-Feb-02	2 U 95/01 X ZR 156/02	settlement aff: revoked	12-Apr-07 30-Jan-07	EP0203206	02-May-85	Chemical engineering
INF REV	DU 4 O 248/01 3 Ni 51/01 (EU)	19-Jul-01 05-Sep-01	76,693	infringed partly revoked	28-May-02 21-Jan-03	2 U 84/02	n/a	n/a	EP0912130	01-Apr-97	Furniture and games
INF REV	DU 4 O 356/01 2 Ni 63/04 (EU) et al.	07-Jul-01 01-Dec-04	1,022,583	infringed partly revoked	31-Mar-05 16-Mar-07				EP0101552	05-Jul-83	Electrical machinery
INF REV	DU 4A O 233/01 2 Ni 14/03 (EU)	04-Jul-01 03-Feb-03	500,000	infringed revoked	25-Mar-03 30-Sep-04	2 U 50/03 n/a	settlement withdrawn	n/a 14-Mar-05	EP0692562	12-Jul-94	Textile and paper
INF REV	DU 4A O 234/01 4 Ni 28/01 (EU)	05-Jul-01 07-Nov-01	511,292	infringed revoked	10-Jan-02 12-Nov-02	2 U 27/02 X ZR 16/03	settlement amd: partly revoked	5-Apr-07 25-Apr-06	EP0646362	20-Sep-94	Medical technology
INF REV	DU 4A O 33/01 2 Ni 47/01 (EU)	26-Dec-00 07-Dec-01	1,022,600	partly infringed revoked	05-Feb-02 08-May-03	2 U 36/02 X ZR 115/03	settlement amd: partly revoked	12-Jul-02 01-Apr-08	EP0548475	26-Sep-92	Other consumer goods
INF REV	DU 4A O 453/01 2 Ni 26/02	17-Jan-02 16-Aug-02	1,500,000	infringed partly revoked	14-Jan-03 20-Nov-03	2 U 25/03 n/a	settlement withdrawn	2-Apr-04 08-Sep-04	DE3639669	20-Nov-86	Electrical machinery
INF REV	DU 4A O 185/03 1 Ni 9/04	10-May-03 10-Mar-04	500,000	partly infringed revoked	08-Jul-04 31-May-05	n/a	withdrawn	04-Oct-06	DE3801617	21-Jan-88	Civil engineering
INF REV	DU 4A O 282/03 2 Ni 3/04 (EU)	08-Jul-03 08-Jan-04	500,000	infringed revoked	20-Jul-04 19-May-05	I-2 U 81/04 X ZR 107/05	settlement aff: revoked	23-Jan-06 30-Jun-09	EP0947279	25-Feb-99	Machine tools
INF REV	DU 4A O 371/03 1 Ni 2/04 (EU)	03-Sep-03 22-Dec-03	100,000	partly infringed revoked	28-Sep-04 14-Mar-05	I-2 U 100/04	settlement	n/a	EP0654427	16-Nov-94	Handling
INF REV	DU 4B O 346/03 3 Ni 11/01 (EU) et al.	01-Sep-03 22-Sep-04	350,000	infringed revoked	14-Dec-04 07-Jun-05	X ZR 154/05	amd: partly revoked	05-Nov-08	EP0291194	26-Apr-88	Measurement
INF REV	DU 4B O 458/03 1 Ni 14/04 (EU)	28-Nov-03 07-May-04	500,000	infringed revoked	14-Oct-04 07-Mar-06	I-2 U 105/04 n/a	settlement withdrawn	n/a 22-Apr-10	EP0781234	12-Sep-95	Handling
INF REV	DU 4A O 152/04 4 Ni 64/04 (EU)	25-Mar-04 14-Dec-04	500,000	infringed partly revoked	10-May-05 28-Mar-06	I-2 U 99/05	settlement	24-Feb-10	EP0706338	16-Jun-94	Furniture and games

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Table A-4 – continued from previous page

Proc.	First instance						Appeal				Patent	
	Case number	Filing date	Litigation value	Decision	Decision date	Case number	Outcome	Outcome date	Publn. No.	Application date	Technology	
INF REV	DU 4A O 453/04 3 Ni 48/07 (EU) et al.	18-Nov-04 21-Feb-05	100,000	infringed partly revoked	26-Jul-05 16-May-08	I-2 U 101/05 X ZR 75/08	settlement aff: partly revoked	27-Oct-11 12-Jul-11	EP0753420	09-Jul-96	Transport	
INF REV	DU 4B O 18/04 3 Ni 39/04 (EU) et al.	04-Nov-03 22-Sep-04	500,000	infringed revoked	14-Dec-04 07-Jun-05	X ZR 154/05	amd: partly revoked	05-Nov-08	EP0291194	26-Apr-88	Measurement	
INF REV	DU 4B O 435/04 1 Ni 4/04 (EU)	06-Nov-04 22-Dec-03	2,000,000	infringed revoked	21-Apr-05 22-Feb-06	n/a X ZR 79/06	settlement withdrawn	n/a 26-Aug-10	EP0755348	07-Feb-95	Handling	
INF REV	DU 4A O 122/05 2 Ni 38/05 (EU)	10-Mar-05 02-Aug-05	500,000	partly infringed revoked	09-Feb-06 29-Oct-07	I-2 U 27/06 XA ZR 6/08	not infringed amd: partly revoked	25-Mar-10 02-Apr-09	EP0361155	06-Sep-89	Civil engineering	
INF REV	DU 4A O 253/05 4 Ni 40/06 (EU)	17-May-05 22-May-06	500,000	infringed revoked	20-Jul-06 14-Oct-08	I-2 U 90/06 n/a	settlement withdrawn	29-Aug-11 29-Aug-11	EP0591132	23-Jul-90	Medical technology	
INF REV	DU 4A O 394/05 2 Ni 2/06 (EU)	31-Aug-05 11-Jan-06	500,000	infringed partly revoked	29-Aug-06 20-May-08	I-2 U 115/06	settlement	18-Jul-08	EP0280340	18-Jan-88	Textile and paper	
INF REV	DU 4A O 452/05 2 Ni 1/06 (EU)	11-Sep-05 05-Jan-06	500,000	infringed revoked	21-Feb-06 14-Feb-08	I-2 U 25/06 XA ZR 85/08	not infringed amd: partly revoked	6-Sep-07 29-Jul-10	EP0676763	04-Jul-95	Audio-visual technology	
INF REV	DU 4A O 484/05 4 Ni 7/06	04-Nov-05 25-Jan-06	250,000	infringed revoked	09-May-06 08-Jan-08	I-2 U 60/06 X ZR 49/08	infringed aff: revoked	27-Sep-06 17-Nov-09	DE19945719	23-Sep-99	Other special machines	
INF REV	DU 4A O 552/05 2 Ni 25/06 (EU)	23-Nov-05 22-Jun-06	500,000	infringed revoked	13-Feb-07 10-Jun-08	I-2 U 14/07 n/a	settlement withdrawn	4-Nov-10 10-Nov-10	EP0851376	30-Dec-96	Computer technology	
INF REV	DU 4A O 62/05 4 Ni 45/05 (EU)	15-Feb-05 03-Sep-05	1,000,000	infringed partly revoked	09-Mar-06 02-May-07	I-2 U 28/06 XA ZR 84/07	settlement amd: partly revoked	31-Aug-12 25-Nov-10	EP0821784	18-Apr-96	Measurement	
INF REV	DU 4B O 128/05 4 Ni 52/05 (EU)	12-Mar-05 10-Oct-05	500,000	infringed revoked	14-Mar-06 26-Jun-07	I-2 U 39/06 XA ZR 126/07	settlement sent back to BPatG	27-Aug-10 13-Jul-10	EP0337612	17-Mar-89	Medical technology	
INF REV	DU 4B O 76/05 1 Ni 8/06 (EU)	03-Feb-05 27-Apr-06	1,000,000	infringed revoked	16-May-06 20-Mar-07	I-2 U 57/06 XA ZR 66/07	settlement amd: partly revoked	4-Dec-07 14-Jan-10	EP0350528	15-Jul-88	Thermal processing	
INF REV	DU 4A O 263/06 3 Ni 48/06 (EU)	22-Jul-06 30-Jun-06	200,000	partly infringed partly revoked	14-Aug-07 29-Apr-08	I-2 U 83/07	settlement	19-Aug-09	EP1098706	08-Jul-99	Chemical engineering	

Table A-4 – continued from previous page

Proc.	Case number	First instance					Appeal					Patent		
		Filing date	Litigation value	Decision	Decision date	Case number	Outcome	Outcome date	Publn. No.	Application date	Technology			
INF REV	DU 4B O 160/06 3 Ni 77/06	09-May-06 07-Dec-06	500,000	partly infringed revoked	22-Jul-08 13-Jan-09	I-2 U 74/08 n/a	settlement withdrawn	14-Oct-10 04-Oct-10	DE4337743	05-Nov-93	Civil engineering			
INF REV	DU 4B O 279/06 2 Ni 30/07 (EU)	15-Jul-06 11-Jun-07	1,000,000	infringed revoked	31-Jul-07 13-Nov-08	X ZR 46/09	aff. revoked	22-Mar-12	EP0852359	20-Dec-96	Computer technology			
INF REV	DU 4A O 136/07 4 Ni 65/07 (EU)	22-May-07 29-Oct-07	500,000	partly infringed revoked	05-Jun-08 01-Dec-09	I-2 U 67/08 n/a	settlement withdrawn	10-Nov-11 30-Nov-10	EP0355391	18-Jul-89	Medical technology			
INF REV	DU 4A O 158/07 4 Ni 14/08 (EU)	14-Jul-07 07-Mar-08	400,000	infringed partly revoked	29-Apr-08 13-Oct-09	I-2 U 47/08 n/a	partly infringed withdrawn	2-Jul-09 08-Jun-12	EP0885676	13-May-98	Machine tools			
INF REV	DU 4B O 284/07 10 Ni 6/08 (EU)	27-Nov-07 08-Oct-08	1,000,000	infringed partly revoked	27-Nov-08 17-Dec-09	I-2 U 2/09	settlement	7-May-09	EP0825350	07-Aug-97	Mechanical elements			
INF REV	DU 4B O 310/07 4 Ni 80/08 (EU)	13-Dec-07 01-Aug-08	500,000	partly infringed revoked	05-Mar-09 28-Sep-10	I-2 U 44/09	settlement	4-May-11	EP0835737	08-Oct-97	Other special machines			
INF REV	DU 4A O 152/08 3 Ni 62/08 (EU)	29-Jan-08 16-Oct-08	750,000	infringed partly revoked	07-May-09 05-May-10	I-2 U 71/09	infringed	n/a	EP0500590	10-Oct-90	Surface technology			
INF REV	DU 4A O 270/08 5 Ni 123/09	01-Nov-08 06-May-09	250,000	partly infringed partly revoked	22-Dec-09 03-Feb-11	I-2 U 18/10	settlement	1-Sep-11	DE19727527	30-Jun-97	Measurement			
INF REV	DU 4B O 155/08 4 Ni 40/08	25-Jun-08 20-Mar-08	500,000	infringed revoked	14-Jul-09 16-Mar-10	I-2 U 97/09 n/a	settlement withdrawn	16-Dec-10 10-Dec-10	DE19500529	11-Jan-95	Medical technology			
INF REV	DU 4B O 98/08 4 Ni 68/08	25-Mar-08 26-Jun-08	500,000	infringed revoked	17-Jul-09 22-Jun-10	I-2 U 101/09	settlement	31-Jan-12	DE102005043978	15-Sep-05	Electrical machinery			