

# Scaling Court Decisions with Citation Networks\*

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## ABSTRACT

To compare legal decisions, they need to be located in their joint case-space. So far, this required legal methods and a close reading of each decision. Only in rare circumstance—if the judges’ individual voting records are available—can we estimate such locations quantitatively. This paper introduces a more general measurement approach that relies upon citation networks instead. Modeling the frequency of citations, we estimate the latent positions of both, decisions and legal sources in a joint case-space. While potentially widely applicable, we showcase our model in the context of forum-shopping and forum-selling of Germany’s lower courts.

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# 1 The Promise of Scaling Lower Court Decisions

When comparing legal decisions, how similar is their legal reasoning? The answer to this question is of key concern to everyone with an interest in law—scholars or practitioner alike. Some might want to quickly identify particularly controversial decisions. Others seek to get a more comprehensive view on a large set of decisions—for example to understand patterns across different courts or the development of a legal doctrine over time. So far, this required legal methods and a close reading of each decision which is only realistic for a small set of decisions. Existing approaches for comparing decisions at large scale tackle the issue mostly on the basis of voting behavior of the respective judges in a court (e.g. [Clark and Lauderdale, 2010](#)). It turns out, however, that in cross-national comparison judges do not always take a vote—and if they do, courts only rarely publish the individual votes ([Kelemen, 2013](#); [Raffaelli, 2012](#)). Thus, with existing methods it is only possible to compare courts’ decisions in some countries (e.g. [Martin and Quinn, 2002](#); [Hanretty, 2012a,b](#)).

We introduce a scaling model that estimates the location of legal decisions in a common case-space. Instead of published votes, the model relies on citations. How often does a decision cite a particular legal source? Similar to [Clark and Lauderdale \(2010\)](#), we assume that the closer the decision to a legal source in a common case-space—and hence the more amenable a source to the legal reasoning in the decision—the more likely is a ‘panel of judges’ (or simply a ‘court’) to cite this legal source. The major advantage of our approach is that citations are commonly available in every legal system at all levels because judges need these references to justify their reasoning. Given the ubiquity of citation data, our approach lends itself to a broad range of new empirical settings.

When implementing the model, we first pre-select decisions that actually can be compared on legal grounds. While curating a concise set of legal documents can of course be done manually, we show how to help scale the human effort with easy-to-deploy algorithms from information retrieval. With our model, we assess data from the legal data base *Juris*,<sup>1</sup> and investigate systematic

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<sup>1</sup>Court rulings in Germany are not freely available. *Juris* GmbH is a publishing company that provides a database

tendencies in judicial decision making in an unlikely case. Germany has a civil law system that is renown for a particularly impartial and objective way of creating legal decisions ([Langbein, 1985](#)). However, a recent debate on ‘forum-selling’ and ‘forum-shopping’ at Germany’s *Landgerichte* (district courts) suggests that there are areas where courts are systematically biased ([Klerman and Reilly, 2016; Bechtold, Frankenreiter and Klerman, 2019](#)). Studying cases from press law and antitrust, we indeed corroborate these findings at Germany’s lower courts in Cologne (Köln) and Hamburg for press law, as well as Cologne, Dortmund and Mannheim for antitrust.

We contribute to the literature in three ways. First, we introduce a new model that allows scholars and legal practitioners to systematically compare decisions in the same case-space using citations—which is data that is widely available. Second, we showcase how to scale measurement efforts when analyzing decisions from a large legal corpus of lower court decisions. Tools from information retrieval allow to identify decisions that lie in the same case-space and that can thus be compared to one another. Third, the substantive application of our new scaling model informs recent debates on ‘forum-selling’ and ‘forum-shopping’ because we show that some courts are systematically more plaintiff friendly than other courts. Our model helps investigate systematic biases in court decisions comparatively and at large scale.

Capable of easily mapping so far uncharted areas of law, our approach opens the door to a whole range of new applications. Scholars and practitioners—*independent* of their background in law, business, economics, social sciences or politics—may all want to understand whether systematic tendencies in judicial decision making exist, where they are coming from, and how they effect other legal and political rule-making. Our model provides a fine addition to their analytical toolbox.

The paper proceeds as follows. We begin with surveying existing approaches that are capable of mapping legal decisions in a case-space. The subsequent section explains why citations leave a trace about a court’s tendency in rule making. We then translate this reasoning into a statistical

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of legal documents and information on which we rely on in this paper. The *JURIS* data is very well suited for our endeavor, because it comprises a complete and already digitized corpus of written rulings of all available German court decisions. The annotation of the corpus with meta data makes this data even more valuable. In short, the extraordinary data quality allows us to develop state-of-the-art measurement models to tap into this so far unused data source.

model, and finally study ‘forum-selling’ in Germany’s lower courts in press law and antitrust. A final section concludes.

## 2 Measuring the Content of Legal Decisions

Comparing legal decisions to one another implicitly accepts the notion that the decisions reside on a continuum: very strict decisions on the one end, very lax decisions on the other, and all others somewhere in between. This spatial notion has been formalized into an analytical framework originally developed to study the influence of politics in high courts such as the U.S. Supreme Court (for an overview e.g. [Clark and Lauderdale, 2010](#); [Lax, 2011](#)). But while the resulting case-space model ([Kornhauser, 1992a,b](#); [Landa and Lax, 2008](#); [Lax, 2011, 2012](#)) offers a rigorous analytical framework, one of its most significant limitations is an empirical one. So far there are no tools to easily and reliably map a large number of real-world cases into such a case-space.

Current empirical strategies offer room for improvement. Distinguishing cases on the basis of a court’s verdict (e.g. guilty-innocent, affirm-reverse) allows to tell on which side of the court’s threshold the case falls—but not where on the spectrum this legal decision is actually located. Broad ideological categories (e.g., liberal-conservative) are also of limited use, since they fail to honor the respective legal context. Nevertheless, some even equate the latent political—not the legal—position of a politically nominated (median) judge with a court’s resulting legal decisions (e.g. [Brouard and Hönnige, 2017](#); [Carrubba et al., 2012](#); [Hönnige, 2009](#); [Sternberg et al., 2015](#)). The judge’s displayed political position that is taken as a proxy for her decisions might not even be her own, but can be “inherited” from other actors who nominated the (median) judge such as parties, senators or presidents (e.g. [Epstein et al., 2007](#); [Hönnige, 2009](#)). An alternative approach is to closely analyze the decisions’ content. Law scholars embraced content analysis methods a while ago ([Hall and Wright, 2008](#)). However, when hand-coding potentially a large number of written decisions, reliability can indeed be an issue. In addition, since the task is labour intensive, it is hard to scale—particularly so when time and resources are scarce.

There are various ways in which scholars can make the most of computers when they want to locate decisions in a case-space at large scale. Of course, the words of decisions reflect their meaning. Existing approaches pay close attention to studying the language of legal decisions and have been exploring supervised and unsupervised text-scaling (e.g. [Evans et al., 2007](#); [McGuire and Vanberg, 2005](#); [Dyevre, 2019](#)) or dictionary methods (e.g. [Owens and Wedeking, 2011, 2012](#)). In the light of the specific requirements of legal terminology, further research in this direction promises important progress. Another option is to rely on the legal sources courts cite in their decisions ([Whalen, 2016](#)). The resulting citation networks allow for example to uncover the relevance of a legal decision ([Fowler et al., 2007](#); [Petersen and Towfigh, 2017](#); [Winkels, de Ruyter and Kroese, 2011](#)). Citation patterns have also been used to show that judges chose legal sources neither randomly nor independently of their preferences. [Frankenreiter \(2017\)](#) exploits the institutional setting at the ECJ where—unlike in other courts—two opinions are drafted, one by the *Advocate General* and another one by the *Judge Rapporteur*. He finds that judges tend to cite decisions of judges appointed by Member State governments that have similar preferences regarding European integration. Finally, we are not the first to use citation patterns for explicitly mapping decisions into a case-space. [Clark and Lauderdale \(2010\)](#) analyze search and seizure cases and freedom of religion opinions before the US Supreme Court between 1953 and 2006. But while [Clark and Lauderdale](#) have to consider the judges' voting behavior to estimate valid positions of opinions, we show how to do it without such data. Given that in cross-national comparison the highest courts rarely, or never, publish judges' votes ([Kelemen, 2013](#); [Raffaelli, 2012](#)), we believe that our approach offers a welcome contribution to the existing toolkit for locating decisions in a case-space.

In short, current approaches that locate decisions in the case-space too often work with crude proxies. There are unexplored potentials in going beyond the human effort of reading and coding each single decision. While first work exists that makes use of the information in citation patterns, there is yet no model that allows to map a legal decision in the case-space in a convenient way.

### 3 Locating Decisions Using Citation Data

The text of a written decision serves the same purpose in any legal system. It provides an argument why a certain case is decided in the particular way it is and not differently. Judges cite legal sources to bolster their argument. The sources a court is citing in a decision are not only a technical requirement; citations may also reveal legal preferences. To ultimately understand how to tell a ‘hard’ from a ‘soft’ decision and how to exactly quantify this statement we first take a closer look at the case-space framework. We will then understand why different legal preferences express themselves in the citations of a legal decision and finally consider the consequences arising from this observation.

#### 3.1 The Case-Space

The case-space model comes with a number of core concepts ([Cameron and Kornhauser, 2017a,b](#)). A legal case can be defined as a “concrete, fact-ridden dispute between two (or perhaps more) parties ([Cameron and Kornhauser, 2017a, 2](#))”. The court has to resolve the dispute—and it does so by applying the law as a rule to the facts of the case. All possible cases on the same subject matter reside on a one-dimensional case-space. For example, if the police catches car drivers at a certain velocity, it is possible to map all cases into this case-space on the basis of their speed. For the court to be able to take a legal decision, it requires a rule that tells the court when the defendant has to be convicted. In the example, there needs to be a law that defines the maximum velocity. A driver below that threshold will not be convicted, a driver above that speed will be. Finally, judges may hold own preferences next to the law. An environmentalist judge and a judge who is a sports-car *aficionado* might differ in what they personally consider an appropriate speed limit—irrespective of the law itself.

Turning facts into a disposition on the basis of a rule seems straightforward in the simplified speeding example. And if adjudicating were a simple matter of applying a rule to clear facts, an algorithm would be qualified enough to sit on the bench. The legal reality, however, is far more

complex. Judges have to translate evidence into legal facts. They then need to select the appropriate rule and apply it to these legal facts. Typically, a court has to evaluate legal facts with a rule on more than one single issue to arrive at a verdict, which is why judges ultimately need to weigh and aggregate all issues when they finally speak the law. And given that this process requires interpretation and evaluation, the door is open to human bias—be it conscious or unconscious. Two courts facing the very same case therefore may come to different conclusions and this is increasingly likely the more complex the case.

Human bias leaves a trace in a decision. When courts evaluate facts on the basis of a rule—be it laws, existing precedent, previous opinions on similar cases or legal scholarship—they have to provide reasons to legitimize their judgement (Charlotin, 2017) and signal consistency of their reasoning (Lupu and Voeten, 2012) by citing particular legal sources. The set of citations in a decision is indicative of the court’s opinion (Clark and Lauderdale, 2010; Choi and Gulati, 2008). Two courts who apply the same set of rules to assess the same legal facts will come to the same conclusion citing similar legal sources. If the judges decide a case differently, they have to apply different rules to the legal facts and hence will cite different legal sources. Therefore, the legal sources in a set of decisions of the same case-space hold the key for locating the decisions in that case-space.

### 3.2 How Do Courts Cite?

If a panel of judges’ legal preferences leave a trace in the citations, it should be possible to infer these preferences on the basis of the citations. Similar decisions—i.e. decisions that are in close proximity in a case-space—make similar arguments. Similar decisions therefore cite similar legal sources and will do so with a similar frequency. In result, similar decisions display a typical combination of cited legal sources that substantiate a particular legal view. The cited legal sources alone already signal important information about the kind of legal argument that a court advances in a decision and how it is framed (Alschner and Charlotin, 2018; Clark and Lauderdale, 2012; Charlotin, 2017; Choi and Gulati, 2008).

How do judges pick the legal sources they cite in a decision? We argue that there are three different behavioral mechanisms that drive what and how often a source gets cited in a legal decision. First, studying citation practices of federal appellate court judges in the US, Choi and Gulati (2008, p.91) argue that the substance matter dictates an authoritative core set of legal sources any judge would agree to cite, for instance, binding rules and norms or previous decisions on similar cases. This argument travels across different legal traditions and also holds for civil-law systems (e.g., Choi and Gulati, 2008; Clark and Lauderdale, 2010). Those *core legal sources* get cited to define the legal substance of what is at stake. All legal decisions in the same case-space cite these core legal sources with a similar frequency. Second, there are legal sources we call *idiosyncratic legal sources* because they appear in only one written decision. A court's decision may cite idiosyncratic legal sources to account for the characteristics of a particular case. Citations of such idiosyncratic legal sources cannot be informative to determine the relative locations among similar decisions within the same case-space. Finally, there are *informative legal sources* that help us to estimate the relative locations of decisions within a given case-space. Decisions cite these sources with a different frequency which reflects their location in the case-space. In short, we distinguish between three different types of what Posner (2000, p.384) calls “informational” citations. Among these three different citation mechanisms, only the latter one using informative legal sources allows to identify the relative location of a decision in the case-space.

Many studies of citation patterns find that a decision is more likely to refer to legal sources that are in line with the court's reasoning (e.g., Choi and Gulati, 2008; Clark and Lauderdale, 2010). Sources that reflect the spirit of the decision help make a legally sound argument (Charlotin, 2017, p.282), which is why the court is likely to quote these legal sources. A court tends to refrain from citing legal sources that are not supportive of the advanced legal argument, because they generate cognitive dissonance and, eventually, cause extra effort when justifying the court's decision (Charlotin, 2017; Posner, 2000). The court refers to dissenting legal sources—if at all—only in passing and will cite them strategically (Alschner and Charlotin, 2018; Lupu and Voeten, 2012; Lupu and Fowler, 2013). Courts may distinguish their legal argument from existing ones in order to show

why a certain legal belief is not binding or valid by entertaining a potential counterargument or introducing a more nuanced view. Similar to the analysis of precedent in decisions of the ECJ (Jacob, 2014), these negative citations are used to bolster the credibility of the decision, demonstrating the argument’s coherence or fending-off potential revisions from higher courts. In addition judges try to minimize their chances of reversal by a higher court and to foster their own reputation (Choi and Gulati, 2008; Jacob, 2014).

In result, given limited time and resources, courts are more likely to cite a legal source in line with the legal reasoning of the decision than a legal source that runs against it. Thus, courts are not only more likely to cite supportive legal sources in their decisions, they will also refer to them more frequently.<sup>2</sup>

### 3.3 Implications and Features

To illustrate the implications of the model, we introduce a simple visualization in Figure 1. We begin with the left panel where two decisions  $D_1$  and  $D_2$  in the same case-space cite the informative legal sources  $S_1$  and  $S_2$ . The thickness of the lines corresponds to how often the two decisions are citing the sources. The decision  $D_1$  is citing the source  $S_1$  quite heavily which is why their locations are close to one another. In contrast, the decision  $D_2$  is citing the two sources  $S_1$  and  $S_2$  to a similar degree and its location is therefore more central. Note that  $D_2$  is not completely in the middle between the two sources, because of the way in which  $D_1$  is citing the two sources. The location of the decisions  $D_1$  and  $D_2$  changes when we introduce a third decision  $D_3$  that is citing  $S_2$  and  $S_1$  to the same degree as  $D_1$  is citing  $S_1$  and  $S_2$ . The symmetry of citations now enforces the symmetry of the locations. Both of the previous decisions  $D_1$  and even more so  $D_2$  change their location with regards to  $S_1$  and  $S_2$  when adding  $D_3$ .<sup>3</sup>

In addition, adding  $D_3$  also changes the relative locations in the case-space. Now  $D_1$  and

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<sup>2</sup>Our work bears similar assumptions about the citation process as for example Clark and Lauderdale (2012) who also analyze citation counts.

<sup>3</sup>This is comparable to scaling models in the context of roll-call votes in legislative politics (e.g. Clinton, Jackman and Rivers, 2004). There, ideologically similar legislators vote ‘yes’ (or ‘no’) on much the same roll-call votes. Those who only sometimes vote ‘yes’ or ‘no’ are identified to lie somewhere in between those two groups of legislators.

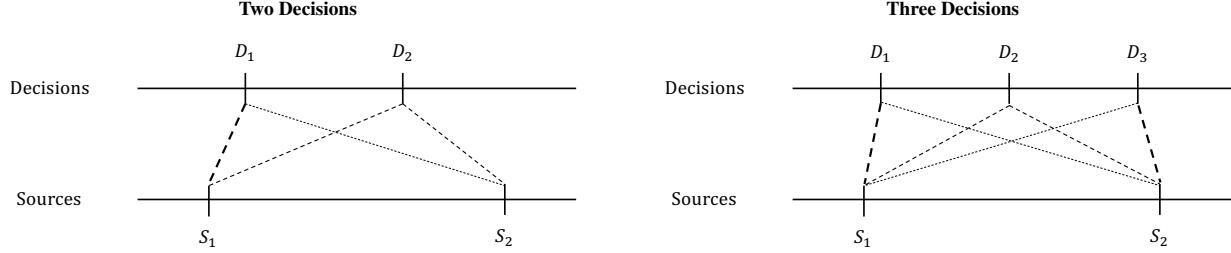


Figure 1: Locations of Decisions  $D_1$ ,  $D_2$  and  $D_3$  in the Same Case-Space Given How Often They Cite Sources  $S_1$  and  $S_2$ . The Thickness of the Lines Corresponds to the Number of Citations. A Third Decision in the Sample Changes the Absolute and Relative Locations of  $D_1$  and  $D_2$ .

$D_2$  do not represent the minimum and maximum of the underlying case-space any longer. Instead, the extreme locations of the new space are defined by  $D_1$  and  $D_3$ . If we define the decisions' case-space to have a standardized metric—for example z-scores—then the numerical value from  $D_2$  would change to a much more central location once the decision  $D_3$  is included into the set of decisions that are being analyzed.

In contrast to previous research (e.g. [Clark and Lauderdale, 2010](#)) we consider all cited legal sources and do not exclude any sources, such as procedural legal sources. Also, with our proposed approach it is not necessary to *ex-ante* distinguish between positive and negative citations and between different types of legal sources to estimate the location of lower court decisions in an appropriate case-space. Positive and negative citations are already accounted for with different expected frequencies in the data generating process. Negative citations should occur less often than positive citations. Furthermore, irrespective of the type of the legal sources, the frequency with which lower courts cite certain legal sources—substantive or procedural—will always be informative because it reflects a choice of the author of a decision.

## 4 A Case-Space Estimator for Decisions and Cited Legal Sources

Now that we developed an understanding for how courts cite legal sources when writing decisions, we translate these insights into an appropriate measurement model. The data we observe consists of a  $n \times m$  *decision-source matrix*  $\mathbf{Y}$  of citation counts, i.e.,  $y_{ij}$  represents the frequency how often

a court’s decision  $i \in \{1, \dots, n\}$  is citing legal source  $j \in \{1, \dots, m\}$ . We use a Poisson distribution as a typical probability model for such citation count data. The systematic component of our model rests on three assumptions. (1) Each decision has a fixed location along a unidimensional case-space. (2) A written decision will cite a legal source more often the closer their locations in this case-space. (3) Each decision has a positive probability to cite any legal source. We express the probability of observing any particular distribution of legal source citations as

$$y_{ij} = \text{Poisson}(\lambda_{ij}) \quad (1)$$

$$\lambda_{ij} = \exp(\alpha_j + \beta_i - \gamma \|\theta_i - \phi_j\|^2). \quad (2)$$

The distance between a decision  $i$  and a legal source  $j$  is expressed as  $\|\theta_i - \phi_j\|^2$ , where  $\theta_i \in \mathbb{R}$  is the location of decision  $i$  and  $\phi_j \in \mathbb{R}$  is the location of legal source  $j$ .<sup>4</sup> The parameter  $\gamma$  captures the overall sensitivity of this difference in the respective case-space. The parameters  $\alpha_j$  and  $\beta_i$  explicitly capture the idiosyncrasies of citation counts. The parameter  $\alpha_j$  expresses the authority of a legal source  $j$ . Some legal sources are by default cited more often than others, simply because they are on average more relevant. Similarly,  $\beta_i$  captures decision-specific differences. Some decisions cite on average more legal sources than others, for example because they are longer.

Identification is a core concern when estimating latent variable models. These models typically have more parameters than observations which results in infinitely many ‘correct’ solutions. Shifting, rotating or scaling one parameter can be easily offset by inversely shifting, rotating or scaling another related parameter. A unique solution needs to address all of these concerns. First, the model has to be anchored in the parameter space so that it does not float around. Second, identification also requires a well defined scale and the model must not be allowed to arbitrarily stretch. But even if local identification is guaranteed, it would still be possible to, third, symmetrically

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<sup>4</sup>This is similar to the strategy of [Clark and Lauderdale \(2010\)](#), but our systematic component employs a richer parametrization (following [Barberá, 2015](#)).

rotate the model in the parameter space by inverting all parameters.

Bayesian estimators address identification challenges by specifying prior distributions (Gelman and Hill, 2007; Jackman, 2009). Following Barberá (2015), we solve local identification of our model with a standard normal distribution for  $\theta_i$  and with a normal distribution with a mean at 0 and standard deviation  $\sigma_\alpha$  for  $\alpha_j$ .

$$\alpha_j \sim N(0, \sigma_\alpha) \quad (3)$$

$$\beta_i \sim N(\mu_\beta, \sigma_\beta) \quad (4)$$

$$\phi_j \sim N(\mu_\phi, \sigma_\phi) \quad (5)$$

$$\theta_i \sim N(0, 1) \quad (6)$$

Global identification is a bit more challenging. Political scientists who estimate locations of political actors and legislative proposals in a common space face a similar problem when they repurpose item response theory (e.g., Clinton, Jackman and Rivers, 2004; Poole and Rosenthal, 2007). They address rotational invariance in at least two ways. Authors either globally identify their model. Highly informative priors on a well known political actor clearly determine who belongs to “the right” or “the left” (Clinton, Jackman and Rivers, 2004; Martin and Quinn, 2002). In a similar vein, in the case of multi-dimensional scaling where prior intuitions about political actors might not be as well defined, Jackman (2001) proposes to set priors on well understood legislative proposals instead. However, fixing certain decisions or legal sources is not possible in our context. *Ex-ante*, an analyst is neither certain about a clear location of certain decisions nor about the location of the cited legal sources. Avoiding any unjustified bias from priors, the model should identify the parameters on the basis of the citation data only.

The other option to address rotational invariance is to not identify a model globally at all. Since the model can flip, the respective posterior distribution can have two modes. While in theory the sampler could visit both sides, in practice this concern often turns out not to be an issue as

long as there is a reasonably large number of political actors whose locations can be reasonably well distinguished (Jackman, 2001, 2004). It is then sufficient to initialize the sampler around an educated guess. Even with symmetric—and thus for rotational invariance uninformative—priors the algorithm quickly converges to the correct posterior (Jackman, 2009). Barberá (2015) follows this latter approach in his original implementation of the model we are building on here. We find, however, that a sampler indeed can flip sides which is why we have to resort to a different strategy.

We use STAN to run an initial model that identifies the two most extreme decisions as anchors for the second run. For this first run, we use one single chain that is not identified with regards to rotational invariance and calculate the median of all parameters  $\theta$ . For the second run—the ‘proper’ estimation—we use these two anchors to identify rotational invariance. If in a draw the right anchor ends up to the left of the left anchor, we have reason to believe that the model flipped and therefore multiply all  $\theta$  parameters with  $-1$ . In this second run, we draw overall 8'000 times from the posterior across multiple chains to effectively explore its central tendency and variation.<sup>5</sup>

## 5 Forum-Shopping and Forum-Selling in Germany’s Lower Courts

Are some lower courts systematically more plaintiff friendly than other courts? We now study decisions by German *Landgerichte* (district courts) and *Oberlandesgerichte* (regional courts of appeal) with our model to see whether we can uncover systematic evidence for forum shopping and forum selling. While it has been documented that plaintiffs engage in ‘forum shopping’—and judges in ‘forum selling’—if respective institutional incentives are in place (e.g. Bechtold, Frankenreiter and Klerman, 2019), Germany is a particularly unlikely case for this kind of behavior: Its civil law system is known to generate decisions in a bureaucratic way, and most importantly, without recording the individual votes of the participating judges who can be seen as apolitical career civil servants. As a matter of fact, Germany is often cited as the exemplary case of an impartial and objective civil law system (Langbein, 1985). Extending research beyond the well-known U.S. context, Bechtold,

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<sup>5</sup>Please see the appendix for convergence diagnostics.

[Frankenreiter and Klerman \(2019\)](#) interview attorneys, judges and court officials and document mechanisms through which forum selling in fact also occurs in Germany. In areas like press law and antitrust where German citizens can choose the court they want to file their case with, litigants indeed strategically “shop” for the forums that suit their purpose. In return, courts who wish to establish themselves as a go-to-place in a certain legal area rely on different means to be particularly appealing. Earning a reputation for a tendency in rule making is a successful strategy when “selling” the own forum—anecdotal evidence also echoed in recent press reports ([Dahlkamp and Schmid, 2014](#); [van Lijnden, 2016](#)). Following the lead of [Bechtold, Frankenreiter and Klerman \(2019\)](#), we therefore decide to study case-spaces in press law and antitrust. Our quantitative analysis will test expectations generated by their case studies on a large sample of decisions.

## 5.1 Collecting Data for a Case-Space

How to identify an appropriate set of legal decisions that can be compared to one another? And how to turn citation patterns into a document-source matrix that can be fed into the measurement model? An analyst first has to find, read, and curate cases that relate to the exact same legal topic. In addition, the time frame has to be narrow enough to guarantee the same regulatory context—after all each decision needs in theory be able to cite each legal source. She then determines all legal sources the judge was citing. Finally, she counts all unique sources per decision and turns them into a table: Each row corresponds to a decision and each column carries the count for the respective citations of a legal source.

To save the effort of relying on manual labour for this task, we show how to employ technology and, at the same time, keep this process transparent and replicable. We use methods from information retrieval for collecting a well defined set of decisions, then identify the citations, and finally generate the decision-source matrix. Table 1 documents the different approaches we take.

Table 1: Overview Over Data Collection.

	Basic Search	Enhanced Sample
Custom Indexed Data Base	$d_{1A}$ : Press Law: Infringement $d_{2A}$ : Press Law: Compensation	$d_{1B}$ : Press Law: Infringement $d_{2B}$ : Press Law: Compensation
Juris Homepage	$d_3$ : Antitrust	

### 5.1.1 The Data from Juris

Our data is from the legal database *Juris*<sup>6</sup> which comprises a comprehensive digital collection of all available German court decisions. Each of *Juris*' records contains not only the complete text, but also further meta data such as titles, dates or the respective court. The data provides information on the further fate of a legal proceeding within the judicial hierarchy, all citations a legal decision makes (backward citation), as well as other legal decisions that refer to a certain decision (forward citation). The annotation of the corpus of decisions with meta data makes the further processing particularly easy.

### 5.1.2 Finding Similar Decisions in a Data Base

Granted access to the backend of *Juris*, we worked with a data base (*MongoDB*) that was indexed with a *Lucene* based search engine (*ElasticSearch*). This infrastructure allowed us to make full use of search engine functionalities and query this corpus as we saw fit. While we collected the data for cases on press law with this infrastructure, we also used a second approach for the sake of reproducibility. For the antitrust case, we accessed the data through the frontend, working with *Juris*' own search functionality on their homepage.

One of the key tasks of any search engine is to find documents that are similar to a query term. In the judicial politics literature, high level approaches such as the use of plagiarism software have been applied for the same task (Hinkle, 2015). Here, we measure the fit between the query terms conceptualized as a “bag of word”, and the documents in the corpus with the cosine similar-

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<sup>6</sup>The data base is comparable to services like *Westlaw* for the British or the U.S. context.

ity—a fundamental measurement that finds widespread application in many search engines.<sup>7</sup>

All documents in the data base can be represented with one large term-document matrix that captures the counts of each word in each document. These counts are then weighted with the *term frequency-inverse document frequency (tf-idf)* to reflect the importance of a word in a document. Each document can be represented with a vector  $\vec{v}_i$  that contains all importance-weighted counts for all words. The cosine between two vectors  $\vec{v}_q$  and  $\vec{v}_d$ , which is defined as the scalar product of those vectors after being normalized, is a very good measure for the similarity between a query document  $q$  and any other document  $d$  in a corpus. This cosine similarity is calculated as

$$\text{cosine similarity}(q, d) = \frac{\vec{v}_q \cdot \vec{v}_d}{|\vec{v}(q)| \cdot |\vec{v}(d)|}$$

with the enumerator being the scalar product between the two vectors  $\vec{v}_q$  and  $\vec{v}_d$ . The denominator normalizes both vectors with the product of their Euclidian lengths.<sup>8</sup>

### 5.1.3 Defining the Set of Decisions in a Case-Space

For the application to press law, we define a number of key words that describe the two areas we are interested in: decisions regarding claims for compensation and decisions concerned with claims for injunction.<sup>9</sup> Acknowledging human limitations in devising dictionaries for direct document selection (e.g. Beauchamp, 2017; King, Pan and Roberts, 2013; Puglisi and Snyder Jr, 2011), we strive to mitigate this bias. The key terms are a seed query for the search engine and allow to retrieve a large collection of 100 documents that are the most similar to the search terms. A trained human coder then uses reasoning to identify those cases that truly belong to the same case-space. In result, we select nine cases on privacy infringements through the publication of photos in print media and a respective claim for compensation (dataset  $d_{1A}$ ). We also collect six decisions on

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<sup>7</sup>For a more in-depth treatment, see Manning, Raghavan and Schütze (2009).

<sup>8</sup>The *Lucene* scoring built into the *ElasticSearch* search engine further refines this measure and allows for more fine grained specifications of search queries. For further information please refer to [https://lucene.apache.org/core/4\\_9\\_0/core/org/apache/lucene/search/similarities/TFIDFSimilarity.html](https://lucene.apache.org/core/4_9_0/core/org/apache/lucene/search/similarities/TFIDFSimilarity.html) (last accessed April 2021).

<sup>9</sup>We provide the respective dictionaries in the appendix.

privacy infringement through criminal act allegation in the media and the corresponding claim for injunction (dataset  $d_{2A}$ ).

For antitrust law we proceed in a similar way—this time, however, we access the database through the *Juris* online portal. We search with key words on antitrust<sup>10</sup> for decisions from German district courts (*Landgerichte*). Again, a trained coder reviewed all resulting 64 decisions and clustered them into reasonable topics. We identified twenty decisions in the same case-space regarding damage claims following from a cartel’s action (dataset  $d_3$ ).

The keyterm queries to identify legal decisions from the same case-space result only in a modest amount of suitable decisions. For the two case-spaces in press law we therefore enlarge our sample with the help of the search engine. This time we take the titles of the decisions from the two already identified sets  $d_{1A}$  and  $d_{2A}$  as query terms.<sup>11</sup> The top 25 most similar results are assumed to belong to the same case-space—and we use those decisions as the enlarged set for claims for compensation (dataset  $d_{1B}$ ) and enlarged set of decisions on privacy infringement through criminal act allegation in the media and the corresponding claim for injunction (dataset  $d_{2B}$ ).

Once the decisions in each set are defined, identifying the citations is straightforward: *Juris* already enriched all decisions with meta data. When accessing the original *Juris* data for press law with the own search engine, all sources of a decision are readily available as a list. In turn, when querying the data via *Juris*’ homepage, downloading each decision’s HTML page allows to extract citations on the basis of embedded hyperlinks.<sup>12</sup> As a third and final step, we count the sources in all legal decision. We define a legal source by its section (*Paragraph*) and paragraph (*Absatz*). The same law and section, but with a different paragraph counts as another legal source.

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<sup>10</sup>Again, we provide the respective dictionary in the appendix.

<sup>11</sup>An example for the collection on compensation cases is decision ‘LG Köln Aktz: 28 O 567/14’ with the following (German) title: “*Unterlassungsanspruch hinsichtlich der Bildnisveröffentlichungen wegen Verletzung des allgemeinen Persönlichkeitsrechts*”. For the collection of infringement cases, an example is decision ‘LG Heidelberg Aktz: 2 O 162/13’ entitled “*Störerhaftung des Betreibers einer Internet-Suchmaschine: Anzeige von Links durch die Suchmaschine zu Internetseiten Dritter mit persönlichkeitsrechtsverletzenden Inhalten*”.

<sup>12</sup>On some rare occasions, decisions use the ‘Ibid.’ citation style (‘a.a.O’ in the German context) and the *Juris* data does not fully annotate this information (see also [Coupette and Fleckner, 2018](#)). The count of existing links between a decision and a legal source is potentially lower if a court uses this citation style. If anything, this bias makes our final estimates more conservative.

Legal sources can be references to German Civil Code (e.g., a particular section of the BGB), to criminal law (e.g., a section in the StGB), to code of civil procedure (e.g., a section in the ZPO) or to a section in the German constitution (the *Grundgesetz*, GG); but also previous decisions of both lower courts (e.g. a decision written at the OLG Hamburg) and higher courts such as the Federal Court of Justice (BGH) or the German Federal Constitutional Court (BVerfG) as a specialized court of higher order. We also consider mentions of academic articles. Using the meta data, we then construct the respective decision-source matrix  $Y_{ij}$  that identifies all cited legal sources ( $j$ ) for each pre-selected decision ( $i$ ). When counting the sources, we leave out all citations to idiosyncratic legal sources, meaning any legal source which is cited by only one decision.<sup>13</sup>

## 5.2 Application to Press Law

Let us now analyze the legal decisions in press law. Jürgens (2014) gathers data on press law caseload at Germany’s regional courts. He finds that between 2010 and 2012, Berlin (28.67%), Hamburg (22.32%), and Cologne (*Köln*) (11.94%) adopt the bulk of all legal decisions with the rest of the caseload shared among all other courts. Authors disagree on how to interpret these data. Some argue, that there are systematic tendencies in rule-making favoring litigants who defend themselves against the press at these three places (Dahlkamp and Schmid, 2014; Höch, 2018; Jürgens, 2014, 2016; Kompa, 2012; Sajuntz, 2014; van Lijnden, 2016). The high case load is a result of litigants who—aware of these tendencies—select their courts strategically. Adding to the data from case loads, authors substantiate their claims with anecdotal evidence from either the court in Cologne (Dahlkamp and Schmid, 2014; Jürgens, 2014, 2016) or Hamburg (Höch, 2018; Jürgens, 2014, 2016; Kompa, 2012). Others contend that this interpretation is wrong. The high number of cases in Berlin, Hamburg or Cologne is rather the result of a concentration of media companies—and that includes an eco-system of specialized press lawyers who can serve them (Dölling, 2015; Höcker and Brost, 2015). Anecdotal evidence suggests that this is the case in

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<sup>13</sup>These idiosyncratic legal sources do not offer any information about locations in the context of our model and leaving them out speeds-up estimation.

particular for Berlin (Dölling, 2015). Answering the call for an analysis that “meets the standards of an empirical science” (Dölling, 2015, 130, *own translation*), we investigate these claims with our measurement model. Are the courts in Hamburg and Cologne really more likely to adopt decisions that are friendly to litigants and hostile towards the press?

### 5.2.1 Estimates Of Decision Locations

Based on these 25 most (cosine) similar decisions each, we generate the decision-source matrices for  $d_{1B}$  and  $d_{2B}$ , omitting idiosyncratic references. Figure 2 displays the median estimates with a circle and the bars indicate the core 90% credible interval.<sup>14</sup> In the first set of legal decisions—the collection on compensation—the courts in Cologne and Hamburg cluster on one end of the spectrum; all other courts can be found on the other end. Decisions on injunctions show more mixed positions. On the top of each figure we present the mean difference between the positions of decisions from Cologne and Hamburg, in contrast to all others. As the credible intervals indicate there is evidence in favor of a difference between the two groups.

In sum, we find empirical evidence that lends itself to the experts’ and journalists’ expectations. In the context of the decisions in press law we analyzed, lower courts throughout Germany show systematic differences in their judgments on comparable cases when it comes to compensation or injunction in privacy infringement cases.

### 5.2.2 A Qualitative Case Study to Assess the Model Validity

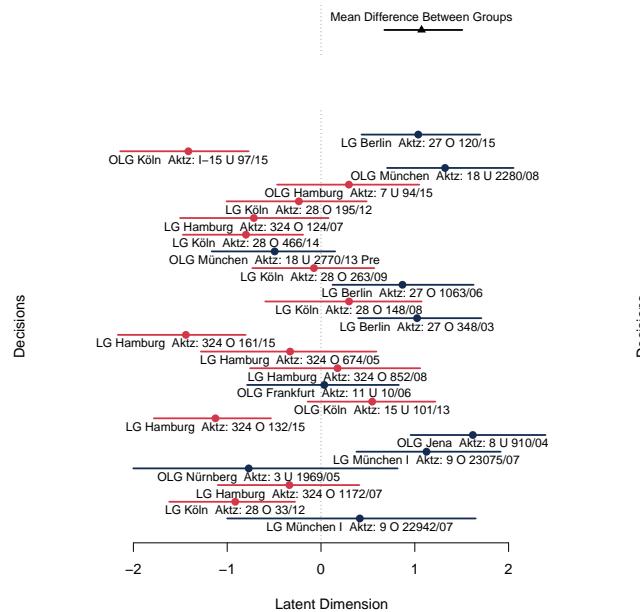
We now qualitatively assess the validity of our estimates and study three decisions from the extended set of cases on privacy infringement and the claim for compensation ( $d_{1B}$ ): Figure 3 charts two decisions that are scaled at similar positions on the latent dimension (LG Hamburg, 324 O 161/15 and LG Cologne, 28 O 466/14) and one decision that is scaled at the opposite end (LG Munich, 9 O 23075/07).<sup>15</sup> Our model predicts a high probability that the position of LG Munich,

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<sup>14</sup>We report the estimates for the two smaller sets  $d_{A1}$  and  $d_{B1}$  in the appendix.

<sup>15</sup>To calculate these first differences, we subtract the respective position estimates for all posterior draws from one another.

**Privacy Infringement—Compensation**



**Privacy Infringement—Injunction**

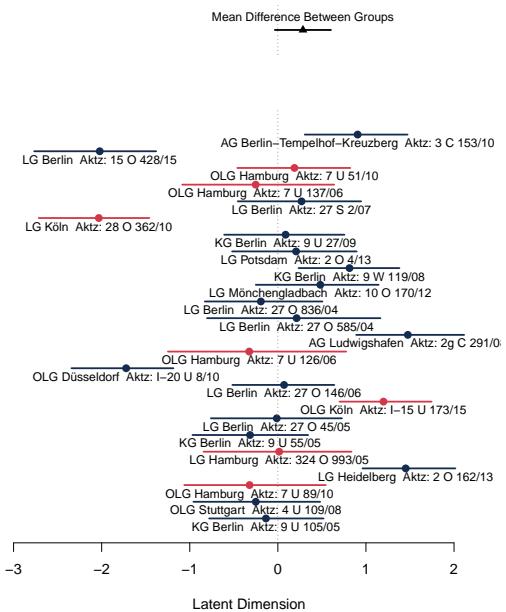


Figure 2: Estimated Locations of Written Decisions ( $\hat{\theta}_i$ ). Set of Decisions Using a ‘More-Like-This’ Query. On the Top: Mean Difference Between the Decisions from Courts in Cologne and Hamburg and All Others. Points Indicate the Median of the Posterior Draws. The Bars Represent the Central 90% Credible Interval.

9 O 23075/07 is different from LG Hamburg, 324 O 161/15 and LG Cologne, 28 O 466/14. In return, the probability that LG Hamburg, 324 O 161/15 and LG Cologne, 28 O 466/14 are different from one another is relatively low. If our approach is valid, then similar legal decisions will derive their legal argument using similar legal sources and the legal decision that is distinct should rely on different legal sources.

### Privacy Infringement—Compensation First Differences of Three Decisions

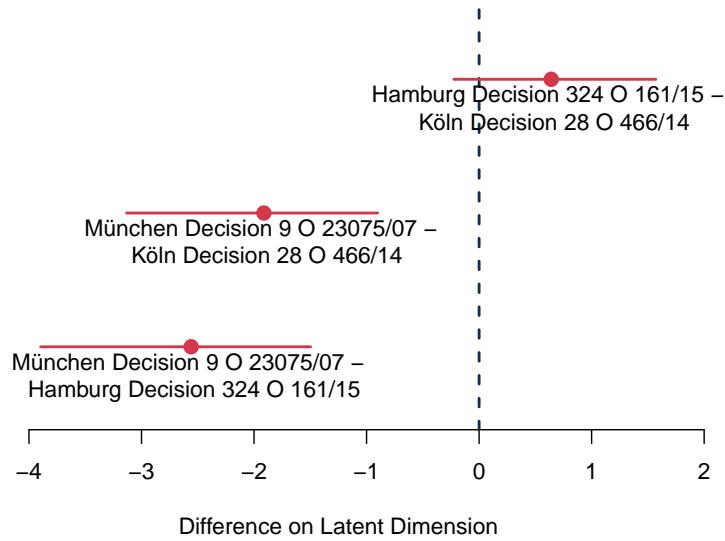


Figure 3: Estimated Differences in the Location ( $\hat{\theta}_i$ ) for Hamburg Decision 324 O 161/15, Cologne Decision 28 O 466/14 and Munich Decision 9 O 23075/07. Points Indicate the Median of the Difference of the Respective Posterior Draws. The Bars Represent the Central 95% Credible Interval of the Difference of the Respective Posterior Draws.

In the appendix we report a full legal interpretation of the arguments and sources the three courts are using. Figure 4 summarizes our findings and illustrates that our scaling approach is indeed capable of differentiating between different nuances in the main body of the decisions, where courts argue the cases. The figure is read from top to bottom. Following the solid line (Hamburg decision), dashed line (Cologne decision) and dotted line (Munich decision) leads to the legal norms and the case-law which are used to develop the judicial arguments over the course of the different decisions. In the initial parts of the decisions there is overlap between the legal norms

on which a case is based on. This is not surprising as these norms are presented by the litigant to initiate the cases based on similar scenarios. However, the Hamburg and Cologne decision argue based on similar legal norms and case-law while the Munich decision cites different sources than the other two decisions. Ultimately, referring to different norms and case-law leads to different outcomes favoring either the litigant or the defendant. This speaks to the validity of our scaling approach: the median scores estimated for the Hamburg and Cologne decision are located at similar ends of our case-space while the Munich decision is placed at the opposite end (Figure 2).

### 5.2.3 Assessment of Model Fit using Posterior Predictive Checks

Finally, we also want to assess whether the model actually fits the data generating process that we posit using posterior predictive checks. We therefore predict the outcome variable on the basis of the last 50 parameter draws and plot the predictions against the original data. Figure 5 displays the results for all models. Each figure represents the predicted citation counts  $\hat{y}_{ij}$  for all decision-source pairs as a histogram. The figures chart the respective counts horizontally and show the square of their occurrence vertically.<sup>16</sup> Credible intervals are at the core 80%, 60%, 40% and 20% of the distribution. The solid lighter line depicts the median prediction across all models. The darker line plots the observed data.

Our predictions mostly match the observed data and we conclude that the models do a good job in predicting the observed counts. For the set of cases that claim compensation for privacy infringements, both models do very well as long as the respective decision-source pair is cited frequently. We are thus confident that our systematic and our stochastic component correctly model the true underlying data generating citation count process.

## 5.3 Application to Antitrust Law

Antitrust is yet another area in German law that offers incentives for plaintiffs or courts to behave strategically. Plaintiffs can file their case either at the seat of a cartel member or at the place where

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<sup>16</sup>In line with Clark and Lauderdale (2012), we use the counts' squared values for better visibility.

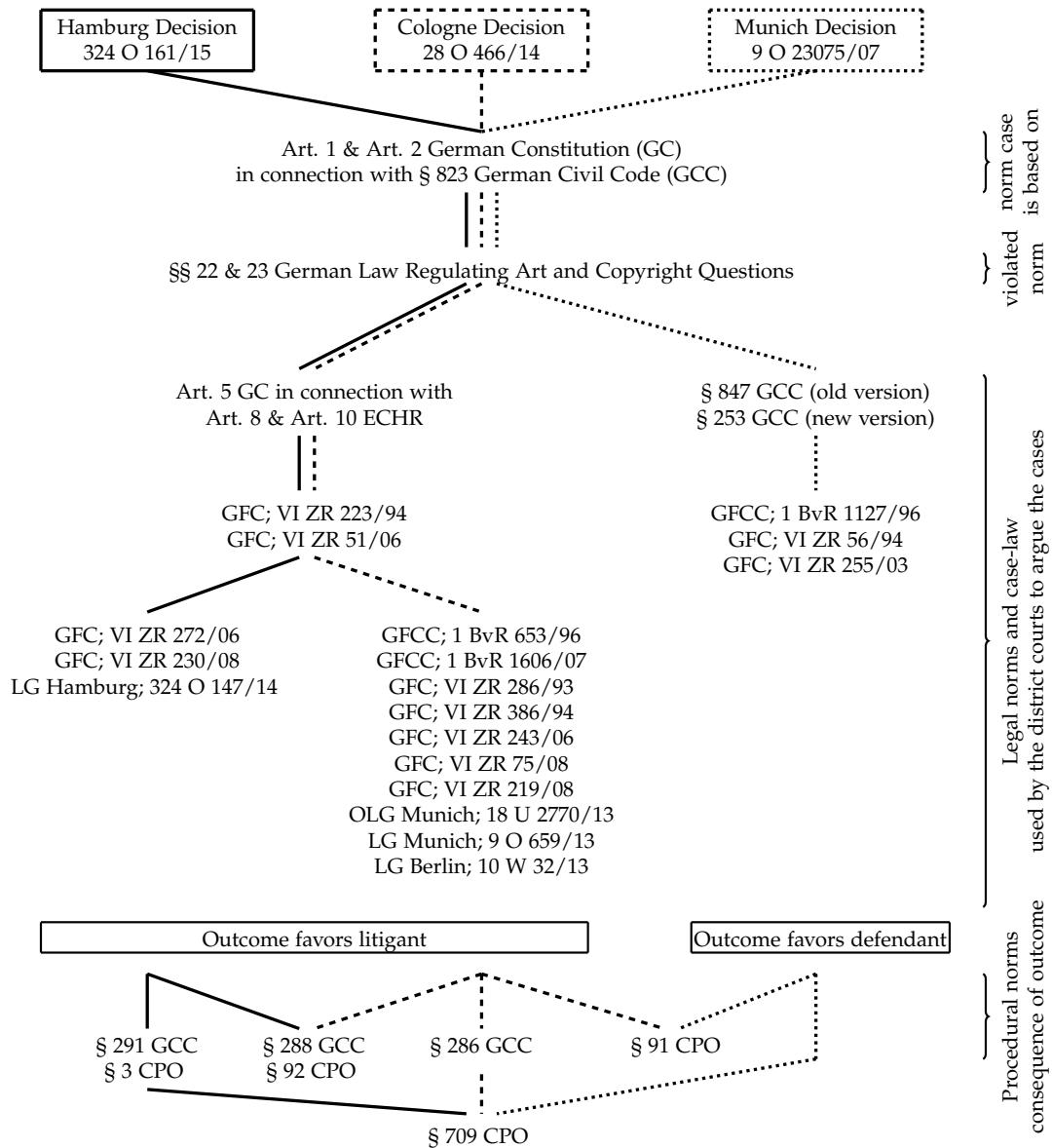
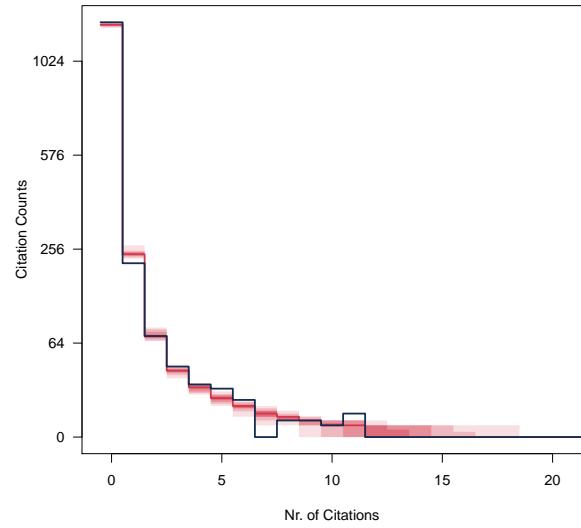


Figure 4: Summary of Legal Argumentation in Three Decisions from the Case-Space on Privacy Infringement and Claims for Compensation in Figure 2.

Privacy Infringement—Compensation



Privacy Infringement—Injunction

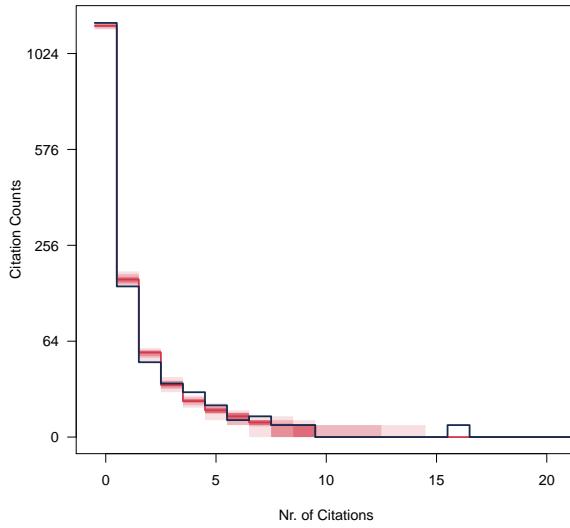


Figure 5: Posterior Predictive Checks. The Figures Visualize the Citation Counts of All Possible Decision Source Pairs in Form of a Histogram. Counts Are Displayed Horizontally and Their Respective Frequencies Is Shown Vertically. Predictions in Red Are Based on the Last 50 Parameter Draws of the Sampling Chain with Credible Intervals at 80%, 60%, 40% and 20%. Median Predicted Counts Are Represented with a Red Line, the Observed Data with a Blue Line.

mischief occurred. Often, cartels operate nationally—which means that the plaintiff can chose from the overall 24 regional courts when filing the complaint. Courts themselves are interested in attracting cases for their highly visible and exciting nature.

[Bechtold, Frankenreiter and Klerman \(2019\)](#) indeed find some evidence in favor of forum selling for the regional court in Mannheim. However, they are more cautious in their conclusions with regards to other cases. According to their interviews, the three regional courts in Cologne, Dortmund and Mannheim are particularly plaintiff friendly. In contrast, there are other courts such as Kiel, Leipzig, Düsseldorf or Munich that are less so.

Figure 6 plots the result for our twenty decisions. The courts in Mannheim and Dortmund tend to adopt decisions that are on one side of the spectrum. Decisions from Cologne seem to have a more central position in our sample. Other courts either occupy the centre or display estimated locations of decisions on the centre-right. The small plot on top charts the difference between the decisions from courts in Cologne, Dortmund and Mannheim versus all other courts. The results

support the existing qualitative evidence. Our results show that the mean differences between decisions of those three courts and the other courts for the case-space in antitrust is systematic.

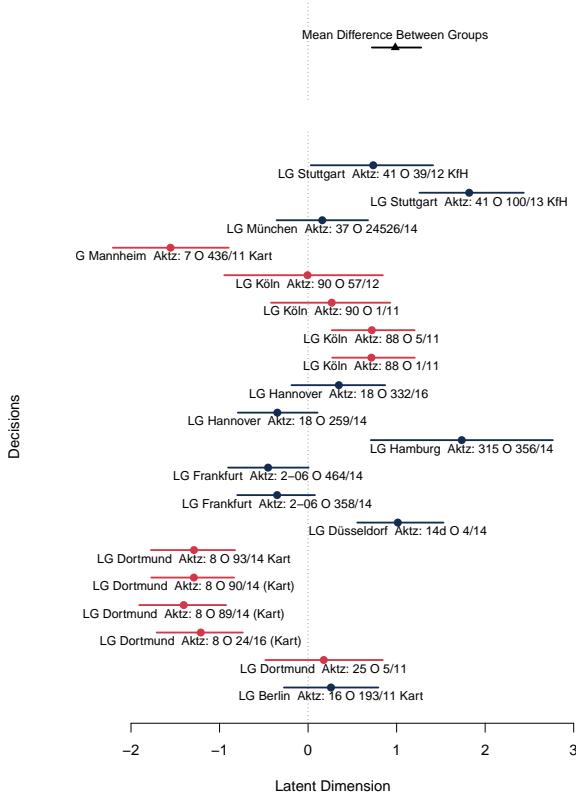


Figure 6: Estimated Locations ( $\hat{\theta}_i$ ) of Written Decisions on Antitrust. On the Top: Mean Difference Between the Decisions from Courts in Cologne, Dortmund and Mannheim and All Others. Points Indicate the Median of the Posterior Draws. The Bars Represent the Central 90% Credible Interval.

## 6 Conclusion

Legal scholars and political scientists are not only interested in understanding the decisions judges make, but also seek to analyze the policy implications of written decisions. Previous strategies usually rely on voting data of the involved judges (e.g. [Clark and Lauderdale, 2010](#)). But in cases where no such records exists, empirical strategies to scale decisions in a common space are still missing. We show how to estimate and consequently compare positions of various actors in a

common case-space of court decisions using citations networks. Our model rests on the notion that ‘similar’ decisions, i.e. decisions with similar locations in a common space, should cite similar legal sources using similar citation patterns.

To showcase the abilities of our model, we study a particularly challenging case: the German legal system. Qualitative evidence indicates that German lower courts have a systematic bias in some legal areas, engaging in *forum selling* in press law and antitrust ([Klerman and Reilly, 2016](#); [Bechtold, Frankenreiter and Klerman, 2019](#)). We corroborate these findings. Indeed, there is evidence that some lower courts—in press law Cologne and Hamburg, and for antitrust Cologne, Dortmund and Mannheim—do take systematically biased decisions. Our detailed legal analysis of three decisions from claims for compensation regarding privacy infringements corroborates our measurements. We can also replicate our findings for different sets of decisions. In addition, we show how to find appropriate decisions in a large legal corpus that all belong to the same case-space, thus leading the way to analyzing larger sets of legal decisions without human intervention.

Of course, there are limits to what our model can do. Just like any other item-response theory approach—for example when locating parliamentarians on a left-right spectrum—all units that are being scaled need to reside in the same latent space. For our legal application, this means that all decisions have to concern the same legal matter and this also includes a constant regulatory contexts: Any major legislative change that affects the legal sources available to the judge is likely to introduce bias. Future research might build on our model to automate the process of identifying decisions that belong in the same case-space even further.

Our model enriches the toolbox for an interdisciplinary group of scholars who study judges and their decisions quantitatively. Legal scholars might be interested in unveiling the development of doctrine across time and space. Political scientists might want to understand the nexus between institutions and power. Others, like economists or sociologists, might rather be concerned with the effects of legal decisions on business or societies at large. Common space positions of legal decisions are the foundation for the development and testing of powerful analytical models and may find their application in any of these fields.

Lastly, our insights have the potential to be useful beyond academia. Locating written lower court decisions in a common space has also important practical implications for law firms. Suppose a lawyer who is in favor of an extreme position in an ongoing case is trying to build an argument. Using our scaling model, she can obtain a quick overview over the tendency in each ruling she selects. This does not only help her identify the locations of courts who are in favor of her own opinion. She could also study the arguments of the opposite side to be able to anticipate and preempt them. Thus, locating actual decisions in a case-space is very helpful for all who want to quickly spot similar or opposing decisions. With our model they can retrieve an easy roadmap capable of guiding them in their professional effort.

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# Scaling Court Decisions with Citation Networks

## *Appendix*

### A Proof of Concept for the Model

We devise toy examples to show that our model indeed correctly picks up positions in a way we expect. Let us begin with a baseline experiment. The artificial data we constructed in Table A.1 specifies whether a legal decision cites a certain source or not. There are five decisions that refer to five different legal sources. If the decision refers to a legal source, it carries a 1, otherwise it has a 0. The way the data is set up, it is straightforward to see that all decisions should be distributed symmetrically and at equal distances in the case space.

Table A.1: Toy Data 1: Does a Decision Cite a Source?

	Source 1	Source 2	Source 3	Source 4	Source 5
Decision 1	1	1	0	0	0
Decision 2	0	1	1	0	0
Decision 3	0	1	1	1	0
Decision 4	0	0	1	1	0
Decision 5	0	0	0	1	1

We compare these results with a null-model where we randomly rewire the citation matrix. Figure A.1 depicts the connections—on the left the systematic data and on the right the randomly rewired matrix. We then measure the ideal points using the model from the main paper—the only difference is to select the appropriate link function for this kind of data, i.e. a logit link function. Overall, we take 8'000 draws from the posterior. The experiments are encouraging: Figure A.2

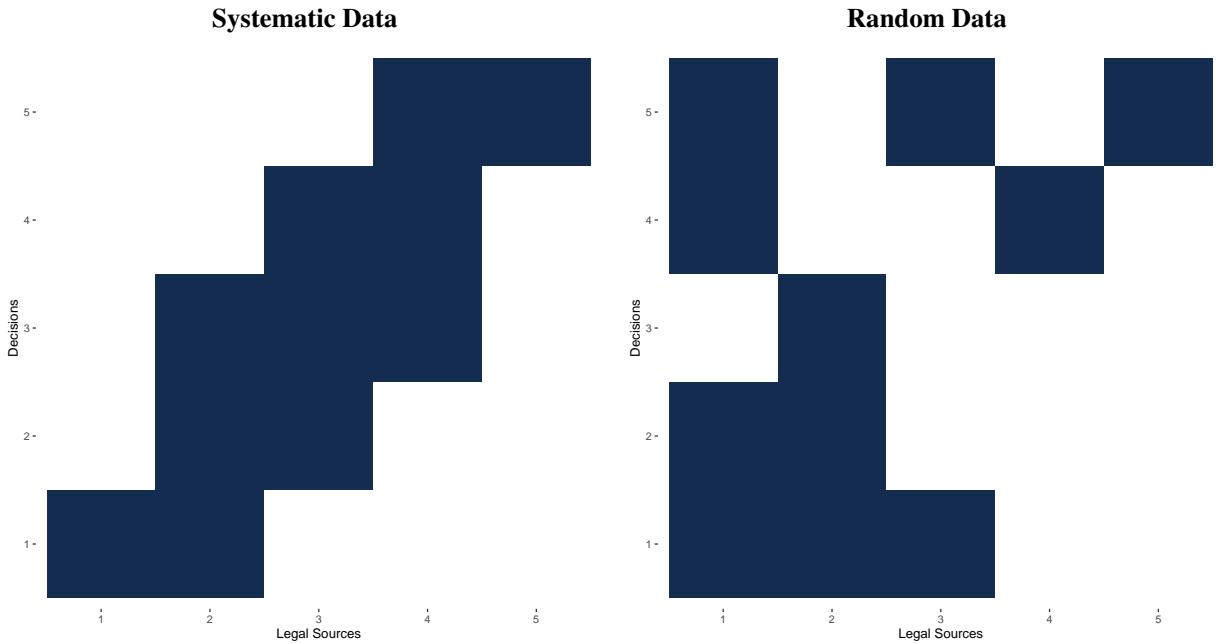


Figure A.1: Citation Source Matrices. Connections in Dark Blue.

shows on the left panel for the systematic data that as expected all estimates are distributed with equal distance in the case space. Credible intervals are also well behaved. The estimated locations we can retrieve from the randomly rewired citation matrix are—as expected—quite random. Figure A.2 indicates on the right the results with random ideal points and overlapping credible intervals.

Recording only whether a court cites a legal source or not is quite a strong assumption. It seems much more realistic to also think about how often a court is citing a source. While a decision considers a dissenting legal source, it might cite it only once or twice. But a legal source that is relevant will be cited much more often. We therefore also estimate ideal points on the basis of the more realistic data structure in A.2.

Again, we also rewire this count data and randomly scramble the citation counts. Figure A.3 shows again both resulting citation matrices. On the left the systematic data and on the right the random permutation. All decisions cite all sources—however they do so with a different frequency. The resulting citation graph with weighed edges can not be estimated with a logit link function. Count models such as the poisson link function allows to appropriately account for the data gener-

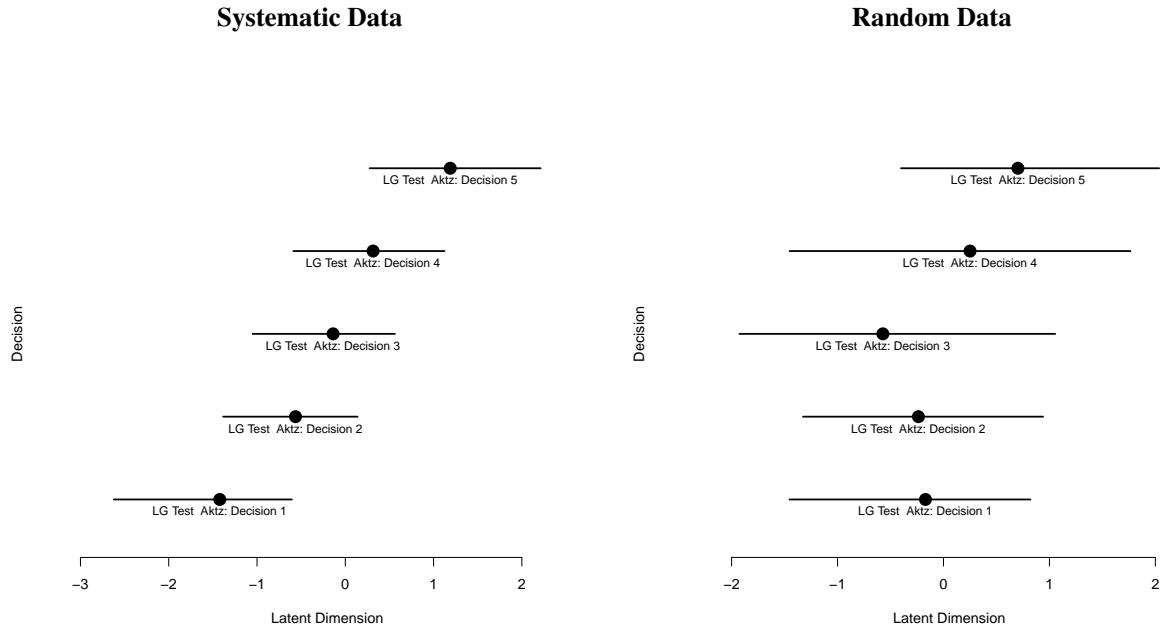


Figure A.2: Estimating the Position of Decisions on the Basis of the Data in Table A.1 and the Rewired Data.

Table A.2: Toy Data 2: How Often Does a Decision Cite a Source?

	Source 1	Source 2	Source 3	Source 4	Source 5
Decision 1	10	5	1	1	1
Decision 2	1	10	5	1	1
Decision 3	1	4	7	4	1
Decision 4	1	1	5	10	1
Decision 5	1	1	1	5	10

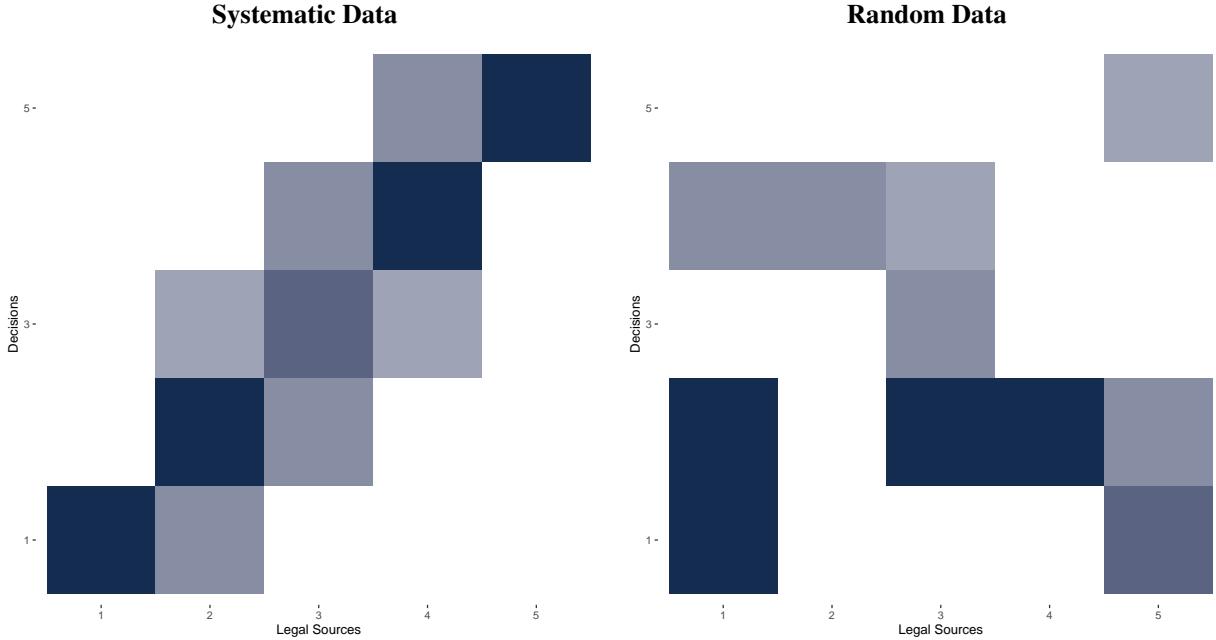


Figure A.3: Citation Source Matrices. Connections in Blue. Darker Shadings Represent a Higher Count.

ating process.

We use the exact same setup to estimate the bayesian Model—including also the flipping to solve rotational invariance—and sample overall 8'000 draws from the posterior. Results in figure A.4 show that the model retrieves ideal points that reflects the data. On the left, we clearly see the systematic pattern from the citation counts also emerging in the positions of the decisions. Credible intervals indicate that the model is capable to handle the count input data from table A.2 well. In contrast, the model on the right is an image of the random data. The estimated locations are again without a clear pattern and the credible intervals are wide.

## B Enhancing the Query

The first step in data collection is to identify a suitable set of decisions that belong to the same legal case-space.

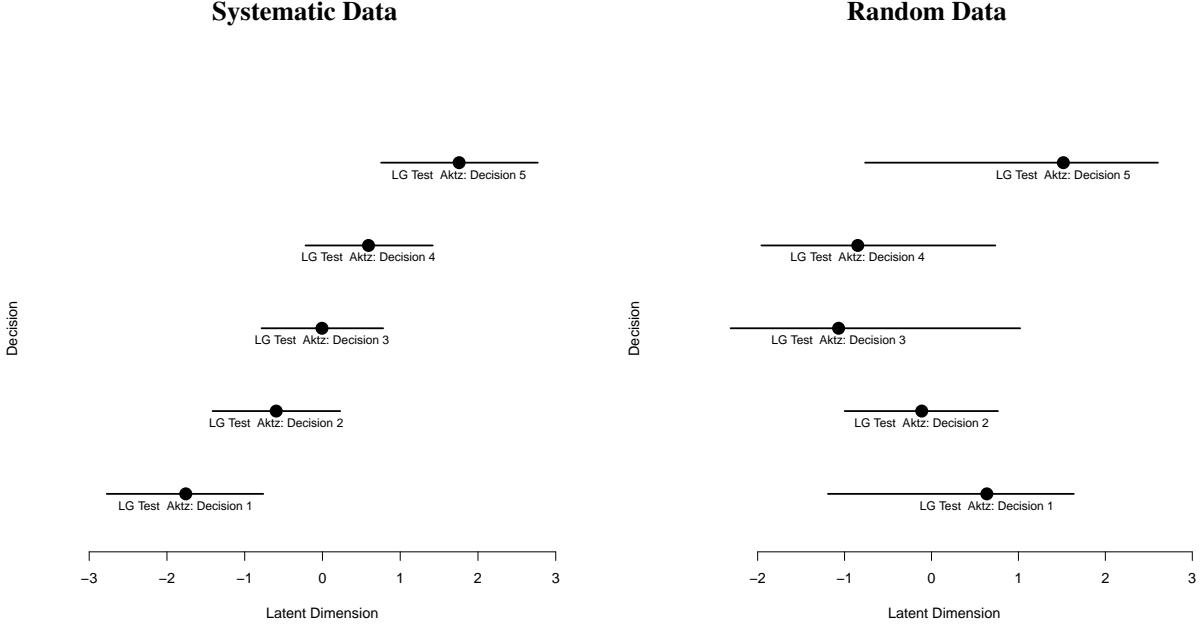


Figure A.4: Estimating the Position of Decisions on the Basis of the Data in Table A.1 and the Rewired Data.

## B.1 Dictionaries for Querying the Data Base

For press law, we are accessing Juris data directly with a *Lucene* based search engine (*Elastic-Search*). We define the following two dictionaries for the initial seed query. Table B.1 relates to claims for compensation. In a similar vein, Table B.2 concerns claims that demand injunction.

Table B.1: Dictionary to Query the Data Base for Decisions on Privacy Infringement Claiming Compensation.

*Presserecht, Presse, Pressefreiheit, Presseerzeugnis, Äußerung, Interview, Darstellung, Medien, Meinungsfreiheit, Meinung, Meinungsäußerung, Persönlichkeitsrechtsverletzung, Persönlichkeitsrecht, Schadensersatz, Schadensersatzanspruch, Schadensersatzberechnung, Schadensersatzklage, Schadensersatz, Schadensfeststellung, Schadenshöhe*

## B.2 Dictionaries for Querying Juris on their Homepage

To analyze cartel cases, we query the Juris homepage directly. The two terms that make up the dictionary are *Kartellrecht* and *Schadensersatz*. The dictionary is much shorter than for press law,

Table B.2: Dictionary to Query the Data Base for Decisions on Privacy Infringement Demanding Injunction.

*Presserecht, Presse, Pressefreiheit, Presseerzeugnis, Äußerung, Interview, Darstellung, Medien, Meinungsfreiheit, Meinung, Meinungsäußerung, Persönlichkeitsrechtsverletzung, Persönlichkeitsrecht, Unterlassung, Unterlassungsanspruch, Unterlassungsklage, Unterlassungsverfügung, Unterlassungserklärung, Unterlassungsangebot, Unterlassungspflicht, Unterlassungsantrag, Unterlassungsverpflichtung*

because we have to abide by the more limited query functionality of the *Juris* frontend. We also restrict the search to lie between 01.01.2012-01.01.2018, with the author being a district court (*Landgericht*).

## C Decision Source Matrix

We also provide a quick overview over the decision-source matrices we find and decide to display them visually.

### C.1 Press Law: Hand Selected

Figure C.1 provides an overview over the resulting decision-source matrices  $Y_{ij}$  for the sets  $d_{1A}$  and  $d_{2A}$ . Each row represents a legal decision, each column a legal source. The darker the color, the more often does a decision cite a particular legal source. For the cases on compensation, the left figure displays a number of long vertical lines that indicate a high degree of overlap: These decisions cite similar legal sources—but some more and others less often. In addition, there are a number of legal sources that get cited by only a few legal decisions. The decision-source matrix for the second application looks quite similar, with some legal sources being standard sources and others that are picked up by a subset of the legal decisions, only.

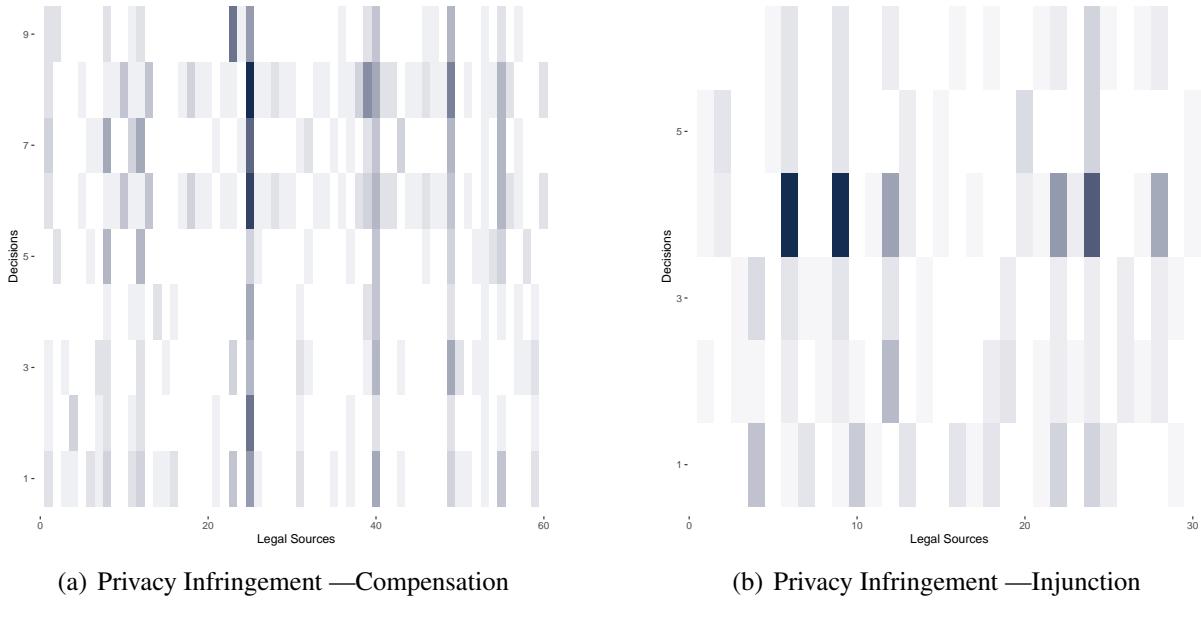


Figure C.1: Exact Query. Coding of the Decision-Source Matrix on the Basis of Metadata. The Darker the Shading, the More Often a Legal Decision Cites a Legal Source.

## C.2 Press Law: Hand Selected and Query Expansion

Figure C.2 displays the data from the sets  $d_{1B}$  and  $d_{2B}$ . For the decisions on compensation, the matrix is quite well-behaved and shows a substantial degree of overlap between those decisions and the cited legal sources. We can clearly identify five legal sources that are being cited by a large number of decisions. In addition, there are legal sources that are being cited only by some decisions, which in the end provide most of the analytic leverage. The decision-source matrix of the second set of written decisions on injunction shows less overlap. Only two legal sources are apparently widely cited.

## C.3 Anti Trust: Hand Coded

We also chart the decision-source matrix for the set of decisions in antitrust in Figure C.3. This set has considerably more legal sources than the other sets in press law. Clearly, there seems to be a core doctrine that courts typically refer to. It is easy to identify it on the left of the figure in darker shading.

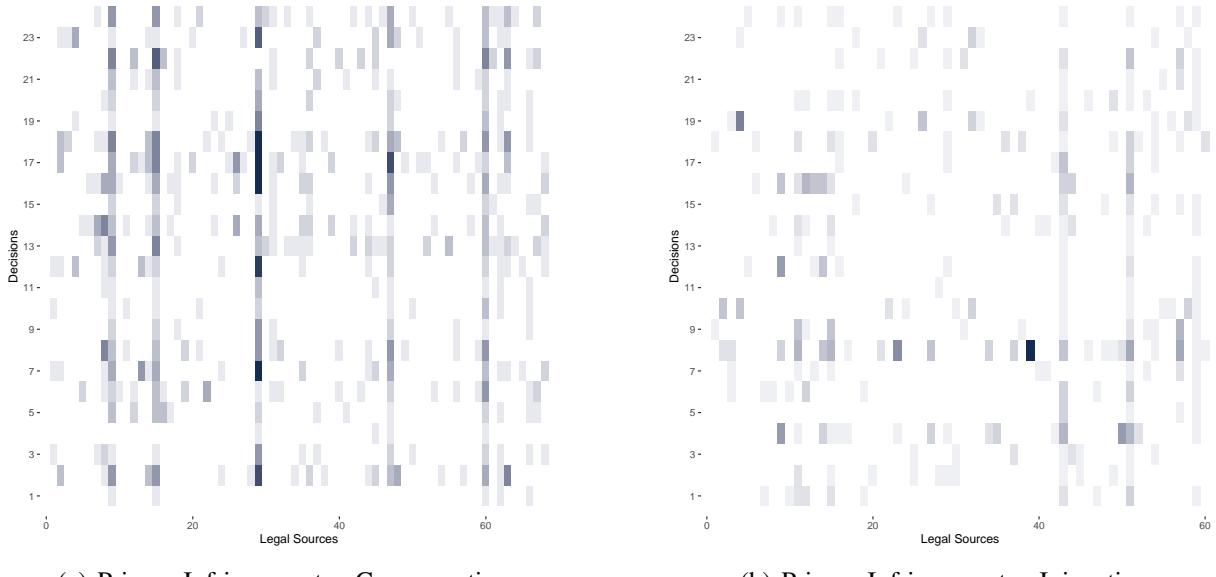


Figure C.2: Set of Decisions Using a ‘More-Like-This’ Query. Coding of the Decision-Source Matrix on the Basis of Metadata. The Darker the Shading, the More Often a Legal Decision Cites a Legal Source.

Due to the manual annotation process of the legal sources displayed in the left panel, the sources are ordered in a way that generates a triangle. Indeed there could be the impression of a systematic pattern due to time dependency. However, the figure on the right hand puts this impression into perspective. It displays the same citation data with one important difference: the sources are ordered by year. If there were indeed a systematic time dependency, we would expect to see the same triangle we observe on the left, which is not the case.

## D Estimating Decision Locations

### D.1 Estimating the Location of Further Decisions

Here we present the estimated locations for the two sets of decisions  $d_{A1}$  and  $d_{B1}$  we collected with a key search query. The resulting position estimates are in line with *ex-ante* expectations based on expert knowledge and media reports. Figure C.4 depicts the estimated decision locations. The figure displays all decision locations in our samples from Cologne or Hamburg in red and

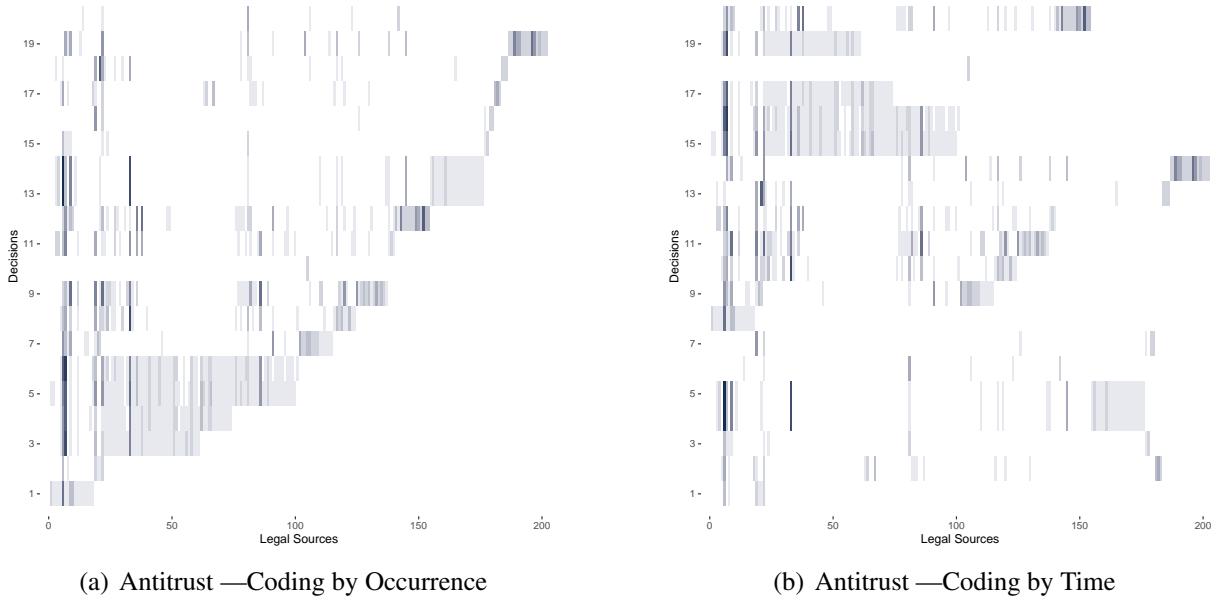


Figure C.3: Set of Decisions Accessed via *Juris* Homepage. Coding of the Decision-Source Matrix on the Basis of Metadata. The Darker the Shading, the More Often a Legal Decision Cites a Legal Source.

locations of any other court decisions in blue. A point represents the respective median of the posterior draws. Uncertainty bars around the estimate depict the central 90% credible interval. The plots on top summarize the mean difference between the decisions from the courts in Cologne and Hamburg *vis-à-vis* all other courts. For the decisions related to compensation in the panel on the left, we observe two outliers—both from Cologne. However, even though Hamburg and Berlin are also known as friendly towards compensation, the decisions do not show systematic differences. In the decisions related to injunction on the right panel, the decisions from Cologne and from Hamburg cluster, i.e. they are mapped onto a similar location in the case-space. Heidelberg, the only other court in the sample, is distinctly situated on the right. The estimated locations are in line with anecdotal evidence from media reports and from experts.

## D.2 Estimating the Location of Sources

Our model also estimates the location of the cited legal sources within the same case-space. As an illustration, Figure D.1 shows the estimated locations ( $\hat{\phi}_i$ ) of every cited legal source for the two

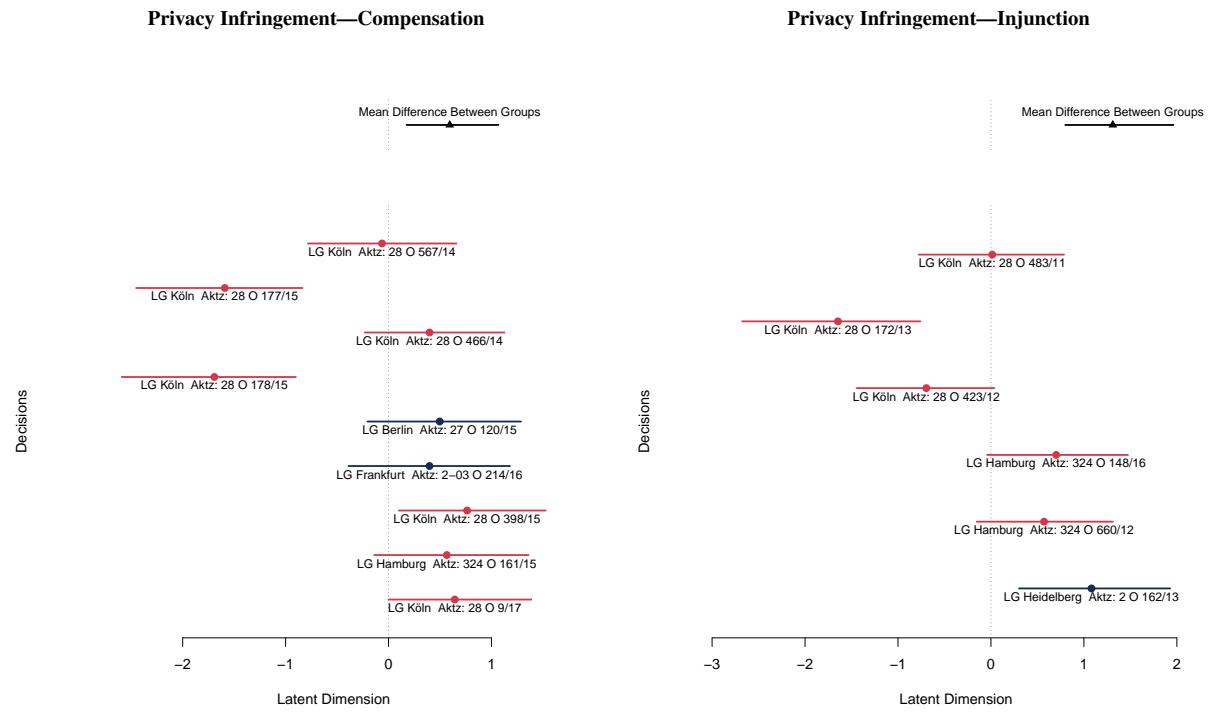


Figure C.4: Estimated Locations of Written Decisions ( $\hat{\theta}_i$ ). Pre-selected Set of Decisions. On the Top: Mean Difference Between the Decisions from Courts in Cologne and Hamburg and All Others. Points Indicate the Median of the Posterior Draws. The Bars Represent the Central 90% Credible Interval.

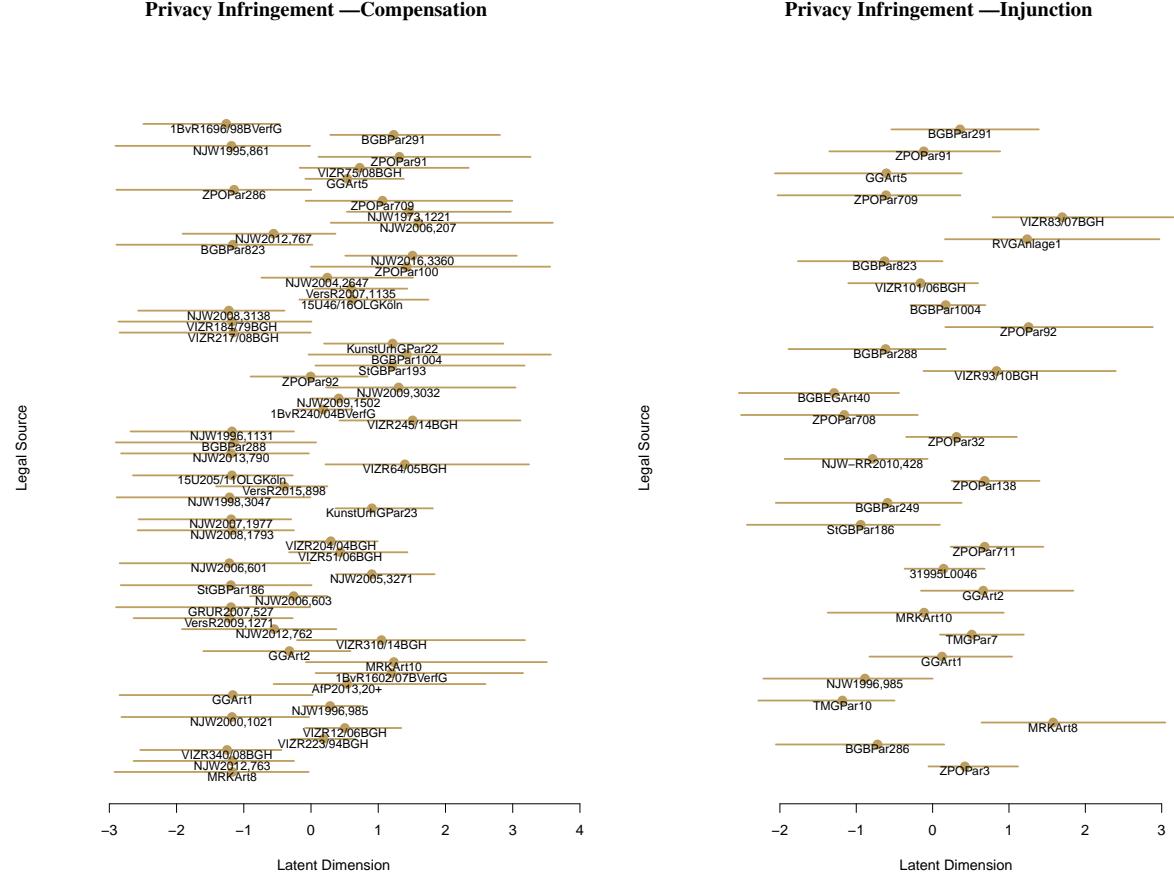


Figure D.1: Estimated Locations of Cited Legal Sources ( $\hat{\phi}_j$ ). Sets of Decisions Without Query Extension ( $d_{1A}$ ,  $d_{1B}$ ). Points Indicate the Median of the Posterior Draws. The Bars Represent the Central 90% Credible Interval.

sets of decision in press law without query extension ( $d_{A1}$  and  $d_{B1}$ ). The other sets of decisions contain even more legal sources which would make them difficult to display at the detailed level.

We do not only scale decisions but also legal sources in the same case-space. This can facilitate more fine-grained substantive interpretations of the legal argumentation that is developed within those decisions because the type and frequency of the cited legal sources provide additional information that has not been leveraged before.

## E Convergence Diagnostics

We also add convergence diagnostics for the parameter  $\theta_i$  in each model.

Table E.1: Convergence Diagnostics for estimated Locations. Press Law Images Exact (Case  $d_{A1}$ ).

	mean	se	n <sub>eff</sub>	$\hat{R}$
theta[1]	0.67	0.02	507.94	1.02
theta[2]	0.58	0.01	1,242.48	1.01
theta[3]	0.78	0.02	433.20	1.02
theta[4]	0.40	0.01	1,138.06	1.01
theta[5]	0.52	0.01	1,063.25	1.01
theta[6]	-1.71	0.03	367.08	1.03
theta[7]	0.41	0.01	961.74	1.01
theta[8]	-1.61	0.03	381.14	1.02
theta[9]	-0.06	0.01	1,667.67	1.00

Table E.2: Convergence Diagnostics for estimated Locations. Press Law Images MLT (Case  $d_{A2}$ ).

	mean	se	n <sub>eff</sub>	$\hat{R}$
theta[1]	-0.38	0.02	2,025.77	1.00
theta[2]	0.92	0.01	1,230.50	1.00
theta[3]	0.34	0.01	2,292.68	1.00
theta[4]	0.70	0.02	2,010.14	1.00
theta[5]	-1.13	0.01	2,059.62	1.00
theta[6]	-1.64	0.02	590.65	1.02
theta[7]	1.13	0.01	1,223.80	1.01
theta[8]	-0.55	0.01	1,365.37	1.01
theta[9]	-0.03	0.01	2,712.72	1.00
theta[10]	-0.17	0.01	3,054.80	1.00
theta[11]	0.34	0.01	3,397.89	1.00
theta[12]	1.46	0.01	974.77	1.01
theta[13]	-1.03	0.01	889.72	1.01
theta[14]	-0.28	0.02	957.51	1.01
theta[15]	-0.87	0.01	2,243.65	1.00
theta[16]	0.08	0.01	1,279.18	1.00
theta[17]	0.49	0.01	1,201.28	1.00
theta[18]	0.81	0.01	1,205.08	1.00
theta[19]	0.72	0.01	2,868.81	1.00
theta[20]	0.25	0.01	2,926.81	1.00
theta[21]	-0.30	0.01	2,524.90	1.00
theta[22]	-1.34	0.01	1,035.63	1.01
theta[23]	1.43	0.01	982.38	1.02
theta[24]	-1.05	0.01	971.21	1.01

Table E.3: Convergence Diagnostics for estimated Locations. Press Law Online Linking Exact (Case  $d_{B1}$ ).

	mean	se	$n_{\text{eff}}$	$\hat{R}$
theta[1]	-1.10	0.02	1,088.12	1.00
theta[2]	-0.58	0.01	1,270.93	1.00
theta[3]	-0.71	0.01	1,293.31	1.00
theta[4]	0.70	0.01	1,200.63	1.00
theta[5]	1.68	0.02	883.28	1.00
theta[6]	-0.01	0.01	1,544.79	1.00

Table E.4: Convergence Diagnostics for estimated Locations. Press Law Online Linking MLT (Case  $d_{B2}$ ).

	mean	se	$n_{\text{eff}}$	$\hat{R}$
theta[1]	0.13	0.01	1,522.14	1.00
theta[2]	0.25	0.01	2,041.67	1.00
theta[3]	0.29	0.01	2,028.76	1.00
theta[4]	-1.47	0.01	624.44	1.01
theta[5]	-0.01	0.01	2,466.49	1.00
theta[6]	0.32	0.01	1,377.14	1.00
theta[7]	0.01	0.01	1,933.98	1.00
theta[8]	-1.21	0.01	637.97	1.01
theta[9]	-0.06	0.01	1,611.72	1.00
theta[10]	1.74	0.01	635.35	1.00
theta[11]	0.28	0.01	2,434.83	1.00
theta[12]	-1.48	0.01	673.25	1.02
theta[13]	-0.20	0.01	2,742.61	1.00
theta[14]	0.18	0.01	1,661.74	1.00
theta[15]	-0.47	0.01	1,520.75	1.00
theta[16]	-0.81	0.01	754.06	1.01
theta[17]	-0.20	0.01	2,261.18	1.00
theta[18]	-0.08	0.01	1,288.60	1.00
theta[19]	2.06	0.02	603.57	1.00
theta[20]	-0.26	0.01	1,531.68	1.01
theta[21]	0.25	0.01	2,224.97	1.00
theta[22]	-0.18	0.01	1,379.84	1.01
theta[23]	2.04	0.01	782.39	1.00
theta[24]	-0.90	0.01	1,127.09	1.01

Table E.5: Convergence Diagnostics for estimated Locations. Antitrust (Case  $d_3$ ).

	mean	se	n <sub>eff</sub>	$\hat{R}$
theta[1]	-0.26	0.01	1,067.15	1.00
theta[2]	-0.18	0.01	1,399.32	1.00
theta[3]	1.22	0.01	391.34	1.01
theta[4]	1.42	0.02	343.43	1.01
theta[5]	1.30	0.02	349.32	1.01
theta[6]	1.30	0.02	349.70	1.01
theta[7]	-1.02	0.01	555.68	1.02
theta[8]	0.36	0.01	682.89	1.01
theta[9]	0.45	0.01	599.33	1.01
theta[10]	-1.74	0.01	2,153.27	1.01
theta[11]	0.35	0.01	717.60	1.01
theta[12]	-0.35	0.01	729.90	1.01
theta[13]	-0.72	0.01	537.23	1.01
theta[14]	-0.72	0.01	526.30	1.01
theta[15]	-0.27	0.01	1,463.24	1.00
theta[16]	0.02	0.02	1,114.47	1.01
theta[17]	1.56	0.02	466.83	1.01
theta[18]	-0.16	0.01	952.86	1.00
theta[19]	-1.84	0.02	255.54	1.03
theta[20]	-0.74	0.01	1,241.91	1.01

## F Extended Qualitative Case Study to Assess Model Validity

We also provide an in-depth analysis of the data to asses the validity of our measurement model. In this section of the Appendix, we have the space to fully consider the legal reasoning in all three cases.

The median estimate of the Hamburg decision (LG Hamburg, 324 O 161/15) is to the left of the case-space in Figure 2. The litigant in the Hamburg decision requests a compensation for the repeated publication of pictures of her taken while visiting her hospitalized husband—a famous Formula One driver. The litigant used various legal means to stop the defendant from publishing pictures before referring to the *Landgericht* (324 O 161/15, Mn 6).<sup>1</sup> The defendant requests to dismiss the lawsuit arguing, for example, that the contemporary interest in the hospitalization was not limited towards the Formula One driver but would include how the spouse addresses the stroke of fate (324 O 161/15, Mn 27-29). The district court concluded that publishing the pictures violated the litigant in her general personality rights derived from the German Civil Code (BGB) in connection with the German Constitution (§ 823 I BGB in connection with Art. 2 I and Art. 1 I GG). According to the court, the publication of a picture does not *per se* violate a person's general personality rights (LG Hamburg, 324 O 161/15, 35). Instead, publishing can be justified when it is documenting contemporary events in line with the German law regulating art and copyright questions (§ 23 I *Kunsturhebergesetz*, [KUG]). Subsequently, the court had to balance the protection of the private sphere of the individual according to the German Constitution (Art. 1 I GG and Art. 2 I GG) and the European Convention on Human Rights (Art. 8 I ECHR) against the freedom of the press to document contemporary events of importance in line with the German Constitution (Art. 5 I GG) and the ECHR (Art. 10 I ECHR).

To justify the litigant's claim, the district court of Hamburg referred to case-law by the German Federal Court (BGH, VI ZR 51/06; VI ZR 272/06). The BGH had argued in the past that the repeated and tenacious publication of pictures can become a very serious infringement of a litigant's privacy and respective violations require financial compensation (BGH, VI ZR 223/94).

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<sup>1</sup>We refer to sections of interest in court decisions using margin numbers (Mn) as shown in the *Juris* database.

In particular, the infringement of a person's privacy is wider when media outlets publish pictures compared to textual articles (BGB, VI ZR 230/08). Moreover, the district court of Hamburg highlighted that the litigant had used legal measures against the defendant to hinder the publication of pictures. Hence, the defendant was well aware of the litigant's disagreement to publish pictures showing her in a personal, very exceptional situation. The infringement of the litigant's privacy was not justified and requires the defendant to pay financial compensation. In short, the court of Hamburg heavily relied on case-law published by the BGB.

If our scaling approach is valid, then the citation pattern of the district court of Cologne in LG Köln, 28 O 466/14 should be similar. The median position of the Cologne decision is to left of the case-space in Figure 2, and similar to the median position of the Hamburg decision. The estimated location of both decisions are not systematically different from one another in the common case-space.

The litigant in the Cologne decision is an actress who requests an act of omission and a financial compensation for the online and offline publication of an article together with a picture speculating about a second pregnancy of her. The litigant argues that the picture was taken in a private moment and violates her general personality rights. The litigant is also anxious to not share information about her personal life. Instead she succeeded with similar legal claims to not publish pictures during her first pregnancy (28 O 466/14, Mn 7). The defendant requests to dismiss the lawsuit arguing in favor of the contemporary importance of the picture which is in the public interest (28 O 466/14, Mn 15-16). These general case characteristics of the Cologne decision are similar to the Hamburg decision. In both decisions the litigants claimed their pictures were taken in private moments violating their personality rights. The defendants rejected claims arguing in favor of the contemporary importance of the pictures.

A closer reading of the Cologne decision shows that the district court refers to the same legal norms and similar case-law compared with the Hamburg decision to settle the dispute. Subsequently, the district court of Cologne argues in favor of the litigant's general personality rights derived from the BGB, the GG and the KUG (§§ 1004 and 823 II GCC in connection with Art. 2 I

GC and Art. 1 GC as well as §§ 22, 23 KUG). Moreover, the court weighs—similar to the district court of Hamburg—the protection of the private sphere (Art. 1 I GG and Art. 2 I GG together with Art. 8 I ECHR) against the freedom of the press (Art. 5 I GG together with Art. 10 I ECHR) on the basis of the European Convention on Human Rights and the German Constitution (28 O 466/14, Mn 20-23).

To argue the case, the court in the Cologne decision relies on case-law published by a number of courts and especially the BGH. While not all decisions referred to by the district court of Cologne were of relevance to the court in Hamburg, both courts heavily relied on case-law published by the BGH. In particular, there is overlap in two BGH rulings repeatedly cited by both courts: VI ZR 223/94 and VI ZR 51/06. These decisions were used to justify the litigant's claim against the defendant.

In sum, the Hamburg decision and the Cologne decision are scaled at similar ends of the case-space in Figure 2. The general case characteristics and the legal outcomes are similar in both cases. In addition, the legal norms and the case-law used to argue the cases widely overlap.

The median position of the *Munich decision* (LG Munich, 9 O 23075/07) is scaled at the opposite end of the case-space in Figure 2 when compared to the median positions of the Hamburg and Cologne decision. If our scaling approach is accurate, we should find that the legal arguments developed in the Munich decision are based on different legal sources than the arguments in the Hamburg and Cologne decision. Moreover, while the cases should address similar scenarios, we might find variation in some case characteristics.

The litigant in the Munich decision—a famous actress—requests financial compensation for the publication of secretly taken pictures showing her going for a walk with her newborn. This scenario is comparable to the scenarios in the Hamburg and Cologne decision. However, different to the latter two decisions the defendant in the Munich decision had already given a declaration to refrain from further publications and had payed previous legal fees of the litigant. Nevertheless, the litigant still requested compensation for the pictures already published. The actress argued that the pictures violated her general personality rights, especially as she was in a private moment with her

newborn (9 O 23075/07, Mn 3). The defendant requested that the district court rejects the claim. The defendant had already signed a declaration to cease and desist and argued that the litigant is a public figure which is why the pictures were of contemporary interest. The newborn was not recognizable in the pictures (9 O 23075/07, Mn 10-11). The litigant's and the defendant's requests are comparable to the scenarios described in the Hamburg and Cologne decision. Nevertheless, the district court dismissed the litigant's request in the Munich decision and saw no right to receive compensation (9 O 23075/07, Mn 13-14).

Interestingly, the court argued that the publication of the pictures violated the litigant's rights derived from the German law regulating art and copyright questions (§§ 22 and 23 KUG; 9 O 23075/07, Mn 15). The courts in Hamburg and Cologne presented similar thoughts. Thus, all three decisions seem to be comparable in an appropriate case-space. However, the judges in the Munich decision do not derive a financial compensation from the violation. Instead, the court's line of reasoning is different to the ones presented by the district courts in Hamburg and Cologne. The court in Munich referred to different legal norms than the other two courts.

The financial compensation for a violation of someone's personality rights after publishing a picture is commonly based on Art. 1 and Art. 2 I GG in conjunction with § 823 I BGB—the regulations referred to in the Hamburg and Cologne decision. Nevertheless, in the Munich decision the judges rather cite decisions by the BGH which the other district courts do not quote. Accordingly, the BGH had outlined that financial compensation requires a “very serious infringement” (9 O 23075/07, Mn 17; own translation) of someone's personality rights. However, the unjustified publication of a picture lowers the legal barriers to receive financial compensation (VI ZR 56/94; VI ZR 255/03). Nevertheless, the district court of Munich concludes that the publication of the actresses' picture does not qualify as serious infringement of her privacy. Instead, the scenario is different to the ones in decisions by the BGH. The legal norm of relevance to the court in Munich is the newly edited § 253 II BGB. This norm allows to grant financial compensation for various physical and psychological violations but—according to the court—is not intended to justify universal compensation. Case-law of courts which had to assess very serious infringements supports this

view. Subsequently, in the case at hand the district court of Munich does not see any justification for financial compensation (9 O 23075/07, Mn 16-22).

The district court in Munich faced a scenario similar to the courts in Hamburg and Cologne. Nevertheless, while the case characteristics are comparable the court in the Munich decision argues the case differently compared to the district courts in Hamburg and Cologne. Eventually the court in Cologne derives different legal consequences rejecting the litigant's claim. Our model finds that the median position of the Munich decision is located at the opposite end to the median positions of the Hamburg and Cologne decision in Figure 2. Subsequently, the comparisons of the three cases supports the validity of our approach to estimate similar locations of the Hamburg and the Cologne decisions, which are very different from the Munich decision.

## G Assessment of Validity Based on Decision Outcomes

If our approach is valid then the following should hold true: The estimated position of a decision ( $\hat{\theta}_i$ ) published by a court is a function of the legal sources cited by the court. If the estimated position between two decision published by the very same court in one case space is wide then this implies that the variation in the cited legal source is larger compared to when the distance between the two decisions is narrow. Moreover, it is plausible to assume that the variation in citation should reflect on the substantive outcome of decisions. For example, in the application on antitrust law the LG Dortmund made a total of five decisions; four are positioned to the left relative to the fifth decision position to the right (see figure 6). Reviewing the substantive outcomes of the scaled decisions we find that in the four decisions to the left the smaller company is favored over the cartel, compared to the single decision to the right which favors the cartel.

Thus, to test the validity of our approach we manually coded the substantive outcomes of decisions by all courts that published at least three decisions in a respective case-space. If our approach is valid we should find that for the very same court in one case-space the substantive outcomes of decisions show an ordered pattern. In other words, until a certain point a court takes

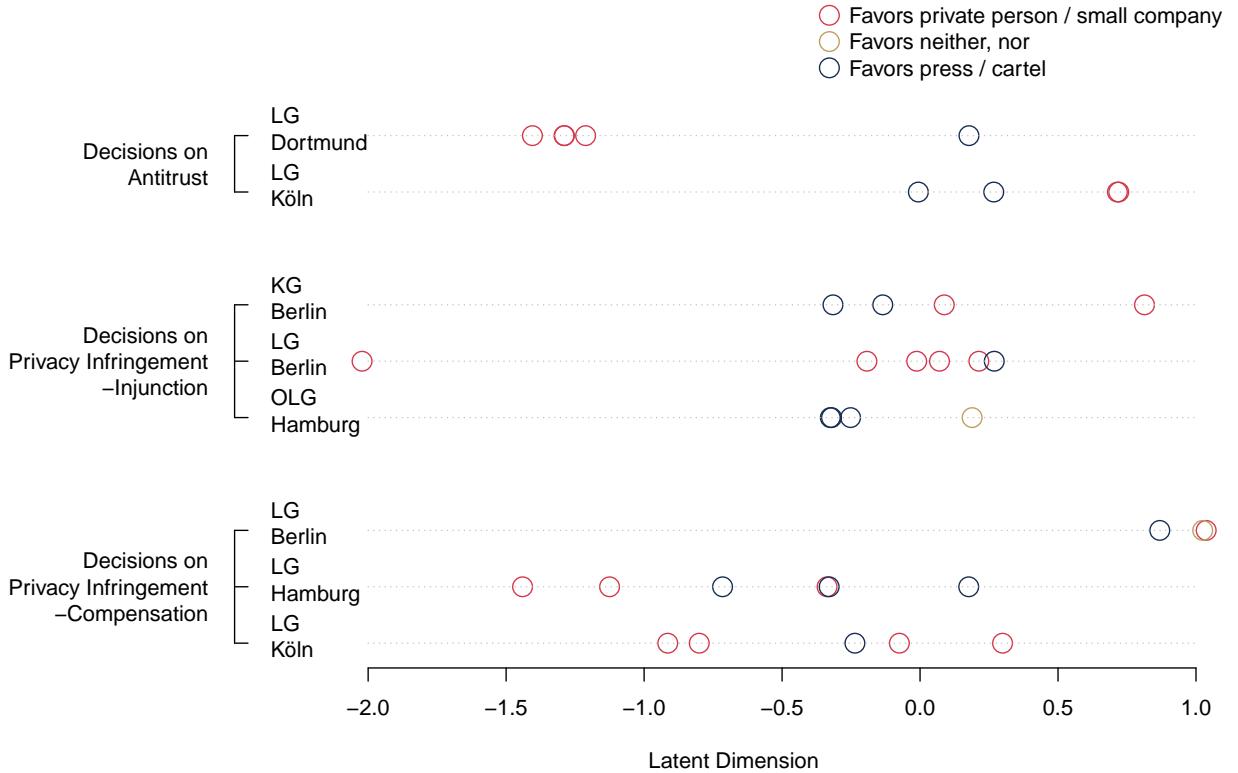


Figure G.1: Estimated Positions of Decisions and their Outcomes.

decisions that favor an individual person (in press law) or a small company (in antitrust law) and afterwards the court would take decisions that favor the press or the cartel. Figure G.1 illustrates that we find this pattern across all our applications with only two exceptions. In the application on privacy infringement involving compensations a single decision made by the LG Hamburg (blue circle, at -0.72 or red circle, at -0.34) and a single decision made by the LG Köln (blue circle, at -0.24) interrupt the expected pattern. On the contrary, the outcomes of the cases published by the LG Berlin show a nice pattern: The decision favors the press (blue circle, at 0.87) until a certain point where neither party is favored (gold circle, at 1.02) after which the private person is favored (red circle, at 1.04). In sum, with the exception of two outliers figure G.1 provides robust evidence that our scaling approach produces validate locations of written decisions that are at the same time predictive of the decision outcome. The variation in locations can also be seen when considering the variation in substantive decision outcomes.

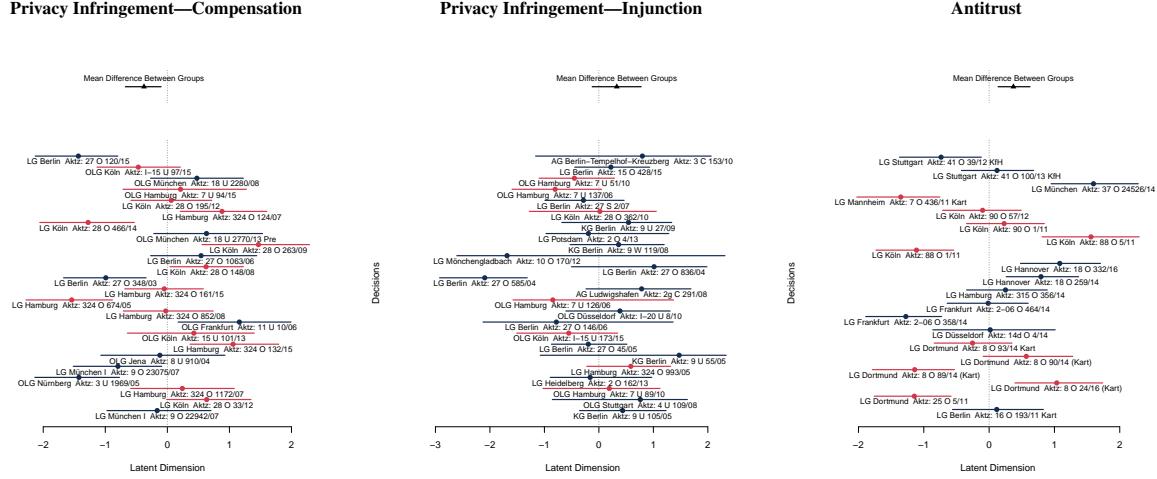


Figure H.1: Positions of Decisions from Randomly Resampled Decision-Source Matrices.

## H Null Models for Forum Shopping

Similar to the toy model in Section A of the appendix, we also generated null models for the case spaces on forum shopping. We again resample each citation-count matrix. While this keeps the exact digits the same, it randomly changes their position in the citation-count matrix.

Figure H.1 depicts the resulting locations. On first sight, the model seems to generate well behaved estimates. However, a closer consideration of the decisions reveals that the results do not make intuitive sense. The same courts adopt decisions that are widely apart from one another—which not only goes against our theoretical expectations, but also against what we know about these decisions when reading them. For example, in the case-space on antitrust the decisions from LG Dortmund (8 O 93/14, 8 O 90/14, 8 O 89/14, 8 O 24/16) are all in the same spirit and should lead to similar locations. The locations in Figure 2 and Figure 6 reflect our knowledge about the decisions much better.

As another means of evaluating the robustness of the null models, we also add posterior predictive checks for these models in Figure H.2. Note that the results clearly indicate that the model is not a great fit for any of the three case-spaces—in particular when compared to Figure 5.

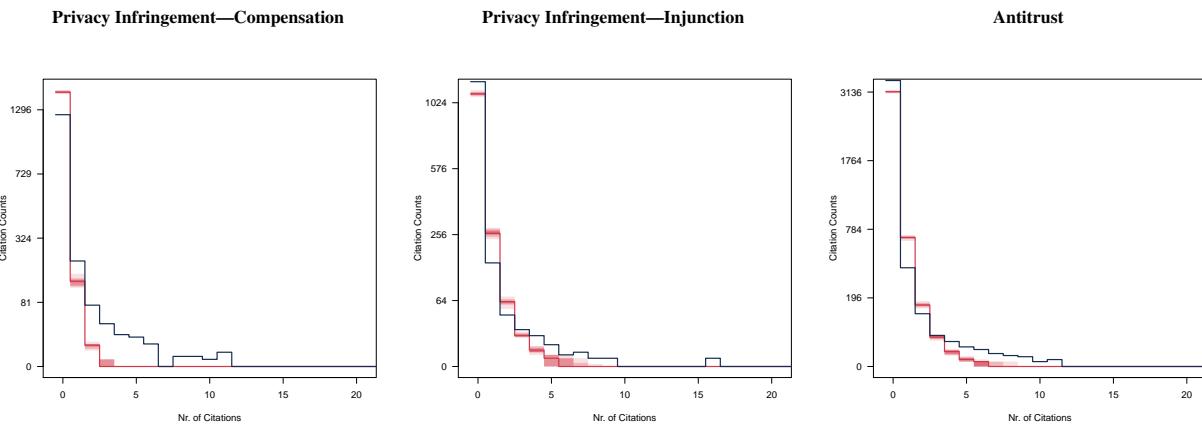


Figure H.2: Posterior Predictive Checks from Randomly Resampled Decision-Source Matrices.