



# The sensitivity of legal proof

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## Abstract

The proof paradox results from conflicting intuitions concerning different types of fallible evidence in a court of law. We accept fallible individual evidence but reject fallible statistical evidence even when the conditional probability that the defendant is guilty given the evidence is the same, a seeming inconsistency. This paper defends a solution to the proof paradox, building on a sensitivity account of checking and settling a question. The proposed sensitivity account of legal proof not only requires sensitivity simpliciter but sensitivity of each relevant step of the proof procedure and/or sensitivity concerning all relevant alternatives. This account avoids problems that have been identified for other sensitivity views of legal proof. Moreover, it is argued that sensitivity, rather than safety, is the crucial modal condition for legal proof. It is, finally, shown that the provided account can fruitfully support very different existing views on the relationship between knowledge and legal proof.

**Keywords** Sensitivity · Legal proof · Proof paradox · Philosophy of law · Knowledge · Checking

## 1 Introduction

Consider the following two cases, which illustrate Cohen's (1977) proof paradox:

Gatecrasher Case A.

The organizers of a soccer match sue S for gatecrashing their last game. They present the following evidence: S attended the last game – she was seen and photographed on the main ranks. No tickets or receipts were issued at the

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entrance. Hence, S cannot be expected to present evidence that she bought a ticket. However, a local police officer testifies in court that she observed S climbing over the fence and taking a seat.

Gatecrasher Case B.

The organizers of a soccer match sue S for gatecrashing their last game. They present the following evidence: S attended the last game –she was seen and photographed on the main ranks during the event. No tickets or receipts were issued at the entrance. Hence, S cannot be expected to present evidence that she bought a ticket. However, while 1,000 people were counted in the seats, only 200 paid for admission.<sup>1</sup>

In Case A, individual evidence is presented, while the evidence in Case B is statistical. Suppose that the police officer is reliable but not infallible, such that her reliability is 80%. With this stipulation, the conditional probability of  $p$  being true given the evidence is the same in both cases. Nevertheless, there is wide agreement between scholars and practitioners that S should be sentenced on the basis of the testimony in Case A but not on the basis of the statistical evidence in Case B.

These intuitions create a puzzle or paradox because in legal theory, evidence quality is supposed to be closely tied to the conditional probability of an event having occurred given the evidence at hand. The evidentiary standard for civil trials in the US and the UK is the principle of the preponderance of evidence. According to this principle, a plaintiff should succeed in her claim if the conditional probability that her claim is true given the evidence the court accepts is higher than 0.5.<sup>2</sup> Thus, if we are judging in line with this principle, the plaintiff's evidence should be sufficient in both cases, while it is only regarded as sufficient in Case A.<sup>3</sup>

Various solutions to the proof paradox have been suggested in the literature.<sup>4</sup> A well received proposal is sensitivity-based. Enoch et al. (2012) suggest that a principle very similar to the epistemic principle of sensitivity plays a crucial role in explaining the proof puzzle. Sensitivity is a modal feature of beliefs that Nozick (1981) introduced as a necessary condition for knowledge. S's belief that  $p$  is sensitive iff, in the nearest possible worlds where  $p$  is false, S does not believe that  $p$ .<sup>5</sup> Enoch et al. (2012) point out that statistical evidence is typically insensitive whereas individual evidence tends to be sensitive. Hence, sensitivity, respectively an action-

<sup>1</sup> These two formulations of the paradox are due to Blome-Tillmann (2015).

<sup>2</sup> See, for example, Law Library - American Law and Legal Information, <https://law.jrank.org/#ixzz6YxOpbPFQ>.

<sup>3</sup> In criminal trials, the evidence is expected to prove beyond a reasonable doubt that the defendant is guilty. There is no probabilistic threshold fixed in these cases, but it is expected to be much higher than 0.5, e.g., around values such as 0.9 or 0.95. See Ho (2015). Hence, the proof paradox can *mutatis mutandis* also arise for criminal trials. Moss (2022). For different standards of proof, see McCauliff (1982).

<sup>4</sup> See, for example, Kaye (1979); Thomson (1986); Pritchard, 2015, 2016; Smith (2018); Gardiner, 2019a; Littlejohn (2020); Moss (2022). For a reply to Smith, see Blome-Tillmann (2020). For an overview, see Gardiner (2019b); Ross (2020). In this paper, I focus on developing a sensitivity account of legal proof. I can provide discussion of strengths and flaws of alternative accounts only where it is necessary for achieving this aim.

<sup>5</sup> Nozick (1981) understands this formulation only as a first approximation and provides a method-relative formulation of the sensitivity condition. I consider modal features of methods in Sect. 2.

guiding version of it, marks a distinction between these two kinds of evidence and allows for a solution to the proof paradox.<sup>6</sup> Sensitivity is a very controversial condition on knowledge and, accordingly, the account developed in Enoch et al. (2012) has also been criticized from various angles and for various reasons.<sup>7</sup>

In this paper, I will defend an epistemic sensitivity account of standards of legal proof. The account that I favor is based on a sensitivity account of checking, a view developed in detail in Melchior (2019). I will thereby position this account of legal proving in a larger context of sensitivity theories of norms for checking and settling a question.<sup>8</sup> I will proceed as follows: In Sect. 2, I will present the sensitivity account of standards of legal proof. In Sect. 3, I will explain why sensitivity and not safety is the crucial modal condition for legal proof. In Sect. 4, I will defend the account against objections, refining it to meet worries that have been raised against standard sensitivity accounts. Finally, Sect. 5 contains a discussion of the sensitivity account within the rapidly developing epistemology of legal proof.

## 2 Sensitivity and legal proof

The basic idea underlying my favored account is maximally simple and clear. When we consider a method for determining whether a defendant is guilty, we seek a method *M* that ideally (a) indicates that they committed the crime if they committed the crime and (b) indicates that they did not commit the crime if they did not commit it. Since these are statements about methods from an *ex-ante* point of view, i.e., before we know what the method will indicate, these two conditions must be interpreted modally as follows:

C1\* If the defendant *S* had committed the crime and *M* were used to determine whether (or not) *S* committed the crime, then *M* would indicate that *S* committed the crime.

C2\* If the defendant *S* were not to commit the crime and *M* were used to determine whether (or not) *S* committed the crime, then *M* would indicate that *S* did not commit the crime.

These modal conditions can be formulated in terms of possible worlds:

C1\* In the nearest possible worlds where *S* did not commit the crime and *M* is used to determine whether (or not) *S* committed the crime, *M* indicates that *S* did not commit the crime.

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<sup>6</sup> The exact role that Enoch et al. (2012) attribute to sensitivity in their account is very subtle. I will take up some of these issues in Sect. 5.

<sup>7</sup> See Blome-Tillmann (2015); Gardiner, 2019b); Moss (2022).

<sup>8</sup> In this paper, I provide a coherent sensitivity-based explanation of why consulting statistical evidence is inadequate for legal proving. Ross (2021) argues that proof in law via statistical evidence cannot be generally rejected. (I cannot address in this paper this more general concerns. However, even if statistical evidence cannot be generally rejected for legal proving, the sensitivity account developed here explains the many cases where the use of statistical evidence is intuitively defective. For this line of argumentation, see also Moss (2022).

C2\* In the nearest possible worlds where S committed the crime and M is used to determine whether (or not) S committed the crime, M indicates that S committed the crime.

These conditions can come in degrees depending on how nearby the possible worlds have to be and in how many of those worlds these two conditions have to be fulfilled, for example all or most possible worlds. C1 and C2 are conditions of a more general type:

C1 If  $p$  were false and M were used to determine whether (or not)  $p$  is true, then M would indicate that  $p$  is false.

C2 If  $p$  were true and M were used to determine whether (or not)  $p$  is true, then M would indicate that  $p$  is true.

Let me stress again that C1 and C2 jointly express the most simple and straightforward idea of an adequate method for determining whether  $p$  is true via a method M.<sup>9</sup>

How are these two intuitively appealing conditions related to well-known modal conditions for beliefs, such as sensitivity, adherence, and safety? Nozick defines method-relative sensitivity and method-relative adherence as follows:

**Method-relative sensitivity.**

In the nearest possible worlds where  $p$  is false and where S uses M to arrive at a belief whether (or not)  $p$ , S does not believe, via M, that  $p$ .

**Method-relative adherence.**

In the nearest possible worlds where  $p$  is true and where S uses M to arrive at a belief whether (or not)  $p$ , S believes, via M, that  $p$ .<sup>10</sup>

C1 and C2 differ in two ways from method-relative sensitivity and method-relative adherence. First, C1 and C2 focus on the modal features of particular *methods*, whereas method-relative sensitivity and method-relative adherence are modal features of *beliefs* formed via certain methods. Second, the modal features jointly described by C1 and C2 are slightly different from the modal features jointly expressed by method-relative sensitivity and method-relative adherence. While C2 and method-relative adherence express the same modal features, there is a subtle difference between C1 and method-relative sensitivity. Fulfillment of sensitivity excludes methods that would indicate that  $p$  is true if  $p$  were false. Given this definition, sensitivity is also fulfilled if the method would not make any indication about whether  $p$  is true if  $p$  were false. This possibility, however, is excluded by C1, making

<sup>9</sup> For a theory of discrimination that is based on these two modal principles, see Melchior (2021).

<sup>10</sup> Nozick (1981) uses counterfactual conditionals for formulating these conditions but possible worlds terminology for analyzing them. For the sake of convenience, I will often use possible world terminology for describing counterfactuals, though nothing should hinge on this terminological decision.

C1 a stronger modal condition than sensitivity. For this reason, I will label henceforth C1 as *strong sensitivity* and Nozick-sensitivity as *weak sensitivity*.<sup>11</sup>

Sensitivity and adherence as modal features of methods are reducible to each other: A method is strongly sensitive with respect to  $p$  iff it fulfills the strong adherence condition for  $\sim p$  and vice versa. The same equivalence relation also holds for the weak versions of sensitivity and adherence. Hereinafter, I will talk about sensitivity for  $p$  and  $\sim p$ , rather than about sensitivity for  $p$  and adherence for  $\sim p$ .

Nowadays, *safety* is the most popular modal condition on knowledge. Sosa (1999) originally defined safety as a modal feature of beliefs. Method-relative safety is a feature of beliefs formed via a specific method. For the purposes of this paper, we are mainly concerned with the modal features of methods. As a modal condition for methods, safety can be defined as follows:

### Safety for methods.

In the nearest possible worlds where M is used to determine whether  $p$  is true and where M indicates that  $p$  is true,  $p$  is true.<sup>12</sup>

What is the relation between safety for methods and the modal conditions C1 and C2? C1 and C2 are versions of sensitivity (and adherence) and are therefore obviously modally distinct from safety for methods. I will have a closer look at the relationship between C1, C2 and safety for methods in the following sections.

Methods that fulfill conditions C1 and C2 are ideal methods of determining whether  $p$  is true and they also play a central role in the broader context of a theory of checking or settling question. In Melchior (2019, 30), I provide the following characterization of checking:

*S checks whether  $p$  is true via method M only if*

- (1) S uses M with the intention of determining whether  $p$  is true, and
- (2) M is an appropriate method with respect to  $p$ .

Let me summarize the crucial aspects of my sensitivity account of checking and settling a question, that I developed in Melchior (2019). Checking requires entertaining a proposition and intentionally using a method for determining whether the target proposition is true. Moreover, appropriate methods for checking and settling a question must be specified modally. Methods that fulfill conditions C1 and C2 are ideal checking methods, but weaker modal conditions are plausibly also sufficient for checking. However, weak sensitivity concerning  $p$  is the crucial necessary condition

<sup>11</sup> There is an asymmetry in Nozick's definition of sensitivity and adherence. While he uses a weak version of sensitivity, he opts for a strong version of adherence. A weak version of adherence states: In the nearest possible worlds where  $p$  is true and where S uses M to arrive at a belief whether (or not)  $p$ , S does not believe, via M, that  $p$  is false.

<sup>12</sup> For a similar definition of method-relative safety, see Pritchard (2005, 156). For definitions of method-relative safety in terms of subjunctive conditionals, see Williamson (2000, 149) and Sosa (2007, 26).

for checking that  $p$  is true.<sup>13</sup>  $M$  is not an appropriate method for checking whether  $p$  is true, if  $M$  would indicate that  $p$  is true if  $p$  were false. Safety, in contrast, does not play a crucial role in theories of checking according to this account.<sup>14</sup>

We can now situate legal proof in this broader context of checking whether a proposition is true. The modal requirements for checking fit neatly with the requirements for legal proof. In legal trials, we entertain and discuss a proposition and intentionally use a method for determining whether it is true, namely the proposition that the defendant is guilty. An ideal method for settling a question in court fulfills the same modal conditions as an ideal checking method, strong sensitivity for the defendant having committed the crime and strong sensitivity for the defendant not having committed the crime. Moreover, safety is not sufficient for legal proof because there are safe methods that are intuitively defective methods for legal proof, as we will see in Sect. 3. Thus, legal proving is a paradigmatic instance of checking or settling a question.

However, there are also some modal particularities of methods for legal proof. Methods can indicate either that  $p$  is true, that  $p$  is false, or fail to make any indication at all concerning  $p$ .<sup>15</sup> This also holds for methods of proving in court. We can distinguish between (1) proving that someone is guilty, (2) proving that someone is not guilty, and (3) not proving either that someone is guilty or not guilty. In the first case, the defendant will be convicted, while in the cases (2) and (3), the defendant will be acquitted (in case 3, following the *in dubio pro reo* principle). A method can fail to provide a correct indication either because its indication is a false positive, a false negative, or because it does not provide any indication concerning the truth of  $p$ . Accordingly,  $M$  fails to provide a correct indication if it either (1) indicates that  $S$  is guilty although  $S$  is not guilty or (2) indicates that  $S$  is not guilty although  $S$  is guilty or (3) does not provide any indication about whether  $S$  is guilty. (1) leads to a wrongful conviction, (2) leads to wrongful acquittals and (3) also leads to wrongful acquittals if  $M$  fails to provide an indication although the defendant is guilty. Fulfillment of different modal conditions can prevent these mistakes. A method  $M$  avoids (1) if it is weakly sensitive concerning  $S$  being guilty, i.e., if  $M$  would not indicate that  $S$  is guilty if  $S$  were not guilty.  $M$  avoids (2) if it is weakly sensitive concerning  $S$  not being guilty, i.e., if  $M$  would not indicate that  $S$  is not guilty if  $S$  were guilty.  $M$  avoids (3) if it is strongly sensitive concerning  $S$  being guilty and strongly sensitive concerning  $S$  not being guilty, i.e., if  $M$  would indicate that  $S$  is guilty if  $S$  were guilty and if  $M$  would indicate that  $S$  is not guilty if  $S$  were not guilty. Importantly, these mistakes in the court are not regarded as equally severe. In particular, wrongful convictions are regarded as more serious than wrongful acquittals, as the Blackstone Ratio expresses.<sup>16</sup> “It is better that ten guilty persons escape than that one innocent

<sup>13</sup> The phrase ‘checking that  $p$  is true’ is linguistically more unusual than ‘checking whether  $p$  is true’. It is meant to be an abbreviation for checking whether  $p$  is true with the positive outcome that  $p$  is true.

<sup>14</sup> For more details, see Melchior (2019).

<sup>15</sup> I assume here for reasons of simplicity that methods that indicate both that  $p$  is true and that  $p$  is false fail to make any indication about the truth of  $p$  at all.

<sup>16</sup> *Commentaries on the Laws of England* (book 4, Chap. 27). The Blackstone-Ratio is also reflected in Littlejohn’s (2020) Veritist Decision-Matrix.

suffer.” Thus, what we primarily seek in law are methods that avoid the case (1) of wrongful convictions, i.e., we particularly aim at avoiding methods that indicate that S is guilty although S is innocent. This is secured by fulfillment of weak sensitivity concerning S being guilty, which is exactly an application of the traditional version of sensitivity: If S were not guilty and M were used to determine whether (or not) S is guilty, then M would not indicate that S is guilty.

Ideal methods for determining whether S is guilty are strongly sensitive concerning S being guilty and concerning S not being guilty. However, we not only accept ideal method for determining whether a defendant is guilty. Methods can be asymmetric in that they have different modal features concerning  $p$  than concerning  $\sim p$ .<sup>17</sup> In law, we particularly seek methods that are weakly sensitive concerning S being guilty, i.e., methods that would not indicate that S is guilty if S were innocent. In this respect, we accept also asymmetric methods. Of course, all else being equal, given considerations about fairness and crime prevention, we prefer methods that are also sensitive (weakly or strongly) concerning S *not* being guilty over methods that lack these modal features, but this is not our highest priority. The importance of weak sensitivity is in line with its crucial role for checking. Hence, the modal requirements for legal proof are paradigmatically those of checking.

The thought that standards of proof require sensitive methods gains further support by considering paradigmatic instances of inadequate methods. Take, for example, a witness who has a negative personal attitude towards the defendant or is negatively biased against her demographic group. In both cases, there is a tendency for the witness to report that the defendant committed the crime even if she did not, ensuring that the testimony of a biased person is not weakly sensitive. Consulting such a person is obviously unfair to the defendant. We use the relevant counterfactuals in pointing out that the method is inadequate, judging that a witness should be ruled out because she would testify that the defendant committed the crime even if she were innocent.

To sum up: Legal proof requires entertaining a proposition, namely that the defendant is guilty, and intentionally using a method for determining whether it is true. In this respect, it is a paradigmatic instance of checking. Moreover, weak sensitivity is crucial for checking and weak sensitivity concerning S being guilty is the crucial modal condition for legal proof. Accordingly, a sensitivity account of legal proof can be smoothly located in a larger context of sensitivity theories of checking.

### 3 Safety and legal proof

In the previous section, I provided a sensitivity-based account of legal proof. However, sensitivity is a rather controversial condition on knowledge.<sup>18</sup> Safety, in contrast, is often taken to be necessary for knowing. Because of this, one might think, as Pardo (2018) does, that safety rather than sensitivity matters for proving in court.

<sup>17</sup> For a detailed overview of asymmetric methods, see Luper-Foy (1984) and Melchior (2019).

<sup>18</sup> There are two main objections against sensitivity accounts of knowledge. The first is that there are instances of inductive knowledge that are insensitive, as Vogel (1987) and Sosa (1999) show, and the other

One reason to think this is that ideal methods are strongly sensitive – if a method would indicate that *S* is guilty if *S* were guilty and would indicate that *S* is not guilty if *S* were not guilty. However, strongly sensitive methods are also safe with respect to both *S* being guilty and *S* not being guilty. Moreover, methods that make random indications concerning *S* being guilty, which are paradigmatically flawed methods, are unsafe as well as insensitive. Suppose that a witness determines what she will testify by throwing dice. In many of the nearest possible worlds where the defendant is not guilty the witness testifies that she is guilty. Therefore, the method is insensitive concerning the defendant being guilty. However, there are also many nearby possible worlds where the witness testifies that the defendant is guilty although she is not. Hence, the method is also unsafe concerning the defendant being guilty. Furthermore, this random method is also insensitive and unsafe concerning the opposite proposition that the defendant is not guilty. Thus, ideal methods are sensitive and safe, whereas random methods, which are paradigmatically flawed, are insensitive and unsafe. Hence, we acquire some desired results in terms of sensitivity but also in terms of safety. Since safety is the more popular modal condition on knowledge, it might be tempting to think that safety rather than sensitivity is the crucial necessary condition for methods of legal proof.

However, this view is mistaken. A method *M* can be safe concerning a target proposition *p* for two reasons: (1) because there is a proper connection between *p* being false and *M*'s not indicating that *p* or (2) because  $\sim p$  is modally remote. In this second case, we get safety 'for cheap.' My belief that I am not a BIV is safe, not because I would be in any position to tell if I was a BIV, but simply because the alternative that I am a BIV is modally remote.<sup>19</sup> Because of examples like these, safety allows for methods that intuitively fail to be adequate methods for checking and proving in court, as we will see. However, we will also see that these methods are insensitive. Consequently, we can conclude that sensitivity rather than safety is the crucial condition for proving in court.

Suppose that *M* is a monotonous method concerning *p* in that it indicates that *p* is true regardless of whether *p* is true or false. In the nearest possible worlds where *p* is true and, in the nearest possible worlds where *p* is false, *M* indicates that *p*. Such a method lacks responsiveness to the world concerning *p*. There might not even be any plausible connection between *p* being true or false and *M*'s indications. A method that is monotonous concerning *p* fails to be weakly sensitive because in the nearest possible worlds where *p* is false, it indicates that *p* is true. Such a method is not adequate for determining whether a defendant is guilty. It is unfair to *S* because it always indicates that *S* is guilty regardless of whether *S* is guilty or not.<sup>20</sup> For example, asking a witness who is negatively biased concerning *S* is such a monotonous method. Such a witness tends to report that *S* committed the crime, regardless of whether *S* commit-

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is that sensitivity leads to highly implausible instances of closure failure, a point made by Kripke (2011). For a discussion of these problems, see Melchior (2019).

<sup>19</sup> See Sosa (1999).

<sup>20</sup> Some authors argue that it is primarily morally and not epistemically wrong to convict someone on the basis of statistical evidence, for example, because someone would be convicted merely because of being member of a particular group. See Zuckermann (1986). For a similar line of argumentation, see Cohen (1987), for a criticism of these moral accounts, see Moss (2022).

ted the crime or not. In these cases, *S* does not have a fair chance. Such monotonous methods are intuitively deficient and do not seem better than random methods. They are paradigmatic methods to be avoided in court. However, safety sometimes fails to diagnose monotonous methods as unsatisfactory, because if  $\sim p$  is modally remote, then a monotonous method can be safe. Nevertheless, such monotonous methods, for example of asking a biased witness, are defective because they are unfair to the defendant.

While monotonous methods can be safe, they cannot be sensitive. Hence, safe methods can be intuitively defective for legal proof whereas sensitive methods cannot suffer from this defectiveness. Sensitivity and plausibly also safety are necessary conditions for adequate methods for legal proof. However, sensitivity rather than safety is the crucial necessary condition.<sup>21</sup> For this reason, safety-based accounts of legal proof fail.<sup>22</sup>

#### 4 Stepwise sensitivity and relevant alternatives: refinements and replies to objections

Thus far, I have proposed a sensitivity account of legal proof that is embedded in a broader sensitivity-based account of checking and settling a question. In this section, I will defend this account against some objections that have been raised against other sensitivity-based theories as developed by Enoch et al. (2012) and that one might also raise against the account proposed here. We will see that further refinements that consider the sensitivity of each relevant step of the legal proof and/or the sensitivity with respect to relevant alternatives are required for an adequate account of legal proof. Moreover, we will see that these modifications deliver intuitively correct results in

<sup>21</sup> Enoch and Spectre (2019, 192) defend a similar intuition. They argue in favor of sensitivity over safety by briefly discussing a dogmatic fact-finder whose attitude is clearly flawed even though her judgments might be safe. They stress that the defectiveness of her attitude can be explained in terms of insensitivity. Such a safe but insensitive dogmatic fact-finder is plausibly monotonous. For further objections against a safety-based theory of statistical evidence, see Enoch and Spectre (2019).

<sup>22</sup> A safety-based theory of legal proof is provided by Duncan Pritchard. In Pritchard (2015 and, 2016), he proposes a modification of his safety-based anti-luck epistemology. This modification utilizes the concept of epistemic risk rather than the concept of epistemic luck and consequently involves a modified version of safety. In Pritchard (2015), he applies this concept of epistemic risk to standards of legal proof. Safety rules out epistemic luck, which requires ruling out the possibility of nearby possible worlds where *S* does not hold a true belief. These can be possible worlds where *S* holds a false belief that *p* or does not hold any belief about *p*. Pritchard argues that this version of anti-luck epistemology delivers intuitively false results in some cases. He suggests that ruling out epistemic risk, in contrast to ruling out epistemic luck, only requires ruling out nearby possible worlds where *S* holds false beliefs. This anti-risk condition on knowledge is a weaker modal condition than safety. Pritchard (2015) argues that this anti-risk condition neatly fits with a theory of legal proof. What we want to avoid in court are wrongful convictions. That is the epistemic risk in play. A method avoids this epistemic risk if there are no nearby possible worlds where the method indicates that the defendant is guilty when she is not. Pritchard is right that this is the crucial case to be avoided. However, if the proposition that the defendant is guilty is sufficiently modally remote, a monotonous method, for example interviewing a biased witness, fulfills this condition as well. The safety condition, which rules out epistemic luck, is stronger than the condition that excludes epistemic risk. Safe methods thus also rule out epistemic risk. Nevertheless, such monotonous methods are deficient for legal proof. Hence, Pritchard's anti-risk epistemology of legal proof is inadequate.

cases that have been presented as counter examples against sensitivity accounts of legal proof.

To begin with, one might object that sensitivity has been proven to be a generally inadequate epistemic concept. This view is far too simplistic. As Becker and Black (2012) point out, there is a ‘second wave’ of sensitivity accounts in epistemology that aim at refining sensitivity accounts of knowledge and at defending the claim that sensitivity is crucial for knowing against well-known objections. More importantly, sensitivity has been criticized for being an inadequate condition on *knowledge*, but this does not entail that it might not be crucial for accounts of other epistemic standings such as checking, discriminating or proving in court.<sup>23</sup>

However, there are also more specific objections that have been raised against sensitivity-based theories of legal proof. Enoch et al. (2012) suggests that the insensitivity of statistical evidence explains its intuitive defectiveness in court. Blome-Tillmann (2015) objects to this proposal by showing that there is sensitive statistical evidence that is, nevertheless, intuitively defective. He concludes that sensitivity cannot be the demarcating criterion for successful legal proof. Blome-Tillmann (2015, 106) presents the following, slightly modified version of the gatecrasher in order to show that the sensitivity condition is not sufficient for legal proof.

### **The Opportunistic Gatecrasher.**

Sarah is on her way to her favorite pub to watch the game – as she does every Saturday afternoon. She hasn’t been able to afford the entrance to the stadium in many years, even though she’d love to watch the game there instead of in the pub. When she comes by the stadium she sees that a lot of people are gate-crashing. She decides to seize the opportunity and joins in. The evidence presented against her in court is as follows: Sarah was in the stadium (she was photographed by security cameras) and 80% of attendees in the stadium were gatecrashers. No further evidence is presented in court.

Blome-Tillman holds that the statistical evidence presented against Sarah is sensitive since the following counterfactual claim is true: If Sarah had not gatecrashed, then the court would not have found her liable. Blome-Tillmann (2015) argues that this counterfactual is true because “if Sarah hadn’t gatecrashed, she would have gone to the pub, wouldn’t have been photographed in the stadium, and wouldn’t have been taken to court in the first place.” (p. 106). Hence, insensitivity is not the crucial feature that determines the defectiveness of statistical evidence.<sup>24</sup>

<sup>23</sup> The view that, while sensitivity is not necessary for knowledge, it might be crucial elsewhere, is also defended by Enoch and Spectre (2019). For a sensitivity-based theory of discrimination, see Melchior (2021).

<sup>24</sup> Blome-Tillmann (2015, 106) actually presents a slightly different reductio argument, concluding that “the court’s belief that Sarah gatecrashed is sensitive, making the evidence, according to the refined sensitivity account, individual.” Thus, Blome-Tillmann also assumes that sensitive evidence is by definition individual. One need not accept this assumption for making this crucial point. Blome-Tillmann also presents counter-examples against causal views of proving in court. Following Nozick (1981), sensitivity should be distinguished from causality, since there can be a causal connection in cases of causal overdetermination even when sensitivity is not fulfilled. For a causal view on individual evidence, see Thomson (1986).

In the opportunistic gatecrasher case, S's belief that Sarah gatecrashed, which is based on statistical evidence, is sensitive. However, it must be noted that the evidence is not purely statistical. Part of the overall evidence against Sarah is that she was photographed in the stadium by security cameras. This is the evidence that Sarah was in the stadium, and this evidence is plausibly sensitive. If Sarah had not been in the stadium, then the cameras would not have photographed her and there would not be any evidence that she was in the stadium.<sup>25</sup> Based on this evidence, further statistical evidence against Sarah is presented. Thus, the proof in court actually proceeds in two steps, first, by proving that Sarah was in the stadium via consulting the cameras, and then by proving that she did not pay admission via statistical induction. The sensitivity condition for the overall proof that Sarah gatecrashed is the following:

In the nearest possible worlds where Sarah did not gatecrash, the method for determining whether she gatecrashed does not indicate that she gatecrashed.

This condition is, problematically, fulfilled as Blome-Tillmann (2015) correctly points out. However, the sensitivity conditions differ for each of the steps:

**Sensitivity condition for step 1:**

In the nearest possible worlds where Sarah was not in the stadium, the security cameras do not indicate that she was in the stadium.

**Sensitivity condition for step 2:**

In the nearest possible worlds where Sarah was in the stadium but did not gatecrash, statistical evidence does not indicate that she gatecrashed.

The sensitivity condition for step 1 is fulfilled, given that security cameras are, like unbiased witnesses, typically sensitive. The sensitivity condition for step 2, in contrast, is not fulfilled: Given that Sarah was in the stadium, if Sarah did not gatecrash, the statistical evidence would indicate that she gatecrashed. Step 2 of the proof builds upon the result of step 1, namely that Sarah was in the stadium. Accordingly, we do not consider possible worlds where Sarah was not in the stadium. Rather we keep fixed that Sarah was in the stadium, which is assumed to be proven by the security cameras. Hence, the only relevant nearby possible worlds to be considered are those where Sarah was in the stadium and did not gatecrash because she purchased a ticket. Given this precondition, step 2 of the overall proof is insensitive.

The first step of the overall proof is sensitive whereas the second is not. Reflecting on proofs step-by-step opens the door for a solution to the problem of sensitive statistical evidence. Plausibly, we judge that the proof provided in the opportunistic gatecrasher case is flawed because its second step is insensitive. This supports the following view:

**Stepwise sensitivity.**

<sup>25</sup> I assume here that possible worlds where an identical twin or someone who looks exactly like Sarah was in the stadium instead of Sarah are remote. Nothing in the cases discussed indicates that these are relevant alternatives.

A proof in court is adequate only if each of its relevant steps is sensitive.

The relevance of the steps is context-dependent. In gatecrasher cases, we can easily identify two plausible steps that the fact-finder or the prosecution takes. The prosecutor and defending attorney agree at some point, based on the evidence provided by the security cameras, that Sarah was in the stadium, but the defending attorney will deny that Sarah did not purchase a ticket. Presumably, the central part of the trial will then center on this question. Hence, proving that Sarah did not gatecrash given that she was in the stadium is a relevant step.

One can also think about this take in terms of relevant alternatives.<sup>26</sup> That Sarah was in the stadium but purchased a ticket is plausibly an alternative that is discussed in court. Thereby, it becomes a relevant alternative which consequently has to be ruled out.<sup>27</sup> Orthodox modal accounts do not directly take relevant alternatives into account, but we can modify an orthodox sensitivity account for acquiring a modal theory of ruling out relevant alternatives.<sup>28</sup> For determining the sensitivity of a method  $M$  concerning  $p$  simpliciter, we consider the nearest possible worlds where  $\sim p$  is true and where  $M$  is used to determine whether  $p$  (or  $\sim p$ ) is true. In contrast, a method  $M$  is sensitive concerning  $p$  and not  $q$  being true if, in the nearest possible worlds where the alternative  $q$  is true instead of  $p$  and where  $M$  is used to determine whether  $p$  or  $q$  is true,  $M$  does not indicate that  $p$ . Such a method can be said to rule out that  $q$  is true instead of  $p$ . Hence, there are different modal conditions for being sensitive concerning  $p$  and not  $q$  being true than for  $p$  being true simpliciter.<sup>29</sup>

In the case of the opportunistic gatecrasher, the crucial sensitivity condition for ruling out the relevant alternative that Sarah regularly attended the game by purchasing a ticket can be formulated as follows:

**Sensitivity condition for relevant alternatives.**

In the nearest possible worlds where Sarah purchased a ticket and regularly entered the game, consulting the security cameras and statistical evidence do not indicate that she gatecrashed.

This sensitivity condition is not fulfilled. Hence, two refinements of the originally proposed sensitivity account deliver the same correct result for the opportunistic gatecrasher: First, requiring sensitivity for each relevant step in the process of proving in court, and, second, requiring a method that is sensitive concerning relevant alternatives. Notably, further cases recently presented by Moss against a sensitivity account of legal proof can also be refuted by considering different steps of the proof

<sup>26</sup> For a contextualist theory of relevant alternatives, see Lewis (1996). For a relevant-alternatives account of legal proving, see Gardiner (2019a).

<sup>27</sup> In contrast, that extraterrestrials built a replica of Sarah and sent her to the game is not a relevant alternative.

<sup>28</sup> For influential accounts that are based on this idea, see Dretske (1971). For applications to theories of discrimination, see Goldman (1976) and Melchior (2021).

<sup>29</sup> For a detailed account of sensitivity and relevant alternatives, see Melchior (2019).

and/or relevant alternatives.<sup>30</sup> Moss (2022) presents two types of examples against sensitivity accounts of legal proof, first, cases where sensitivity is not sufficient for legal proof since statistical evidence can be sensitive, and, second, cases that aim at showing that sensitivity is not necessary.

Moss (2022) presents the following two cases for sensitive statistical evidence:

### **Bold Prisoner.**

25 prisoners are in a prison yard. An especially bold prisoner attacks the prison guards and thereby causes a riot. 23 prisoners join in the riot, while the remaining prisoner tries to stop it. Local prosecutors randomly select one of the prisoners from the yard and bring him to trial. By sheer coincidence, the randomly selected prisoner is the bold prisoner responsible for the riot.<sup>31</sup>

### **Playing Cards.**

The local prison has four teams of prison guards and thirteen buildings, with exactly 25 prisoners living in each building. Every afternoon, a playing card is drawn at random. The suit of the card determines which guard team is on yard duty, and the number determines which building of prisoners goes out.

All the prisoners hate the Team Diamond guards. They decide that there should be a riot in the prison yard on the next day that Team Diamond has yard duty. That afternoon, the five of diamonds is drawn. Team Diamond and Building Five enter the yard. 24 of the prisoners riot, while the remaining prisoner tries to stop them. Local prosecutors randomly select one of the Building Five prisoners and bring him to trial. As it happens, the selected prisoner was indeed part of the riot.

Moss points out that in both cases, the statistical evidence is sensitive. If the bold prisoner had not attacked the guard, there would not have been any riot and the guard would not have been attacked at all. In this case, the evidence would not indicate that the bold prisoner attacked the guard. Analogously in Playing Cards, in most of the nearest possible worlds where the defendant of Building Five did not attack the guards of Team Diamond, a different card was drawn, there was no riot against Team Diamond in Building Five, and consequently the defendant did not attack the guards. In these possible worlds, the evidence does not indicate that the defendant is guilty. Thus, according to Moss, both cases depend on sensitive statistical evidence. She concludes that insensitivity cannot explain the defectiveness of statistical evidence for legal proofs.

In both cases the evidence of the overall legal proof is sensitive, but not every relevant step itself is sensitive. The fact-finding procedure contains two steps -- first the crime is specified, the riot in Bold Prisoner and the riot in Building Five in Playing Cards. The evidence for this first fact-finding step is plausibly sensitive, e.g. testimony of eyewitnesses. However, given the first step, the statistical evidence for the second step is insensitive. In the nearest possible worlds where there was a riot but

<sup>30</sup> Moss (2022), stresses the importance of ruling out relevant alternatives for legal proof, but she does not acknowledge how modified sensitivity accounts can handle relevant alternatives.

<sup>31</sup> For a similar example, see Blome-Tillmann (2015).

the bold prisoner did not participate, the statistical evidence indicates that the bold prisoner is guilty. Furthermore, in the nearest possible worlds where there was a riot in Building Five but where the selected prisoner is the one who did not participate, the statistical evidence indicates that the selected prisoner is guilty. Hence, the second step of the fact-finding procedure is insensitive. By using a relevant alternatives account of sensitivity, we achieve the same result. The evidence is not sensitive concerning the relevant alternative of the bold prisoner (or the defendant in *Playing Cards*) being the one prisoner not participating at the riots.

There might be cases, where it is not a relevant alternative that someone else other than the defendant committed the crime. For example, if Freitag's dead body is found on an island with suspicious injuries where only Freitag and Robinson Crusoe live, then it is not a relevant alternative that someone else murdered Freitag. The only relevant alternative might be that Freitag died by accident. However, in the cases presented by Moss, it is a relevant alternative that the defendant is the one person that is not guilty, which will be discussed in course of the trial. Thus, the fact-finding procedure has to be sensitive with respect to this particular alternative. Moss (2022) correctly presses the importance of relevant alternatives for legal proof but overlooks their role for sensitivity accounts.

The examples presented aim at showing that sensitivity accounts of legal proof are flawed because, since there are instances of statistical evidence that are sensitive but inappropriate for legal convictions, sensitivity is not sufficient for legal proof. These cases share a specific feature. Their sensitivity is due to the fact that, in the nearest possible worlds where the defendant is not guilty, no crime has been committed (*Opportunistic Gatecrasher* and *Bold Prisoner*) or a different crime at a different location (*Playing Cards*) has been committed. However, the evidence in these cases is not sensitive to the fact that the defendant did not commit the crime given that the crime happened or to the relevant alternative that someone else committed the crime. Consequently, the evidential defectiveness of these cases can be neatly explained by pointing towards the insensitivity of a relevant step or to the insensitivity concerning relevant alternatives, as we have seen.

Moss also presents a case of insensitive evidence which is said to be sufficient for legal proof, thereby intending to show that sensitivity is not *necessary* for legal proof.<sup>32</sup>

### **Grand Canyon.**

Acme Corp. is charged with dumping waste onto federal land without a permit. At trial, the prosecution presents video evidence of Acme employees heaving a trash bag into a chute that dumps out into the Grand Canyon. (Moss, 2022)

Moss suggests that the details in the case can be filled out similarly to Sosa's (1999) chute case such that the evidence is not sensitive but still intuitively sufficient. She concludes that sensitivity is not necessary for legal proof. However, Moss's characterization of the case is too simplistic. by sketching a more detailed picture, including

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<sup>32</sup> Pardo (2018) chooses the same strategy. For a persuasive reply to Pardo's case, see Enoch and Spectre (2019).

stepwise procedures, we can see that each step of an appropriate process is sensitive and that Moss's diagnosis is wrong. First, note that Grand Canyon is described ambiguously. Moss talks about "video evidence of Acme employees heaving a trash bag into a chute that dumps out into the Grand Canyon." According to this description, it is unclear whether the video is meant to show that the employees heave trash into the chute or also to document that the trash drops from the chute into the Grand Canyon. Notably, regarding the latter situation, the evidence is sensitive. In the nearest possible worlds where the trash does not land in the Grand Canyon, it is stuck in the chute and the video evidence does not show that waste lands in the Grand Canyon. Thus, only the first reading, according to which the video just shows that the employees heave the waste into the chute, is viable for Moss's purposes of presenting insensitive but appropriate evidence.

Thus, Grand Canyon must be understood in a way that there is no direct evidence that a crime was committed, i.e., that waste was dumped onto federal land. However, if it is not even proven that the Grand Canyon was polluted in the area where the employees were filmed, this evidence alone is plausibly not sufficient to convict Acme. Thus, it has to be (tacitly) assumed that there is further evidence of pollution in the Grand Canyon, e.g., through observation, testing of the water quality, etc. This evidence is plausibly sensitive to the fact that the Grand Canyon is polluted in the relevant area. Only then can it be determined whether the pollution was caused by Acme employees by consulting the security cameras. According to the proposed sensitivity account of legal proof, this evidence must be sensitive to the fact that Acme employees caused the pollution given that there is a relevant pollution in the Grand Canyon. For determining the sensitivity of this second step, we consider the nearest possible worlds where someone else other than Acme employees caused the pollution.<sup>33</sup> However, in these possible worlds, consulting the security cameras plausibly does not indicate that Acme employees polluted the Grand Canyon.<sup>34</sup> Hence, the second step of the two-step process is also sensitive, and consequently, the process itself is flawless according to the proposed account. This is the intuitively correct result. Analogously, one can argue that consulting the cameras given that there has been dumped waste into the Grand Canyon provides sensitive evidence with respect to Acme employees causing the pollution rather than someone else.

Finally, the proposed account of stepwise sensitivity does not suffer from the factivity problem, which is put forward against sensitivity accounts. Blome-Tillmann (2015) correctly points out that adequate evidence presented in court can be misleading, i.e., evidence delivered by an accepted source can, nevertheless be false. Blome-Tillmann (2015, 108) claims that sensitivity understood as a feature of beliefs is factive, i.e., "necessarily, if one's belief or judgement that  $p$  is sensitive, then  $p$  is true." Thus, a false belief trivially violates the sensitivity condition and is, therefore, insensitive. Therefore, necessarily sensitive beliefs are true. However, this is an unwanted outcome since we want to allow faultless wrongful convictions in court

<sup>33</sup> However, according to Moss we consider the nearest possible worlds where Acme employees did not cause the pollution which are in her case possible worlds, where no pollution at all took place.

<sup>34</sup> I assume here, for example, that possible worlds where someone else dressed up as Acme employees and dumped waste into the Grand Canyon are modally remote.

which requires fallible methods for legal proof. Blome-Tillmann argues that sensitivity is, because of its factivity, a condition that is too rigorous for proof in court, since it does not allow for faultless wrongful convictions.<sup>35</sup>

Since knowledge is factive, the problem of faultless wrongful convictions also affects knowledge accounts of legal proof. Moss (2022) defends such a knowledge account against this objection by distinguishing subjective from objective norms, arguing that subjective norms are grounded in objective norms from which they are derived.<sup>36</sup> Moss (2022) diagnoses that “there is something good about convicting an innocent person on misleading evidence and also something bad about it. Any decent account of legal proof should offer explanations of both judgments.” In terms of objective norms, there is something bad about convicting an innocent person, although the jurors might be blameless in doing so. Moss argues that this distinction can provide the desired differentiated picture about faultless wrongful convictions.

I regard it as an open question whether faultless wrongful convictions should be possible and whether they are problematic, but, crucially, my sensitivity account does not face this problem since the specific version of sensitivity underlying this account is not factive. I argue that proof in court requires a sensitive method, i.e., a method that if it were used to determine whether  $p$  is true it would not indicate that  $p$  is true if  $p$  were false. According to this understanding, sensitivity is not a modal feature of the beliefs held but of the methods used. A sensitivity account for methods would suffer from the factivity problem if being a sensitive method concerning  $p$  would entail that the method truly indicates that  $p$ . However, this is not the case. The modal feature of sensitivity for *methods*, i.e., of not indicating that  $p$  is true if  $p$  were false, is incompatible with making false indication. However, it is compatible with not making any indication about whether  $p$  is true. In this case, the method is sensitive but it does not deliver a true indication since it does not deliver any indication. Moreover, we can also attribute modal features to methods prior to using them. For example, we can attribute sensitivity to a witness about S having committed the crime before interviewing her. For these reasons, being a sensitive method concerning  $p$  does not entail that  $p$  is true. Hence, sensitivity of *methods* does not entail factivity. In contrast, when we talk about the sensitivity of beliefs, then we talk about the modal feature of an outcome of a method used, namely the outcome leading to the belief. Thus, we must only consider possible worlds where the method made an indication. Possible worlds where the methods did not make an indication are not relevant for determining the sensitivity of *beliefs*.<sup>37</sup> There might be a factivity problem for the sensitivity of beliefs as Blome-Tillmann (2015) points out, but there is no factivity problem for sensitive methods. Faultless wrongful convictions might pose a problem for factive theories of legal proof, but the provided sensitivity account of methods does use a factive concept of sensitivity.

<sup>35</sup> For a similar line of argumentation, see also Smith (2018).

<sup>36</sup> For this approach, see Williamson (forthcoming). For a more detailed analysis of Moss’s knowledge account of legal proof, see Sect. 5.

<sup>37</sup> Note that there is also a crucial difference between the sensitivity of method M concerning  $p$ , which is a modal feature of M, and method-relative sensitivity of a belief that  $p$  based on M, which is modal feature of the belief based on M. The first type of sensitivity does not entail that M makes an indication, whereas the second does.

To sum up: Various objections against a sensitivity account of legal proof have been raised. Alleged examples of sensitive statistical evidence fail to be fully sensitive, since one of the relevant steps of proof is insensitive or the proof is not sensitive with respect to all relevant alternatives. Moreover, alleged examples of sufficient evidences that are insensitive turn out to be sensitive, if the complete body of evidence is considered. Finally, the proposed sensitivity account does not suffer from the factivity problem because it relies on sensitive methods rather than on sensitive beliefs.

## 5 The significance of sensitivity for trials and the law

I have shown that the provided sensitivity account of legal proof is extensionally adequate in that it delivers the intuitively correct results in cases of statistical evidence. However, we not only desire an extensionally adequate account of legal proof -- we also want an account that illuminates the connection between sensitivity and legal proof. In this section, I will address the role of sensitivity for legal proof and criminal and civil law in more detail.<sup>38</sup>

Here is a straightforward connection between sensitivity, legal proof, and trials. My underlying sensitivity account of checking relies on the general assumption that, in contexts of checking, we raise the question whether  $p$  is true and intentionally use a method for settling it. In these checking-contexts, a method is adequate only if it is sensitive with respect to  $p$ . Moreover, we can also check whether  $p$  instead of an alternative  $q$  is true by raising the specific question whether  $p$  or  $q$  is true and by using a method that is sensitive with respect to  $p$  and not  $q$ . Trials are paradigmatic instances of publicly raising, considering, and settling a question. Thus, in the context of trials, sensitive methods are paradigmatically required. Sensitivity is crucial for legal proof because sensitivity is crucial for checking and settling a question in general and trials are paradigmatic instances of settling a question. This holds for both the macrostructural and the microstructural levels of trials. On the macrostructural level, the overall goal of a trial is determining whether the defendant is guilty. Accordingly, on this level, sensitivity *simpliciter* concerning the question whether the defendant is guilty is required, i.e., a method that would not indicate that the defendant is guilty, if she were not guilty. On the microstructural level of the trial, in contrast, various alternatives will be disputed, for example whether the defendant who was proven to be in the stadium purchased a ticket or gatecrashed. Thus, on this level, relevant alternatives will be discussed which require not sensitivity *simpliciter*, but sensitivity concerning specific alternatives. Thus, given that checking and settling a question require sensitive methods, trials, which are paradigmatic instances of settling a question, also require sensitive legal proofs. Since many questions are raised and considered during a trial, sensitivity in various different forms is crucial for legal proof.

Let me next investigate the relationship between sensitivity, legal proof, knowledge, and conviction in more detail. A challenge that one faces when reflecting on these issues is that they are hotly debated and there are currently different views about them on the market. Accordingly, a final general verdict about the role of sensitiv-

<sup>38</sup> I am indebted to an anonymous referee for this journal for pressing me on this point.

ity for legal proof and the law is not possible at this stage. I assume that sensitivity concerning relevant steps and relevant alternatives is a crucial mark of legal proof. Therefore, the account defended here should be compatible with promising theories on legal proof and knowing. Because I cannot investigate all views about legal proof here for making this point, in order to show the versatility of my account I will focus on two influential views on legal proof which diverge concerning the role of sensitivity and concerning the relationship between legal proof and knowledge. Enoch et al. (2012) defend a version of a sensitivity account of legal proof while at the same time arguing that knowledge is not crucial for legal proof. Moss (2022), in contrast, argues that knowledge is the standard for legal proof but criticizes sensitivity-based theories. My sensitivity account is neutral about the relationship between legal proof and knowledge, but it is compatible with both views, and I take the compatibility with such diverging views as an indicator that it captures a fundamental aspect of legal proof.

Let me first reflect on the account proposed by Enoch et al. (2012), who stress the importance of sensitivity-like principles for legal proof. Enoch et al. (2021) generally criticize the project of legal epistemology and reject epistemic bases for legal theories as knowledge fetishism. Enoch et al. (2012) defend a non-epistemic sensitivity condition and propose that the crucial conditional for the proof paradox is: Had the defendant not committed the crime, we would not have punished the defendant. As they point out, this counterfactual is incentive-oriented and action guiding and despite some structural similarities it diverges from the original sensitivity condition for believing. Enoch and Spectre (2019, 192) stress in a defense of their account that “at the end of the day we think that nothing epistemological should intrinsically matter legally, Sensitivity (and Safety) included.” In this respect, their view is anti-epistemic.

The account proposed by Enoch et al. (2012) faces a severe problem, which they already noted. Statistical evidence violates their incentive-oriented sensitivity condition only if the crime had happened even if the defendant hadn’t committed the crime (and someone else had it done instead.) Critics like Gardiner (2019b) stress that this additional condition is often not fulfilled. In most cases, if the defendant had not committed the crime, then nobody would have committed it and no crime had happened at all. In these cases, consulting statistical evidence fulfills the incentive-oriented sensitivity condition, since it would not lead to punishment of the defendant if she had not committed the crime. Nevertheless, consulting statistical evidence is intuitively flawed. The critics conclude that the sensitivity condition of Enoch et al. is inadequate. However, with the tools developed here, we can spell out an incentive-oriented sensitivity account for relevant alternatives that avoids this problem. Here is the reformulated incentive-oriented sensitivity condition for relevant alternatives: Had the defendant not committed the crime but someone else did instead, we would not have punished the defendant. The modified version of sensitivity is arguably also incentive-oriented and action-guiding, since the fact that one would not be punished if someone else had committed a crime also motivates one not to commit a crime. We see that the provided account of stepwise sensitivity and/or of sensitivity concerning all relevant alternatives is neutral concerning the question of whether sensitivity should be interpreted as an epistemic or an action-guiding principle. If one follows

this argument, then one can formulate a theory of legal proof in the spirit of Enoch et al. on the basis of my sensitivity account that resolves one of their central issues.

In opposition to Enoch et al., Moss (2022) defends a knowledge account of legal proof according to which knowledge is the standard of legal proof. Moss spells out knowledge in terms of relevant alternatives that have to be excluded, leading to a relevant alternatives account of legal proof. In her own words: “A recurring theme of the paper is that legal proof requires ruling out relevant epistemic possibilities, where the relevance of a possibility is not determined by its probability.” (Moss, 2022) As Moss lays out, the formulation “beyond reasonable doubt” was introduced to protect jury deliberation from “epistemic inflation”, which occurs if too far-fetched alternatives are considered. As she claims, the standard set by the phrase “beyond reasonable doubt” places “an important constraint on the context in which the jury should be deliberating—namely, it must be a context in which they are considering all and only doubts that it is reasonable for them to consider.” (Moss, 2022)<sup>39</sup>

According to my account, sensitivity is crucial for legal proof because sensitivity is crucial for checking and settling a question and a trial is a paradigmatic instance of settling a question. This account does not tell us anything about the relationship between checking and knowing in general and between legal proof and knowledge in particular.<sup>40</sup> However, it can potentially support Moss’s account. Legal proof not only requires sensitivity simpliciter, but sensitivity of each relevant step or concerning each relevant alternative. My account models the exclusion of relevant alternatives in terms of sensitivity. A legal proof that a defendant is guilty is successful only if the method used is sensitive with respect to any relevant alternative. As I argued, in the case of the gatecrasher, that the defendant was in the stadium but purchased a ticket *is* clearly a relevant alternative. Therefore, a method is appropriate only if it is sensitive with respect to this alternative. This is also explicitly acknowledged by Moss.<sup>41</sup> However, she does not provide an illuminating theory about when alternatives are ruled out. The sensitivity account defended here, however, does provide such a theory. Hence, it can neatly support Moss’s knowledge-account of legal proof as follows. Ruling out an alternative requires sensitivity concerning this alternative. Knowledge requires ruling out relevant alternatives, at least in the context of legal proof. Since

<sup>39</sup> Moss uses this knowledge account of legal proof based on relevant alternatives for explaining the fact that “beyond reasonable doubt” is so hard to define in law and that explanations do not improve much. Knowledge is elusive according to Lewis (1996), in the sense that it intuitively vanishes, when considering alternatives. “Beyond reasonable doubt” is elusive, since its standard is knowledge which itself is elusive. Again, in Moss’s (2022) own words. “Now we can see why it is hard to define this reasonable epistemic standard in greater detail. The problem is that the more we say in an effort to spell out the difference between reasonable and unreasonable doubts, the more we call attention to the possibilities that jurors shouldn’t be considering.”

<sup>40</sup> Part II of Melchior (2019) contains a detailed examination of the potential relationship between knowing and checking, including invariantist and contextualist theories, but without committing to a specific view.

<sup>41</sup> In Moss’s (2022) words: “Suppose you are the factfinder in Gatecrasher. The plaintiff has proved that most people at the rodeo climbed over the fence. But the defendant insists that he is not just any arbitrary person at the rodeo. In effect, the defendant is raising a certain possibility—namely, that he is an individual, not represented by features of the group to which he belongs. Given the lottery-like similarity of all the possible defendants in the Gatecrasher scenario, this possibility is impossible to ignore.” See also Gardiner (2019a).

knowledge is the standard of legal proof, legal proof also requires ruling out relevant alternatives based on sensitivity concerning these alternatives. For this reason, we then end up with a sensitivity-based account of legal proof and of knowledge in the context of legal proof.

However, one point of Moss's account has to be abandoned. Moss criticizes sensitivity-based accounts of legal proof for not delivering the correct results for cases of statistical evidence. I have argued that they do if sensitivity is properly understood as sensitivity concerning relevant alternatives. According to my account, Moss is right that relevant alternatives are crucial for legal proof. I remain neutral as to whether sensitivity is also crucial for knowledge (in the context of legal proof). However, Moss is mistaken in claiming that these relevant alternatives cannot be captured in terms of sensitivity.

Gardiner (2019a) also articulates and defends a detailed relevant alternatives account of legal proof, including a detailed reflection on legal practice, but, in contrast to Moss, without defending the view that knowledge is the standard for legal proof. Gardiner argues that the different standards of legal proof, of preponderance of evidence, clear and convincing evidence, and beyond reasonable doubt, can all be modelled in terms of relevant alternatives, where the relevant alternatives are increasingly remote for these standards. For example, for proving beyond a reasonable doubt, an alternative might be relevant that is not relevant according to the standard of preponderance of evidence. Gardiner diverges from a Lewisian account of relevant alternatives in arguing that relevant alternatives are stable within a particular standard and do not depend on the conversational context. Gardiner does not provide a detailed account of when exactly a relevant alternative is ruled out or *addressed*, to use her terminology. However, she acknowledges the significance of sensitivity, briefly noting that “[s]ensitive evidence is valuable, on this framework, because such evidence is how relevant error possibilities are addressed.” (Gardiner, 2019a, p. 317) Hence, I assume that my sensitivity-based account of legal proof is a welcome complement to her account. Gardiner (2019a) and Moss (2022) both present detailed analyses of the importance of ruling out relevant alternatives for legal proof. Since ruling out relevant alternatives can be modelled in terms of sensitivity, sensitive legal proofs are crucial to the criminal and civil law.

To sum up, there is a natural connection between sensitivity and legal proof. Sensitivity is a crucial mark of checking and settling a question and trials are paradigmatic instances of settling a question. Therefore, sensitivity is also a crucial mark of legal proof. Various questions concerning legal proof are still hotly debated, for example its relationship to knowledge or the possibility of faultless wrongful convictions, which I addressed in Sect. 4. The provided sensitivity account can make a substantial contribution to all these accounts and topics. It might be an open question which role exactly sensitivity plays for trials and the law, for example, whether it is part of an incentive-oriented and action-guiding system of convictions or whether it is a principle of ruling out relevant alternatives. However, we have seen that it plays a crucial role according to any of these views.

## 6 Conclusion

In this paper, I have developed a sensitivity-based solution to the proof paradox. According to this solution, statistical evidence is dismissed in court because it is insensitive. Individual evidence, on the other hand, is sensitive, leading it to be accepted even when it predicts the same conditional probability that a defendant is guilty. This sensitivity account is part of a more general account on the epistemology of checking and settling a question. Legal proof requires sensitivity because it is a paradigmatic instance of checking, an epistemic notion which also requires sensitivity. Moreover, I have shown that sensitivity rather than safety is the crucial modal condition for proving in court. Further refinements of the provided account were presented in order to meet objections that have been proposed against alternative sensitivity-based theories of legal proof. Not only must a legal proof be sensitive, but each relevant step has to be sensitive, respectively the proof must be sensitive concerning relevant alternatives. The provided account can fruitfully support very different views on the relationship between knowledge and legal proof, a fact that provides further support that it captures a crucial feature of legal proof.

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## Declarations

**Conflict of interest** There are no competing interests. There are no ethical concerns.

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