Legal Proof Should Be Justified Belief of Guilt

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Abstract

We argue that legal proof should be tantamount to justified belief of guilt. A defendant should be found guilty just in case it is justified to believe that the defendant is guilty. Our notion of justified belief implies a threshold view on which justified belief requires high credence, but mere statistical evidence does not give rise to justified belief.

1 Introduction

Imagine you are a fact-finder in a court of law. A prisoner is accused of having murdered a prison guard. You have to find the accused guilty or innocent. Your decision is governed by a standard of proof and the available and admissible evidence. Out of fairness, you seek truth: you aim to establish the facts as you believe they are. So you find the prisoner guilty just in case you believe that he is guilty based on the available and admissible evidence.

Your beliefs follow certain norms. Foremost, your beliefs aim at truth. You believe a proposition only if you believe it to be true. Inconsistent propositions cannot be true. Hence, you do not believe any inconsistencies. If

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you believe that a proposition is true, you do not believe that its negation is true as well. As you strive for true beliefs and truth is closed under logical consequence, you believe what logically follows from your beliefs. In sum, your beliefs are rational: consistent and deductively closed. Indeed, your beliefs are even justified: they are rational and sufficiently supported by the admissible evidence available to you. Or so we assume.

In this paper, we argue for the thesis that legal proof should be tantamount to justified belief of guilt. A defendant should be found guilty just in case a fact-finder is justified to believe that the defendant is guilty.[1] This thesis has the ring of truth, whereas its negations do not. 'The defendant should be found guilty but the fact-finder is *not* justified to believe that he is' sounds just as odd as 'the defendant should *not* be found guilty even though the fact-finder is justified to believe that he is'.

We have put forth our thesis and made clear that we assume the perspective of an ideal truth-seeker. It remains to explain how the beliefs of a fact-finder can be justified by the available and admissible evidence. We do so by improving upon the idea of justified belief as high enough credence in light of the evidence. We show that our notion of justified belief solves the problem posed by statistical evidence—evidence which supports a high credence but no justified belief. The upshot is a rather unifying view of legal proof in terms of evidence-based credence.[2]

2 The Simple Threshold View

When is it justified to have a belief? On one view, you are justified to believe a proposition iff you have a high enough credence in that proposition given your total evidence. And your credence is high enough iff it exceeds a certain threshold (Foley, 1993). On this simple threshold view, your cre-

[1] In the law, guilt is usually understood to imply an *actus reus*—or objective element of a crime—and a *mens rea*—or criminal intent of a crime. For this paper, we put the intricate issue of what constitutes a *mens rea* aside and focus on beliefs about *actus reus*.

[2] This paper builds on Günther (forthcoming), where legal proof is analysed in terms of rational belief.

dences or 'degrees of belief' are rational: they satisfy the Kolmogorov axioms of probability and the ratio definition of conditional probability.

The simple threshold view translates your evidence-based credences into what it deems justified beliefs. When your credence in a proposition A given your whole body of evidence surpasses the threshold, your belief in A is justified. Your credences, in turn, are justified by the total evidence you received, which is summarized by the strongest proposition of which you are now certain. To be clear, your credences at time t are represented by a probability function conditionalized on the total evidence you received up to time t. Typically, your total evidence leads to non-extreme credences: subjective probabilities strictly in-between 0 and 1. You would have only few justified beliefs if you were to set the threshold for them to 1—too few.

The exact threshold for justified belief, if there is any, is of course subject to debate. But there is a natural lower bound: justified belief in a proposition requires a credence in that proposition strictly above $1/2$. Suppose for reductio that the threshold were equal to $1/2$ or less. Then you could be justified to believe a proposition A and its negation $\neg A$ to be true at the same time. But you are never justified to believe such a contradiction to be true. The resulting inconsistent belief state is irrational and so unjustified.

The simple threshold view can explain how your beliefs are supported by your evidence. Imagine you look out of the window and you see it raining. Based on this evidence, your credence in rain goes up so that it seems to be high enough for a justified belief in rain. Conversely, if you are justified to believe that it rains, your credence in rain must be high enough in some sense. The view is not too implausible. But there are issues.

A—if not 'the'—problem for the simple threshold view is posed by statistical evidence: evidence which supports a high credence but no justified belief. For example, suppose there are 100 prisoners in a yard under the supervision of a guard. 99 of them join a pre-planned attack to kill the guard. One prisoner clearly refrains, standing alone in a corner. We know this from a reliable video recording. However, the video footage does not allow to discern the individual prisoners—all wear the same uniforms and the quality is not good enough to identify faces or other characteristics.

There is no other evidence. Each prisoner is tried in a court of law.[3]

Are you justified to believe that the prisoner standing trial is guilty? On the simple threshold view, you are because your credence in his guilt is high enough. If legal proof should be tantamount to high enough credence of guilt, this would also mean that we should find the prisoner guilty. But many are not willing to endorse this consequence (Wells, 1992; Niedermeier et al., 1999; Redmayne, 2008; Arkes et al., 2012; Blome-Tillmann, 2015). Buchak (2014, p. 303), for example, says

> we never think it justified to blame an individual on the basis of merely statistical evidence [...] And this is best explained by the fact that we need a belief in someone's guilt to blame her, and that merely statistical evidence cannot give rise to a belief in these cases.

On this, we agree with Buchak. However, Buchak also argues that justified belief cannot be reduced to credence. And so "threshold views of the relationship between *licensed court verdicts* and rational credence are false." (p. 291) We disagree. In what follows, we offer a threshold view on which justified belief requires high credence, but mere statistical evidence does not give rise to justified belief.

3 A Threshold View of Justified Belief

We develop now our notion of justified belief in terms of credence. As on the simple threshold view, your credences are determined by your total evidence. This means you consider all the pieces of evidence you received. If you are a fact-finder, you exclude the inadmissible pieces of evidence. But there is more. Your total evidence also determines the possibilities you consider overall. You consider all and only those possibilities your credences assign a definite positive probability value. The total evidence you received partitions the underlying set W of all logical possibilities into

[3] The prisoner example originates in Nesson (1979).

possibilities π_i that are assigned a positive credence $P_\Pi(\{\pi_i\}) > 0$. Such a possibility is a maximally specific way things might be with respect to the partition Π induced by your total evidence. A partition Π on W is a set of pairwise disjoint and non-empty subsets π_i of W so that $\bigcup \pi_i = W$. If you are a fact-finder, your initial partition includes the possibilities that the defendant is guilty and innocent.

Propositions are understood relative to a partition. Any subset of a partition Π is a proposition. A proposition $A \subseteq \Pi$ is consistent iff $A \neq \emptyset$. A proposition A is consistent with a proposition B iff $A \cap B \neq \emptyset$. A entails B iff $A \subseteq B$. The negation $\neg A$ of a proposition is given by its complement $\Pi \setminus A$, the conjunction of $A \wedge B$ of two propositions by their intersection $A \cap B$, and the disjunction $A \vee B$ by their union $A \cup B$. The probability distribution P_Π is defined for all subsets of Π.

We are now in a position to define justified belief in terms of credence:

> You are justified to believe a proposition $A \subseteq \Pi$ iff $B_\theta \subseteq A$, where B_θ is chosen among the propositions you assign a high credence $P_\Pi(B_\theta)$ and you expect B_θ to remain more likely than not.

The conjunct 'you expect B_θ to remain more likely than not' means that you consider no relevant proposition which would lower your credence $P_\Pi(B_\theta)$ to $1/2$ or below. You consider a proposition B to be relevant to B_θ iff your credence in it is non-zero and it is consistent with B_θ. In symbols, you consider a proposition $B \subseteq \Pi$ to be relevant to $B_\theta \subseteq \Pi$ iff $P_\Pi(B) > 0$ and $B_\theta \cap B \neq \emptyset$. In sum, we say you expect B_θ to remain more likely than not iff your conditional credence $P_\Pi(B_\theta \mid B) > 1/2$ for any proposition $B \subseteq \Pi$ you consider relevant. Equivalently, you expect B_θ to remain more likely than not iff you consider no relevant proposition $B \subseteq \Pi$ which would lower your credence $P_\Pi(B_\theta \mid B)$ to $1/2$ or below.[4]

Our notion of justified belief is synchronic: you are justified to believe a proposition at time t iff you have a high credence in it at t and you expect it

[4]The expectation of a proposition to remain more likely than not is inspired by Leitgeb's (2014) P-stability.

to remain more likely than not at t. In what follows, we leave the reference to a point in time implicit.

Let us revisit the prisoners example. Your total evidence is that 99 out of 100 prisoners killed a prison guard. Each of the 100 prisoners may be innocent and you have no reason to believe of any one that he is more or less likely to be guilty than any of the others. All the 99:1 statistics says is that there are 100 equiprobable possibilities that each prisoner is innocent and all the others are guilty. So your total evidence assigns to only 100 possibilities a definite positive probability value, and so partitions the underlying set of possibilities into exactly 100. Let π_i be the possibility where prisoner i ($1 \leq i \leq 100$) is innocent and all the other prisoners are guilty. Your total evidence makes you consider the partition $\Pi = \{\pi_1, ..., \pi_{100}\}$ of mutually exclusive and jointly exhaustive possibilities. Moreover, you assign to each possibility the same definite credence: $P_\Pi(\{\pi_1\}) = ... = P_\Pi(\{\pi_{100}\}) = 1/100$.

Let us name the prisoner standing trial 'prisoner 1'. Are you justified to believe that prisoner 1 is guilty? Well, your credence in the guilt of prisoner 1 is high: $P_\Pi(\Pi \setminus \{\pi_1\}) = 99/100$. However, you do not expect any non-empty $B_\theta \subseteq \Pi \setminus \{\pi_1\}$ to remain more likely than not:

$$P_\Pi(B_\theta \mid \{\pi_1, b\}) = \frac{P(\{b\})}{P(\{\pi_1, b\})} = 1/2 \text{ for any } b \in B_\theta.$$

For illustration, let $B_\theta = \Pi \setminus \{\pi_1\}$. You assign the proposition that prisoner 1 or prisoner 2 is innocent a positive credence and the proposition is consistent with the proposition that prisoner 1 is guilty. Hence, you consider the proposition relevant. And your credence that prisoner 1 is guilty given that prisoner 1 or prisoner 2 is innocent does not strictly exceed $1/2$:

$$P_\Pi(\Pi \setminus \{\pi_1\} \mid \{\pi_1, \pi_2\}) = \frac{P(\{\pi_2\})}{P(\{\pi_1, \pi_2\})} = 1/2.$$

This means you do not expect $\Pi \setminus \{\pi_1\}$ to remain more likely than not. A similar argument applies to each prisoner. Hence, you are not justified to believe of any prisoner that he is guilty—even though your respective credence is very high. Our notion of justified belief solves this paradigmatic example of statistical evidence.

Our notion can also deliver justified belief where appropriate. To see this, consider a modification of the prisoners example. We have no video recording, but the prison director walks by. She then testifies about prisoner 1: "I saw him killing the guard!" Let's suppose you think that the director is very reliable but not perfectly so: she raises your credence that prisoner 1 is guilty to $^{99}/_{100}$.

Your total evidence is the prison director's eye-witness testimony 'I saw prisoner 1 killing the guard'. This testimony is only about prisoner 1, it does not say anything about another prisoner. It does not answer at all to the question, let's say, how likely it is that prisoner 2 is guilty. As you deem the prison director not perfectly reliable, her testimony makes you assign a definite positive credence to exactly two possibilities: the testimony is true and so prisoner 1 killed the guard, or else the testimony is false and the prisoner is innocent. Indeed, all the testimony bears on is the question whether or not prisoner 1 is guilty of having killed the guard. So your total evidence makes you consider the partition $\Pi' = \{\pi'_1, \pi'_2\}$, where π'_1 is the possibility that prisoner 1 is innocent and π'_2 the possibility that prisoner 1 is guilty.

Are you justified to believe that prisoner 1 is guilty based on the eye-witness evidence? Well, your credence in the guilt of prisoner 1 is high: $P_{\Pi'}(\Pi' \setminus \{\pi'_1\}) = {}^{99}/_{100}$. And you expect his guilt to remain high. There are only three possibilities. $\{\pi'_1\}$ is inconsistent with $\Pi' \setminus \{\pi'_1\}$ and so irrelevant; $P_{\Pi'}(\{\pi'_2\} \mid \{\pi'_2\}) = 1$; and $P_{\Pi'}(\{\pi'_2\} \mid \Pi') = {}^{99}/_{100}$. By choosing $B_\theta = \Pi' \setminus \{\pi'_1\}$, you are justified to believe that prisoner 1 is guilty.

We have seen that the different pieces of evidence in the prisoners example and the director example, respectively, determine the same credence in the guilt of prisoner 1. And yet our threshold view says that there is justified belief in his guilt in the former but not in the latter example. The reason is that the different pieces of evidence give rise to different partitions of the underlying possibilities. The 99:1 statistics induces a uniform credence function expressing a symmetry between the prisoners: each prisoner is just as likely as any other to be innocent. We suggest it is this symmetry why it feels so random to convict one of the prisoners based on statistical evidence alone: looking at the probability values, it could likewise have been any other prisoner.[5]

The director's eye-witness testimony, by contrast, biases the fact-finder's credences towards prisoner 1 being guilty. It induces an uneven credence function expressing that the eye-witness evidence supports the guilt possibility much more than the innocence possibility. The uneven credence over the two-cell partition—prisoner 1 killed the guard, or else he did not—gives a rather strong indication of what to believe about prisoner 1. The eye-witness evidence induces no air of randomness: the two possibilities are far from being equally likely. From the vantage point of our notion of justified belief, the distinction between the 99:1 statistics and the eye-witness testimony hints at a general notion of statistical evidence.

4 Statistical Evidence

We have said that statistical evidence supports a high credence but no justified belief (Nelkin, 2000; Buchak, 2014). This common characterization is directly derived from the prisoners example, where the 99:1 statistics supports a high credence but no justified belief. Indeed, the term 'statistical evidence' is usually characterized *only* by pointing to examples (Gardiner, 2018). Enoch and Spectre (2019, pp. 183-4) make this explicit:

> When we—following the literature—speak of statistical evidence, we think of examples such as Blue Bus [or the prisoners example], and the phenomenon it is an example of. This is the phenomenon sometimes called base-rate evidence, sometimes market-share evidence, or sometimes naked statistical evidence. [...] How *do* we, then, define statistical evidence? We don't.

[5]Pritchard (2018) explains the feeling of randomness thus: it is an *easy* possibility that the prisoner standing trial is innocent. He does not define what possibilities are easy in terms of probabilities. By contrast, we may stipulate that a possibility is easy if it is at least as likely as any other possibility. On this stipulation, it is an easy possibility that the prisoner standing trial is innocent given only the 99:1 statistics. Given only the director's eye-witness testimony, however, the prisoner being innocent is not an easy possibility.

We think lacking a definition of statistical evidence is a problem. As long as we don't know what pieces of evidence are statistical, we simply cannot answer the question of whether or not statistical evidence may give rise to justified belief—on our notion or another. We need a general definition of 'statistical evidence' in order to know whether our notion of justified belief solved the problem posed by *it*.

Our notion of justified belief suggests the following definition of statistical evidence. A piece of evidence is purely statistical iff it would assign a uniform probability distribution over the partition it induces if it were the only piece of evidence received. So defined, a piece of purely statistical evidence alone may support a high credence but never gives rise to justified belief. The problem posed by statistical evidence for the simple threshold view is solved by our notion of justified belief on the suggested definition. Furthermore, we may say that your total evidence is statistical iff it assigns uniform credences over the partition it induces. Non-statistical total evidence assigns non-uniform credences over the induced partition, and so may give rise to justified belief. In future work, we may measure how much a piece of evidence (or the total evidence) is statistical by measuring to what degree the evidence deviates from a uniform distribution.

In the literature, statistical evidence is usually contrasted with 'individual evidence' (Thomson, 1986; Blome-Tillmann, 2015). A paradigm example of individual evidence is eye-witness testimony. And indeed, the prison director's testimony is non-statistical (to a high degree) and induces justified belief. Based on the testimony alone, you expect the prisoner's guilt to remain more likely than not. Our statistical/non-statistical distinction (or continuum) accounts for the intuitive dichotomy between 'statistical' and 'individual' evidence in our two examples.

Many statistics are not statistical evidence on our definition. This sounds paradoxical but it is not. All statistics which, if they were the sole piece of evidence, would assign a non-uniform probability distribution over the induced partition are non-statistical (to some degree). And any sufficiently uneven distribution can give rise to justified belief depending on the induced partition and the specific probability values. An uneven distribution based on a statistics may well give rise to justified belief.

Base rates, by contrast, are statistical evidence. A base rate is a relative frequency—a proportion of individuals in a population who have a certain feature. A base rate without any further evidence induces a uniform distribution over a fixed number of possibilities. Our definition, therefore, can explain why "a base rate unaccompanied by other evidence" is statistical evidence (Koehler and Shaviro, 1990, p. 264). But note that our definition counts any piece of evidence inducing a uniform distribution 'statistical'—not only base rates.

In our framework, all evidence is probabilistic. Each piece of evidence—be it statistical or not—leads to some credence distribution. Pieces of statistical evidence may still help give rise to justified belief when combined with other pieces of evidence. So 'the' law should have no aversion to statistics in general, let alone probabilistic evidence (Allen and Smiciklas, 2022). The point is merely that a piece of statistical evidence alone cannot give rise to justified belief. And neither does statistical total evidence.

5 Rational Belief States

'Still,' one might wonder, 'why am I not justified to believe that prisoner 1 is guilty in the prisoners example? After all, my credence in his guilt is very high. Why is this not sufficient for justified belief of guilt?' This objection sides with the intuition expressed in the simple threshold view. Our answer is this: you have no justified belief in his guilt because your belief state would be irrational. Let us explain.

We have assumed that your beliefs are rational: consistent and deductively closed. To be more precise, we say your state of belief is consistent iff the strongest proposition B_θ you believe—the conjunction of all the propositions you believe—is non-empty. We say your state of full belief is deductively closed iff (i) you believe the proposition B if you believe A and A entails B, and (ii) you believe $A \wedge B$ if you believe A and you believe B. Hence, you believe a proposition A iff your strongest belief B_θ is consistent and entails A.

We show now that your beliefs in the prisoners example cannot be rational if you adhere to the simple threshold view. If so, you are justified to believe that one prisoner is innocent because your credence $P_\Pi(\Pi) = 1$ is maximal. At the same time, you are justified to believe of *each* prisoner that he is guilty because your credence $P_\Pi(\Pi \setminus \{\pi_i\}) = {}^{99}/_{100}$ is high enough ($1 \leq i \leq 100$). If your justified beliefs were closed under conjunction, you would also be justified to believe that *all* prisoners are guilty:

$$(\Pi \setminus \pi_1) \cap (\Pi \setminus \pi_2) \cap ... \cap (\Pi \setminus \pi_{100}) = \emptyset.$$

But you should never be justified to believe the contradiction that *all* prisoners are guilty and one is innocent. Indeed, the 'simple threshold you' is not justified to believe that *all* prisoners are guilty because your credence $P(\emptyset)$ in that proposition is minimal. Your 'justified' beliefs are rather not closed under conjunction and so they are not deductively closed. The simple threshold view cannot satisfy our two standard rationality norms on justified belief.

As a consequence, a simple threshold believer with non-maximal threshold is not guaranteed to have a rational state of belief: there is no strongest but consistent belief which entails all her other beliefs. This is a cost. To see that, imagine you are found guilty but the fact-finder's 'justified' beliefs are inconsistent. Surely you have a reason to contest the verdict. For one, the fact-finder believes everything, in particular that you are innocent. Moreover, imagine there are only three elements to be proven in court for a finding of guilt. The fact-finder is well-justified to believe *each* element A, B, and C in isolation. However, the fact-finder's beliefs are not closed under conjunction. And so it could be that she is not justified to believe *all* elements $A \wedge B \wedge C$. This is indeed a possibility on the simple threshold view. Should the defendant then be found guilty? If so, the simple threshold view of legal proof is false. If not, what else is required for a justified finding of guilt besides the justified beliefs in each element? And how should the verdict of not-guilty be explained in light of the justified beliefs in A, B, and C? To give up deductive closure seems to lead to more questions than answers.

Unlike the simple threshold view, our threshold view guarantees that you have a rational belief state. There is always a consistent and deductively closed belief state represented by the strongest non-empty proposition

B_θ you are justified to believe. Your credence $P_\Pi(B_\theta)$ is typically non-maximal. In the prisoners example, however, you are not justified to believe of a particular prisoner that he is guilty even though your credence in his guilt is very high. For then you would be justified to believe of each prisoner that he is guilty due to the symmetry of the example. But then, as your justified beliefs are deductively closed, you would believe that all prisoners are guilty and that one is innocent. Fortunately, you are rational enough not to believe such a contradiction. All you are justified to believe is that one prisoner is innocent and the other 99 are guilty—you just don't know which one. Your rational belief state is $B_\theta = \Pi$, where Π is both the partition induced by your total evidence and the strongest proposition of which you are certain. Assuming your total evidence is non-empty, you are at the very least justified to believe your total evidence—and more generally any proposition you assign maximal credence.

We take it that a notion of justified belief which guarantees rationality is better than one which doesn't. And we suggest that the rationality of our belief states explains the intuition that belief is not justified in the prisoners example—the unease to say yes which is felt by many when asked whether they believe the prisoner is guilty. There is no such unease in the director's example. And no wonder. In this example the consistency, deductive closure and evidential support of your beliefs are not in any tension: you have a high enough credence in his guilt and expect it to remain more likely than not.

6 Thresholds and Legal Proof

Our notion of justified belief entails a threshold view. Your state of justified belief is represented by the 'strongest' non-empty proposition B_θ you are justified to believe. Hence, you are justified to believe a proposition $A \subseteq \Pi$ iff $B_\theta \subseteq A$. $B_\theta \subseteq \Pi$ is then the smallest set of possibilities of which you have a high enough credence and you expect it to remain more likely than not. As B_θ is non-empty, it is consistent with the partition Π induced by your total evidence such that $P_\Pi(\Pi) = 1$. As your $P_\Pi(B_\theta \mid \Pi)$ must exceed $1/2$, so does $P_\Pi(B_\theta)$. And any superset of B_θ has a credence that is at least as high. This means you are justified to believe a proposition $A \subseteq \Pi$ iff $P_\Pi(A) \geq P_\Pi(B_\theta)$.[6] Your (variable) threshold for justified belief *is* your (current) credence in the strongest proposition you are justified to believe.

We propose that a legal standard of proof should be tantamount to justified belief of guilt relative to a certain credence threshold. Murder is a matter of criminal law. A criminal conviction requires the prosecution to prove the defendant's guilt 'beyond reasonable doubt'. This means the admissible evidence presented in court must be enough to 'remove any reasonable doubt in the mind of the fact-finder that the accused is guilty of the crime with which they are charged'. What the phrase is supposed to mean, however, is less clear. We explain it as follows: proof beyond reasonable doubt should be tantamount to justified belief in a criminal trial. A defendant's guilt should be proven beyond reasonable doubt iff your credence in his guilt is high enough and you expect it to remain more likely than not. You have a reasonable doubt if you consider a proposition to be relevant which would lower your credence in the defendant's guilt to $1/2$ or below. If you have a reasonable doubt, you consider a set of possibilities consistent with your beliefs which would make the defendant's innocence more likely than not. If so, your belief in guilt is not justified.[7]

Let us turn to the long-anticipated question: what credence is high enough for justified belief? We think your credence should exceed a threshold

[6] This consequence has been proven in detail by Leitgeb (2013) and Leitgeb (2014).

[7] Our account of legal proof can be understood as a probabilification of Lackey's (2021). She proposes:

> Convict a defendant if and only if you (i) justifiably judge that the defendant is guilty on the basis of the *admissible* evidence and (ii) justifiably judge that there is no plausible account of innocence consistent with the admissible evidence. (p. 198)

We may interpret condition (i) as requiring that you have a high enough credence in the defendant's guilt based on the available and admissible evidence. And condition (ii) as requiring that you consider no 'plausible account' B such that your credence $P(I \mid B)$ in his innocence is more likely than not. We stipulate: an account is plausible iff you assign it non-zero credence and it is consistent with your strongest justified belief induced by your available and admissible evidence. A plausible account of the defendant's innocence is then a reasonable doubt of his guilt. (i) and (ii) taken together simply mean: you should convict a defendant iff you are justified to believe that the defendant is guilty.

which depends on your value assessments or 'stakes'. You are fair in that you consider how valuable the possible outcomes of your verdict are. The argument rests on orthodox decision theory, where utility is a proxy for value. The theory says that we should maximise expected utility. In this paradigm, a defendant should be found guilty iff finding guilty has greater expected utility than finding innocent (Kaplan, 1968). The legal decision problem can be summed up as follows:

	guilty	innocent
finding guilty	TG	FG
finding innocent	FI	TI

Your available options are finding guilty or innocent. Let's denote your credence that the prisoner is guilty by $P(G)$, and so your credence that he is innocent by $1 - P(G)$. Each option—together with the prisoner's actual guilt or innocence—determines an outcome: a true finding of guilt (TG), a false finding of guilt (FG), a false finding of innocence (FI), and a true finding of innocence (TI). Your utility function U assigns each outcome a value. According to the principle of maximising expected utility, you should find the prisoner guilty iff

$$U(TG) \cdot P(G) + U(FG) \cdot (1 - P(G)) \geq U(FI) \cdot P(G) + U(TI) \cdot (1 - P(G)).$$

The inequality is equivalent to

$$P(G) \geq \frac{U(TI) - U(FG)}{U(TG) - U(FG) + U(TI) - U(FI)} = \theta.$$

Standard decision theory recommends you to find guilty just in case your credence of guilt meets the threshold obtained from the utility values you assign to the outcomes. We borrow the threshold θ to choose among the sets B_θ you expect to remain more likely than not by the constraint that $P(B_\theta) \geq \theta$.

Plausibly, you neither disvalue a true finding of guilt nor a true finding of innocence. Let's say the cost of true findings is zero: $U(TG) = U(TI) = 0$. Under this assumption, we obtain

$$P(G) \geq \frac{-U(FG)}{-U(FG) - U(FI)}.$$

Furthermore, let's say you disvalue falsely finding the prisoner guilty much more than falsely finding him innocent. Blackstone (1753, p. 358) thought "the law holds that it is better that ten guilty persons escape than that one innocent suffer." Assuming you deem a decision-theoretic version of the Blackstone ratio to be true of the prisoners example, you think a false finding of guilt is ten times worse than a false finding of innocence: $U(FG) = -10$ and $U(FI) = -1$. Your credence threshold for justified belief is then $^{10}/_{11}$, or approximately 0.91. You deem a credence above this threshold to be high enough for justified belief in the prisoner's example. This is how we use orthodox decision theory to obtain a threshold for your 'high enough' credence.

To be clear, we propose a justified belief account of legal proof, not one which maximises expected utility. And we do not aim to reconcile the two approaches either. Indeed, you think finding prisoner 1 guilty has greater expected utility than finding him innocent in the prisoners example. And yet you are not justified to believe that prisoner 1 is guilty—at least on our notion of justified belief. Rational truth seekers and expected utility maximisers may come apart.[8] The maximisers achieve a much higher accuracy than our truth seeker in the prisoners example: 99 correct verdicts and only 1 incorrect one. But they cannot justify their verdicts in terms of full belief without further ado. Perhaps they could do so by adopting the simple threshold view. But there is some tension. Their value assessments in certain cases may be as follows: finding guilty has greatest expected utility but the credence threshold for finding guilty, and so for justified belief in guilt, is below $^{1}/_{2}$. As we explained above, such a simple credence threshold leads to 'justified' beliefs in contradictions. Our rational and fair truth-seeker does not maximise expected utility and is not prepared to sacrifice the rationality of belief for a gain in accuracy.

We leave a thorough comparison of our justified belief account of legal proof to one of maximising expected utility for future work. There, we will discuss an avenue for reconciling the two approaches to a large extent, namely by investigating what value assessments are appropriate in what legal cases. For now, we merely use decision theory to borrow a credence threshold for justified belief. And we can do this without further

[8]We would like to thank an anonymous reviewer for this point.

problem: if the threshold imported from decision theory happens to be exactly 1/2 or below, your threshold is just above 1/2—you must still expect the defendant's guilt to remain more likely than not.

Our account of legal proof is unifying. Evidential standards other than beyond reasonable doubt just require a less high credence of guilt. The reason seems to be this: the difference between disvaluing a false finding of guilt and a false finding of innocence diminishes in these cases, as compared to the 'high stakes' cases like murder.

The evidential standard of civil law is known as 'preponderance of evidence' and is typically interpreted thus: a plaintiff's claim counts as proven in court just in case the claim is established to be more likely than not. In a civil trial, you should have no preference for either finding for the plaintiff, or finding for the defendant. This means in our framework that a false finding of liability and a false finding of innocence should be equally costly. Together with the above assumption that the cost of true findings is zero, the borrowed threshold for finding liable should then be exactly 1/2. A defendant's liability should be established by preponderance of the evidence iff the fact-finder is justified to believe that the defendant is liable. And this is the case whenever B_θ entails the defendant's liability and she expects B_θ to remain more likely than not. This solves the 'blue bus' case—a case of civil law that is structurally similar to the prisoners example (Tribe, 1971, pp. 1340-50). And other structurally similar cases like the 'paradox of the gatecrasher' (Cohen, 1977, pp. 74-81). In sum, our account of legal proof solves the 'proof paradoxes' (Redmayne, 2008).

7 Conclusion

We have argued that legal proof should be tantamount to justified belief of guilt. A fact-finder should find a defendant guilty just in case she is justified to believe that the defendant is guilty. Pace Buchak, our notion of justified belief implies a probabilistic threshold view which solves the problem posed by statistical evidence. And unlike other accounts, we need not impose any further condition on legal proof but justified belief.[9] On our view, proof beyond reasonable doubt should be justified belief in a criminal trial. And proof by preponderance of evidence should be justified belief in a civil trial.

Our threshold view improves upon the simple threshold view. The latter says: you are justified to believe that a defendant is guilty just in case your credence in his guilt is high enough based on the available and admissible evidence. Our threshold view adds that your strongest justified belief should entail guilt and you should expect your credence of your strongest justified belief to remain more likely than not. Both views admit the fact that you—our truth-seeking fact-finder—find yourself in a position, where both your beliefs and credences should be rational. You must make a binary decision—to find guilty or not—based on your available and admissible evidence, which induces almost always non-extreme credences of guilt. You should therefore have a rational procedure to translate your evidence-based credences into a final verdict. The two threshold views can both serve as such a procedure: find guilty just in case you are justified to believe that the defendant is guilty. But only ours guarantees that your justified beliefs are rational. And only ours discerns statistical from non-statistical evidence.

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[9]Our account has no need to impose any modal notion of sensitivity (Enoch et al., 2012; Enoch and Fisher, 2015; Günther, 2024), of safety (Pritchard, 2015, 2018; Pardo, 2018), and of normic support (Smith, 2010, 2018). Our account has also no need for knowledge, it neither imposes (probabilistic) knowledge (Moss, 2021) nor sufficiently high evidential probability of knowledge (Blome-Tillmann, 2017). Finally, our account has no need for a notion of second-order probability or meta-uncertainty (Steele and Colyvan, 2023).

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