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LEGAL RISK, LEGAL EVIDENCE
AND THE ARITHMETIC OF CRIMINAL JUSTICE

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ABSTRACT. It is argued that the standard way that the criminal justice debate regarding the permissible extent of wrongful convictions is cast is fundamentally flawed. In particular, it is claimed that there is an inherent danger in focussing our attention in this debate on different ways of measuring the probabilistic likelihood of wrongful conviction and then evaluating whether these probabilities are unacceptably high. This is because such probabilistic measures are clumsy ways of capturing the level of risk involved, to the extent that a defendant can be subject to an unacceptably high level of legal risk in this regard even where the relevant probabilities are very low. An alternative conception of legal risk⸺one that is primarily cast along modal rather than probabilistic lines⸺is set out which offers a much better way of framing the debate regarding what would be an acceptable level of wrongful conviction. It is further argued that with this modal conception of legal risk in play we can capture an important necessary condition that should be imposed on legal evidence, one that has application beyond the context of the criminal trial.

1. THE ARITHMETIC OF CRIMINAL JUSTICE

One of the most pressing issues in legal theory concerns the extent to which a criminal justice system ought to countenance the possibility of wrongful conviction. Clearly any wrongful conviction is an injustice, and hence something to be avoided. Moreover, any real-world system of criminal justice is bound to make mistakes from time to time, and hence is bound to generate some wrongful convictions, and so we cannot reasonably expect a criminal justice system to make no errors of this kind. The question is then how extensive can this kind of legal error be before it entails that the criminal justice system should be reformed. In short, what level of *legal risk* of this

kind is compatible with a well-functioning criminal justice system?

What is interesting about this debate for our purposes is that the risk of wrongful conviction is almost exclusively cast along probabilistic lines. Two particular percentages tend to be focused on here. First, the so-called 'Blackstone Ratio', which is the percentage of false acquittals relative to false convictions as a whole. The idea is that this percentage should be as high as possible (i.e., to paraphrase Williams Blackstone himself, that it is better that the guilty walk free than that the innocent suffer by being wrongfully convicted). Alternatively, second, there is the percentage of wrongful criminal convictions relative to criminal convictions as a whole. There are important issues here regarding whether these are the right statistical measures to use, but usually where concerns of this kind are raised the question is just whether this particular statistical measure ought to be replaced by a different measure.[1] My concern about this purely probabilistic approach to wrongful conviction is rather that it simply doesn't capture the kind of risk that is in play in this debate.

Consider the following exchange on this topic. First we have the findings of Samuel Gross and his colleagues who offer the following estimate of the level of wrongful criminal convictions in the US over a particular time period (during which there were around 15 million criminal convictions in total):

> "Any plausible guess at the total number of miscarriages of justice in America in the last fifteen years must be in the thousands, perhaps tens of thousand." (Gross *et al* 2005, 551)

After quoting this passage, Larry Laudan comments as follows:

> "Even if Prof. Gross's worst fears are realized, the justice system makes a mistake less than once in every thousand convictions. Is there any other form of human deliberation in which errors are so rare? I know no epistemologist or experimental psychologist or statistician who would not regard this figure, if true, as anything less than an astonishingly successful cognitive achievement. Even if there were 100,000 false convictions in the fifteen years covered by Gross's study—instead of the 340 that he actually found—this would still represent an error rate of less than one percent." (Laudan 2008, 283)

Laudan is surely correct that the statistic offered by Gross *et al*, if correct, is in fact surprisingly low, to the extent that one would surely antecedently wonder why, if the criminal justice system is this effective at avoiding false convictions, there is any worry on this score at all. And yet, as Laudan also notes, it is similarly natural to think that *any* level of wrongful criminal conviction is too high, and hence an indictment of the criminal justice system. What is going on here?

One response to this tension in our thinking about wrongful convictions is that it simply reflects a kind of failure of intellectual nerve, a kind of intellectual *akrasia*, if you will. If we were level-headed and consistent in this regard, then we would set a particular (presumably very low) level of wrongful conviction which was reasonable, given the inherent fallibility of any complex

human endeavor, and thereafter be sanguine, if somewhat regretful, about the possibility of wrongful convictions so long as this level was not breached. Of course, we would still regard any wrongful conviction as an injustice which should be corrected if identified, and of course we would also keep a close eye on how this level of wrongful conviction was being measured in order to ensure that the level wasn't being illicitly breached. But, crucially, the intellectually hard-headed amongst us would not be unduly concerned about the fact that the criminal justice system was compatible with this particular level of wrongful conviction. After all, the idea that a well-functioning criminal justice system could exclude *any* possibility of legal risk of this kind is to submit to wooly thinking, and so there is no alternative but to be sanguine about some degree of risk of this sort.

While I think the general idea behind this reasoning is sound—in that we should be willing to countenance some degree of fallibility in our criminal justice system—I want to suggest that the idea that we should track this fallibility by focusing just on the probability of a wrongful conviction (however that is measured) isn't right. As we will see, the nub of the problem in play here is that we cannot capture risk, including the legal risk of a wrongful conviction, in purely probabilistic terms.

2. RISK

In evaluating the risk involved in a particular activity, such as taking a flight on a plane, we have in mind a certain possible, but unwanted, outcome of that activity, such as dying in a plane crash. Call this unwanted outcome the *risk event*. With regard to the variety of legal risk that concerns us, the risk event is that of wrongful conviction. The standard view about risk is that it is essentially a probabilistic matter. That is, we measure the degree of risk by determining how high a probability to assign to the risk event.[2] We can then make a judgement about the desirability of that activity on that basis—e.g., by trading off the level of risk involved relative to other factors, such as the importance of the activity in question. In simple terms, if there is a higher than usual level of risk involved in taking this particular flight, but catching the flight is also very important (one has a pressing need to be at one's destination, say), then the right decision might well be to live with a higher than usual level of risk than one would do otherwise. Applied to the problem of legal risk that faces us, the challenge would be to settle on a probabilistic threshold for the risk event of a wrongful conviction, and then ensure that the criminal justice system doesn't exceed that threshold.[3]

Despite the widespread endorsement of the probabilistic account of risk, it is at best an incomplete account, in that it cannot capture a particular kind of risk. We can illustrate this problem by comparing two different ways in which a particular risk event might come about, where in both cases the chances of this event occurring are by stipulation identical. The probabilistic account of risk is thus committed to regarding the risk events in both cases as being of equal risk. As we will see, however, one of the risk events is clearly far more risky than the other.

Here are the cases:

CASE 1: An evil scientist has rigged up a large bomb, which he has hidden in a populated area. If the bomb explodes, many people will die. There is no way of discovering the bomb before the time it is set to detonate. The bomb will only detonate, however, if a certain set of numbers comes up on the next national lottery draw. The odds of these numbers appearing is 14 million-to-one. It is not possible to interfere with this lottery draw.

CASE 2: An evil scientist has rigged up a large bomb, which he has hidden in a populated area. If the bomb explodes, many people will die. There is no way of discovering the bomb before the time it is set to detonate. The bomb will only detonate, however, if a series of three highly unlikely events obtain. First, the weakest horse in the field at the Grand National, Lucky Loser, must win the race by at least ten furlongs. Second, the worse team remaining in the FA Cup draw, Accrington Stanley, must beat the best team remaining, Manchester United, by at least ten goals. Finally, third, the Queen of England must spontaneously choose to speak a complete sentence of Polish during her next public speech. The odds of this chain of events occurring is 14 million-to-one. It is not possible to interfere with the outcomes of any of the events in this chain.

Note that the probability of the risk event in each case is by stipulation identical—14 million-to-one—and so the probabilistic account of risk is committed to treating the risk in play in each case as being of an identical level. I contend, however, that there is a much higher level of risk in play in case 1 than in case 2.

In order to see this, we only need to note that in case 1, even despite the odds involved, the bomb blast is nonetheless something that *could very easily* occur. All it would take for the bomb to go off, after all, is that a few coloured balls in the lottery draw fall in a certain configuration. I don't think anyone who knew about this bomb plot would be sitting comfortably while watching the next lottery draw, since there is a serious risk that many people will soon die from a large bomb blast.

Would there be any corresponding cause for alarm in case 2, however? I don't see why. Each of the three events, while the kind of thing that could potentially occur, is incredibly far-fetched. That is, none of them are events that could very easily occur. For all three to obtain would require an incredible run of events. That's not to say that there is no risk of the bomb going off, since all three of these events are genuine possibilities—as we might say, stranger things have happened. But the point is that the possibility that the bomb goes off in case 1 is not something

that could very easily occur in the way that it is in case 1, even despite the sameness of the probabilities involved.[4]

Moreover, notice that in both cases, the risk event (a large bomb explosion, with many potential casualties) is exactly the same. This is important because if the risk event were different then one could argue that this would affect our judgements about the risk involved. That is, we might naturally raise our assessments of risk where the target event is particularly unwanted—as we noted above, it is common to in part evaluate how we should respond to risk by taking into account other factors, and this could include the extent of the undesirability of the risk event. Accordingly, this could conceivably explain why two events with identical probabilities might nonetheless be judged to have different levels of risk. Clearly, however, this diagnosis of what is going on in these two cases is not available here, as it is the very same risk event that is at issue in both cases.

Call the puzzle that we have just set out for the probabilistic account of risk the *lottery puzzle,* and the type of problem cases that we have identified (i.e., case 1 scenarios, as opposed to corresponding case 2 scenarios) *lottery cases* (even though there need of course be no actual lottery involved). There are two main ways in which the proponent of the probabilistic account of risk might respond to the lottery puzzle. The first would be to insist that, since the probability of obtaining is the same, the risk event in both cases is equally risky. The second would be to grant that the risk event in case 2 is indeed riskier than the risk event in case 1, but that this reflects the fact that we have assessed the probabilities of these events obtaining incorrectly, and that the probability of the obtaining of the risk event in case 2 is in fact much lower than the probability of the obtaining of the risk event in case 1.

The difficulty facing the second line of response is that even though one can always dispute the assignment of probabilities in a particular case, it ought to be clear that there will inevitably be pairs of cases of this general type. The reason for this is that there is a clear distinction to be drawn between the probability of an event and its modal closeness. More specifically, that an event has a very low probability of occurring, as with the two risk events at issue above, is compatible with that event nonetheless being such that it could very easily occur (as we saw with the risk event in case 1).

The point is that we naturally order possible worlds, and thus the possible events which obtain in those worlds, in terms of their similarity to the actual world, where similarity is determined by how much needs to change in the actual world in order to get to this possible world where the target event occurs. A close possible world is thus one which does not require much change in the actual world. A far-off possible world, in contrast, is one which does require a great deal of change in the actual world. So there is a close possible world in which all that is different is

that the cup on my desk is positioned slightly to its left. In contrast, the possible world in which Paris has switched places with Tokyo is much more distant, modally speaking. The first possibility is thus something that could very easily occur—it is an *easy possibility*—whereas the latter is not something that could easily occur, in that a great deal of change separates the actual world from this possible world.[5]

Here is the crux of the matter. Although in general close possible worlds will tend to be worlds where high probability events occur, and far-off possible worlds will tend to be worlds where low probably events occur, there are exceptions. In particular, there can be close possible worlds where very low probability events occur—i.e., where such events are easy possibilities, even despite their low odds of obtaining. Indeed, lotteries are a classic way of illustrating this point. Although a lottery win is an event with very low odds of obtaining, it is nonetheless an easy possibility, since not a lot needs to change about the actual world for one to be a lottery winner— just a few coloured balls need to fall in a slightly different configuration.[6]

We can now see why it would be hopeless for the proponent of this view to try to evade the puzzle by arguing that the probability of the risk event in case 2 is in fact much higher than the probability of the risk event in case 1. For even if they manage to make this claim stick in this particular pair of cases, it ought to be clear that the underlying problem is not thereby resolved. That is, insofar as there can be low probability events that obtain in close possible worlds, such that the very same event when brought about by a different cause would only obtain in a far-off possible world, then this puzzle will arise.

That leaves the other option which is open to the proponent of the probabilistic account, which is to contend that the risk events at issue in cases 1 and 2 are equally risky. Presumably, the line of argument will be that although there is a modal difference between these two events, in that the one is an easy possibility whereas the other isn't, this is not a difference that has any bearing on the objective risk in play. Instead, this is a matter of the probability of the event obtaining, and since this is the same in both cases, so both events are of equal risk.

While undoubtedly a theoretical option in this regard, it is clearly one which is heavily theory-driven. Unless we had already signed-up to the probabilistic account of risk, why would we be at all tempted by this line of argument? In particular, notice that the point that low probability events can nonetheless be modally close is not itself the product of theory, but rather rooted in our everyday assessments of events. Indeed, it is widely noted in the empirical literature on the psychology of risk ascriptions that our judgements about risk are primarily responsive to the modal closeness of the event and not to its probability.[7] In particular, subjects will grant that two risk events might be equally likely to occur from a probabilistic point of view and yet nonetheless

judge the one event to be riskier than the other. When this occurs it is clear that the reason for this is that the subject regards the obtaining of the riskier event as modally closer than the other event.

A good example of this is subjects' judgements about the risks involved in various kinds of transport. While subjects will grant that the probability of sustaining serious injury when, say, driving a car is much, much higher than alternative forms of transport, such as taking the train, they nonetheless tend to judge that car driving is not an especially risky activity (i.e., no more risky, or at least not especially riskier, than taking the train). There are various explanations for this. It is certainly true, for example, that various cognitive biases have a role to play in leading subjects to make these assessments of risk. The fact that one is driving one's car, as opposed to being a passenger (as on a train), makes the 'illusion of control' bias relevant, for example.[8] This leads subjects to overestimate their control over events associated with car driving, such as their propensity to have accidents. This bias, coupled with the fact that subjects tend to overestimate their expertise (most people think that they are above-average drivers),[9] leads them to regard driving a car as a not especially risky activity, even taking the relatively high probability of car accidents (when compared with some other forms of transport) into account. The upshot is that when people make judgements about risk, what they are tracking is not the probabilistic likelihood of the risk event, but rather its modal closeness. In particular, where the latter comes apart from the former, the subjects' judgements go with the latter.[10]

If we want to capture our natural judgements about risk, it follows that we shouldn't exclusively focus on the probability of the risk event but also consider its modal closeness. The probabilistic account of risk is thus highly problematic. In its place we need a modal account of risk that can accommodate the phenomena that we have identified. According to this proposal, we should evaluate the riskiness of an activity in terms of the modal closeness of the target risk event. In particular, the closer the modal proximity of the risk event, the riskier the activity is. In this way we can explain the different judgements about risk that arise with regard to cases 1 and 2 above, since the modal closeness of the risk event in case 1 is much closer than in case 2, even despite this risk event having the same probability of obtaining.

It is important to note that the modal account of risk doesn't completely supplant the relevance of probabilities to assessing risk. Indeed, probabilities will continue to be a useful guide to assessing risk across a wide range of cases. After all, the modal ordering of possible worlds in terms of similarity is often closely aligned with the probabilities of the events in question, such that low probability events tend to be concerned with far-off possible worlds, and high probability events tend to be concerned with close possible worlds. Appeals to probability can thus remain as a general guide to assessing risk. The point is just that this cannot be the full story about how to assess risk, as the lottery-style cases illustrate.[11]

3. LEGAL RISK

With the foregoing in mind, we are now much better placed to understand what is wrong with a purely probabilistic conception of legal risk of the kind that concerns us. For no matter how high we set the probabilistic threshold for wrongful conviction, there will always be the possibility of legal lottery cases. These will be cases where, even though the possibility of the target risk event (wrongful conviction) is extremely low, the risk event is nonetheless an easy (i.e., modally close) possibility. In such cases, one would judge there to be a high risk of wrongful conviction, even though the probabilities say otherwise. Accordingly, if one's criminal justice system allows for the possibility of legal lottery cases, then it is compatible with an unduly high level of legal risk, and hence not fit for purpose.

Notice that the debate about how low the rates of false conviction ought to be which we noted above doesn't engage with this issue at all. The rates could be very low, and yet still be compatible with wrongful conviction being an easy possibility (i.e., with there being a relatively high level of legal risk of this kind). Conversely, these rates could be relatively high, and yet it not be the case that wrongful conviction is an easy possibility (i.e., the level of legal risk of this kind could be relatively low). Furthermore, how we measure the specific probability of wrongful conviction is neither here nor there too. While there is no doubt a utility in having more specific measures to hand, and while no doubt some statistical measures are better guides to particular phenomena than other measures, the point remains that any straightforward probabilistic analysis of the risk of wrongful conviction is bound to fail to capture the particular kind of legal risk that interests us.

The lacuna at issue here does not reside in the general principles that guide the concern with wrongful conviction, but rather lies in the particular probabilistic way in which those principles are understood. Consider again the Blackstone ratio noted earlier. This arises out of Blackstone's famous remark that it 'is better that ten guilty persons escape than that one innocent suffer.' One can naturally understand this in terms of a particular ratio of wrongful convictions over wrongful judgements (whether acquittals or convictions) more generally, and hence that's where we derive the probabilistic treatment of legal risk that we noted above. But there is nothing to prevent us from interpreting such a principle modally rather than probabilistically, such that we should be willing to put measures in place to ensure that wrongful conviction is a modally far-fetched possibility even if that means, as it surely will, that there is a higher rate of wrongful acquittal as a result.

We can see this idea in action by considering what a lottery-style case of legal risk of wrongful conviction might look like. Consider DNA evidence, which offers a very strong

evidential basis for a defendant's guilt. Let's stipulate, for the sake of argument, that the chance of the DNA left at the crime scene belonging to anyone other than the defendant is 14 million-to-one (i.e., the same as the chances of the risk event in our lottery case above). The defendant's defence, let's say, is built around the claim that she has never been anywhere close to the scene of the crime, and so this evidence is particularly damning. Furthermore, let's imagine a futuristic scenario whereby there is no room for error in the collection or analysis of the DNA evidence, perhaps because someone's DNA profile is immediately transparent to all (e.g., it is displayed as a pattern somewhere on one's person, say). Finally, and crucially, let's stipulate that even though the possibility that the DNA presented does not belong to the defendant is extremely low, this is nonetheless a modally close possibility, in that not much would need to be different about the actual world for this 14 million-to-one event to obtain.[12]

The import of this final stipulation is that it makes this scenario a lottery-style case, in that although the odds that the DNA doesn't belong to the defendant are extremely low, it is nonetheless an easy possibility that this event might obtain (just as it is an easy possibility that someone playing a lottery might win it, even despite the astronomically low odds involved). If all we cared about when assessing the legal risk of a wrongful conviction is that the odds of such a conviction must be very low, then in cases like this we ought to be sanguine about the possibility of a conviction on the DNA evidence alone. That is, given the evidential weight of the DNA evidence, there shouldn't be any need for corroborating evidence, as this evidence all by itself will ensure that the probability of a wrongful conviction is extremely slight.

Conversely, just as we should be willing to allow that the odd innocent person might get convicted on the basis of DNA evidence, so we should similarly be willing to allow that an equally small proportion of guilty people might be acquitted on this basis also. This is because it will also be an easy possibility, albeit a very unlikely one, that a guilty person's DNA doesn't match the sample found at the crime scene. Accordingly, even where there is considerable circumstantial evidence in support of the defendant's guilt, the evidential burden of the DNA evidence in support of her innocence should suffice to generate an acquittal. The probabilistic approach to legal risk thus enjoins us in this case to be sanguine both about a certain small proportion of modally close wrongful convictions and a similarly small proportion of modally close wrongful acquittals.[13]

In contrast, suppose we adopt a modal approach to the legal risk of wrongful conviction. It would follow that even the low probability of wrongful conviction in this case would not be acceptable, in that it was compatible with a wrongful conviction being an easy possibility. The obvious way of ensuring that it is not an easy possibility would be to insist that no-one could be convicted on DNA evidence alone, and that independent corroborating evidence is thus always

required. For our purposes we can set to one side what this independent evidence should consist of. The relevant point for our discussion is that this independent corroborating evidence should be of a kind to ensure that it is not an easy possibility that the defendant is subject to a wrongful conviction. In short, having a criminal justice system that avoids high levels of legal risk of wrongful conviction involves having certain *structures* in place which ensure that wrongful conviction is not an easy possibility.[14]

A further consequence of introducing this rule will obviously be to make it easier for a guilty person to be acquitted (or, relatedly, to avoid trial altogether). Where the evidence of someone's guilty solely consists of DNA evidence, then it won't be possible to secure a conviction. Hence, a greater proportion of guilty people will avoid conviction. This point reminds us that in focusing on the legal risk of wrongful prosecution, modally conceived, we are not disregarding the principles which traditionally guide a concern to reduce wrongful conviction. The principle laid down by Blackstone which we noted above is a case in point, in that, as we have just seen, we are effectively adhering to this principle, only not in a crude probabilistic fashion. That is, the elimination of legal risk that we are envisaging does have the effect of privileging the avoidance of wrongful conviction over the desirability of convicting the guilty. Rather than abandoning this general principle, we are instead demonstrating the importance of unpacking these very general constraints on the criminal justice system in such a way that takes legal risk properly into account.

4. LEGAL EVIDENCE

I want to close by noting how this point about legal risk has the potential to also cast light on a related debate in legal theory regarding legal evidence. In effect, the foregoing has placed a *necessary* condition on the evidence required to convict in criminal cases. In particular, what is required for a conviction is evidence such that, given that evidence, it cannot be an easy possibility that the defendant is wrongfully convicted.[15] Merely having evidence which makes it highly likely that the defendant is guilty will not suffice to meet this condition, as the existence of legal lottery-style cases illustrates. But this is not to say that we have in effect raised the evidential bar for conviction. After all, weaker evidence, from a purely probabilistic point of view at any rate—e.g., where several independent sets of evidence corroborate each other—could nonetheless satisfy this condition. The point is rather that the axis along which we evaluate legal evidence is different than it would be on the probabilistic model of risk.

Although our focus here has been the criminal justice system, I think we can extract some

tentative morals for legal evidence more generally. For example, consider the 'blue bus' problem regarding civil liability. Simplifying the case somewhat, imagine that someone has been hit by a bus and that it can be shown, to a very high degree of probability—let's say 90%—that the bus was operated by a certain company (the 'Blue Bus Company'). For example, nearly all the buses operating in this town are owned by this company. The twist in the tale, however, is that the plaintiff cannot offer any evidence which specifically ties the accident to this particular bus company. She is not in a position to identify the bus herself, for example, nor can she offer any witnesses which might identify the bus for her. Accordingly, the case is dismissed, on the grounds that the plaintiff hasn't demonstrated that this particular bus company is the one which caused the accident, even despite the weighty statistical evidence that the plaintiff could cite in support of her case.[16]

Here is the puzzle. When it comes to civil liability the standards of proof are much lower than in criminal cases, in that one is only required to demonstrate liability on the balance of evidence (as opposed to beyond a reasonable doubt). And yet the plaintiff did indeed present evidence, albeit only statistical evidence, which would seem to almost guarantee that the bus company was liable for the accident. (Indeed, in the original court case on which this puzzle is based, the court explicitly granted as much). So how did the Blue Bus Company avoid liability?

If we view this problem through the lens of legal risk, then we can chart a coherent path through the issues. Even though the standard for evidence in civil liability cases is lower than for criminal cases, it can still be the case that a necessary condition for the evidence in each case is that it ensures that the target risk event (wrongful conviction, wrongful judgement of liability) is not an easy possibility. For notice that this is precisely the problem posed by offering merely statistical evidence, for no matter how strong this evidence is from a probabilistic point of view, it will inevitably be compatible with the easy possibility of the risk event. Indeed, think about the blue bus case just described. Given only the evidence cited in court, there is nothing to exclude there being a close possible world in which a bus from a different company—the rival Red Bus Company, say—just happens to be on the scene that particular day. In effect, what we have here is a legal lottery case (albeit where the odds are not so massively stacked against the target event).

Notice how adding reliable eyewitness testimony changes this situation quite radically. If we grant that the bus which caused the accident was painted blue, then, given the evidence, it is no longer an easy possibility that the court wrongly finds against the Blue Bus Company. For think of what kind of scenario would need to obtain in order for the company to not be liable in this case. We would need, for example, a conspiracy by the Red Bus Company involving one of their buses being painted blue in order to create problems for the rival company. Moreover, as we add further

evidence which specifically ties the Blue Bus Company to the accident, such as corroborating testimonial evidence, so the modal closeness of the risk event becomes even more remote. The crux of the matter is that there is more to the weight of legal evidence than the probabilities involved.

Finally, notice that in saying that the same kind of necessary condition on legal evidence is demanded in both criminal cases and civil liability cases⸺i.e., that the evidence should exclude legal risk of the relevant kind⸺we are not undermining the idea that different overall standards of evidence are operative in these two spheres. In particular, it is entirely compatible with the claim in play that the standard of evidence that is *sufficient* for conviction in a criminal case is much higher than for making the corresponding judgement in a civil liability case.[17]

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NOTES

[1] For an excellent overview of some of the issues in this regard, see Laudan (2008). See also Allen & Laudan (2008).

[2] It is normally *objective* probabilities that are at issue here.

[3] See Hansson (2004; 2014) for two excellent, and overlapping, surveys of the philosophical literature on risk. These surveys also make the hegemony of the probabilistic account of risk within this literature very clear.

[4] Possible risks events which are so far-fetched as to be unrealistic are known in the literature as *de minimis* risks. For discussion, see Mumpower (1986) and Petersen (2002).

[5] For the seminal discussion of possible worlds—which includes a defence of this 'similarity ordering' of worlds—see Lewis (1973; 1987). See Sainsbury (1997) for more on easy possibilities.

[6] Ideed, this is why people play lotteries. In particular, it is why people play lotteries even though they would not generally place bets on events obtaining which have astronomical odds. This is because events with astronomical odds are usually events which only obtain in far-off possible worlds, and one would be unwise to bet on an event of this kind obtaining. In contrast, a 'bet' on a lottery win, while also having astronomical odds, is nonetheless a bet on a possibility which could easily obtain—i.e., it is a bet on an easy possibility. This point is illustrated by the slogan for the UK's national lottery, which is: "It could be you!". This is clearly not the 'could' of probability, since in this sense it (realistically) couldn't be you, but rather the 'could' of modal nearness—i.e., if you play the lottery, then someone just like you will win it. This is borne out by the accompanying advertising campaign, which at one point featured a God-like finger hoverring over ticket-holders, and then zapping one of them (the winner). Note that in arguing that one would be crazy to bet on a modally far-fetched event with similar odds to a lottery win I am not thereby suggeting that playing the lottery is rational. The point is rather that whatever one thinks of the rationality of playing the lottery, placing a bet on a modally far-fetched event with similar odds would be, from a rational point of view, much worse.

[7] See Kahneman & Varey (1990) and Teigen (1996) for discussion of how subjects' judgements about degrees of risk vary in proportion to the counterfactual closeness of the target event.

[8] Indeed, subjects tend to judge travelling by car as more risky when it is made clear that they will be a passenger rather than the driver. See, for example, McKenna (1993). For more on the illusion of control, see Langer (1975) and Thompson (1999; 2004).

[9] This is the so-called *overconfidence bias*. Famously, in a US study Svenson (1981) found that 93% of drivers rated their driving abilities as above average. Interestingly, those with low levels of skill are often *more* apt to overestimate their skill levels, a phenomenon known as the 'Dunning-Kruger effect'. See Kruger & Dunning (1999).

[10] For some of the empirical work on risk ascriptions—and also the closely related topic of luck ascriptions—see Slovic (1987), Kahneman & Varey (1990), Teigen (1995; 1996; 1997; 1998*a*; 1998*b*; 2003), Tetlock (1998), Sjöberg (2000), Tetlock & Lebow (2001), and Moen & Rundmo (2004). I survey the psychological work on luck and risk ascriptions in Pritchard & Smith (2004). See also Pritchard (2014; 2015*b*).

[11] For further development of the modal account of risk, see Pritchard (2015*b*). See also the related modal account of luck (luck and risk being two notions which are closely related)—Pritchard (2005; 2014).

[12] For a helpful discussion of the actual risks involved in collection and analysis of DNA evidence, and the bearing of this on its use in a criminal trial, see Thompson, Taroni & Aitken (2003).

[13] In all likelihood, of course, where the person's guilt is not borne out by the DNA evidence (at least so conceived anyway), then the case won't make it to trial in the first place, and hence there will be no need for an acquittal. This demonstrates the point that when considering the question of the legal risk of wrongful prosecution it is not enough to look at the rate of wrongful convictions relative to the overall rate of wrongful judgements (either convictions or acquittals). For example, if one introduces a higher standard of legal evidence in order to prevent wrongful convictions, then this will likely have the effect not only of increasing the level of wrongful acquittals, but also the proportion of guilty people who avoid trial altogether. See Laudan (2008) for an insightful discussion of these issues.

[14] One interesting issue which is raised by this approach is how it bears on traditional debates in legal epistemology, such as regarding the role of the intellectual virtues in assessments of legal evidence—these are, after all, the kind of structural features that are likely to ensure that one's criminal justice system is incompatible with legal lottery-style cases. See Amaya (2008) for a helpful recent discussion of the role of the intellectual virtues in legal fact-finding.

[15] Although I have not the space to explore this issue here, the modal condition that we are imposing on legal evidence in this regard is what is known as a *safety* condition. Such a condition is generally regarded as being a necessary condition for knowledge, and also—relatedly—being the condition which excludes the kind epistemic luck/risk which is incompatible with knowledge. For some key defences of safety, see Sosa (1999), Williamson (2000), and Pritchard (2005; 2007; 2012*a*). Interestingly, Enoch, Spectre & Fisher (2012) have recently proposed a very different modal constraint on legal evidence, which appeals to what is known as a *sensitivity* condition—see Nozick (1981). Sensitivity is not generally regarded as a necessary condition on knowledge, however, and it is certainly not a plausible candidate for the modal condition which excludes knowledge-undermining epistemic luck/risk. Accordingly, the prospects for this proposal are not good. For further discussion of the relative merits of safety and sensitivity conditions in epistemology, see Pritchard (2008; 2012*b*).