CrossMark

Something Rather Than Nothing

GUIDO IMAGUIRE

Abstract
Peter van Inwagen (2001) has given a probabilistic answer to the fundamental question 'why is there something rather than nothing?': There is something, because the probability of there being nothing is 0. Some philosophers have recently examined van Inwagen's argument and concluded that it does not really work. Three points are central in their criticism: (i) the premise which states that there is only one empty possible world is false, (ii) the premise which states that all possible worlds have the same probability is not plausible and (iii) the argument is not significant for the question it sets out to answer. In this paper, I shall show that (i) even if there are many empty worlds, this does not necessarily invalidate the argument in its general lines, (ii) the examples they offer to support the intuition that possible worlds may have different probabilities fail, and (iii) even if the conclusion of the argument does not really answer the question van Inwagen sets out to answer, it is still not an insignificant response to the question.

1. The Probabilistic Argument and its Reformulation

This is the fundamental question: why is there something rather than nothing? Inspired by a suggestion sketched by Robert Nozick (1981, pp. 127–28), Peter van Inwagen (2001, p. 61) explores an answer to it: Because the probability that there is nothing, the probability of the 'empty world', is 0. There are infinitely many possible worlds and only one among them is the empty world. Thus, the probability of there being nothing rather than something is vanishingly small.

The original argument proposed by van Inwagen is constituted by four simple premises. Because of some issues in these premises that we do not need to examine in detail here (one issue concerning the cardinality of the set of all possible worlds will be explained in section 2), Gonzalo Rodriguez-Pereyra (2018) proposes a more perspicuous formulation of the argument, viz.:

1. There are some beings that can vary continuously.
2. If there are beings that can vary continuously, there are uncountably infinitely many possible worlds.
3. There is at most one possible world in which there are no concrete beings.
4. For any two possible worlds, the probability of their being actual is equal.

doi:10.1017/S0031819121000371 © The Royal Institute of Philosophy, 2021
First published online 22 November 2021

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

The probabilistic argument for the non-existence of the empty world is quite easy to understand. There is only one empty world (premise 3), but uncountably many possible non-empty worlds (from premises 1 and 2 by *modus ponens*). Since there are infinitely many possible worlds, and all have the same probability (premise 4), the probability of each world must be the result of the division of 1 (probability of the total space of possible outcomes) by infinity (total number of outcomes). The upshot is that the probability of each possible world, including the empty world, is 0. This does not mean, of course, that the empty world (or any other possible world) is impossible in a strict sense (it is neither logically, nor metaphysically impossible), but only that it has the lowest possible probability, 0.

The argument can also be conceived in terms of the probability of propositions (or sets of possible worlds). The probability of a proposition is determined by the proportion of the set of all possible worlds that is occupied by the worlds where the proposition in question is true. For instance, the probability of the proposition that $2 = 2$ is 1, since it is true (I assume) in all possible worlds, and the probability of the proposition that $2 = 1$ is 0, given that it is true in no possible world. According to the probabilistic argument, the proposition that there are no concrete beings is true in only one world, viz. the empty world, while the proposition which says that there are some concrete beings is true in all the other, infinitely many worlds. Therefore, the probability of the proposition that there are no concrete beings is 0, and the probability of the proposition that there really are concrete being is 1.

This is the version of the argument which Rodriguez-Pereyra examines critically and which I will discuss in this paper. I assume that it adequately captures the core insight of van Inwagen's proposal.

Curiously, van Inwagen himself is not happy with the argument (2001, p. 65). He considers it '*too* simple' and feels that there must be something wrong with it. Indeed, some authors have recently claimed insight into what is wrong. According to some (Mawson, 2009; Heylen, 2017), premise 3 is false, according to others (Kotzen, 2013) premise 4 is false. For Rodriguez-Pereyra (2018), both are false. Another issue raised against the probabilistic argument is that the conclusion of the argument is irrelevant, i.e. it does not really answer the question van Inwagen set out to answer (Rodriguez-Pereyra, 2018). In section 3, I will examine premise 3. I explain that, even if these authors were right that premise 3 is false, the core of the probabilistic argument, under some plausible assumptions, remains intact. In section 4, I will defend the plausibility of premise 4 against the suggested counter examples. Finally, in section 5, I will discuss

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

the third problem, viz. the putative irrelevance of the argument. However, before the discussion of the argument can begin, some of its assumptions must be clarified.

2. Some Assumptions of the Argument

The first assumption made by van Inwagen concerns the existence of abstract objects. As premise 3 of the modified argument makes clear, the 'empty world' is a world with no *concrete* objects. Since van Inwagen accepts that some abstract objects like numbers and pure sets exist in all possible worlds, the empty world is only 'empty' in this restricted sense: It is a possible world with no concrete, but with some abstract objects. Like van Inwagen, I regard the existence of such abstract objects as unproblematic.[1]

The second issue concerns the cardinality of the infinitely many concrete worlds (this is not considered in van Inwagen's original formulation of the argument)[2]. Rodriguez-Pereyra is certainly right in complaining that van Inwagen says nothing about this, for this is an extremely relevant issue in the argument. If the cardinality of the possible worlds is a countable infinity, then those worlds can all have probability 0 only if one rejects the axiom of countable additivity, which states that the probability of every countable set, finite or infinite, is the sum of the probabilities of the members of the set. If there are countable infinitely many possible worlds, each with probability 0, the probability of the total space of possible worlds will also be 0, which is the sum of the probabilities of all possible worlds. Now, this is inconsistent with an axiom of probability theory which requires that the probability of the total space of possible outcomes must be 1.

Rodriguez-Pereyra recalls the solution proposed by De Finetti[3] of rejecting the axiom of countable additivity and limiting oneself to the axiom of finite additivity. But, in the end, he assumes as plausible that the cardinality of the set of all possible worlds is an uncountable infinity. This makes it possible to assign probability 0 to each possible world without having to reject the axiom of countable additivity. This is explicitly stated in premise 2 of the modified version, and I

[1] For a criticism on the very coherence of the idea of abstract objects, see John Heil (2013, p. 174).

[2] The second premise of the original argument states that 'if there is more than one possible world, there are infinitely many possible worlds.'

[3] See Donald Gillies (2000).

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

take it for granted. Since van Inwagen says in his defense of this premise that things may vary 'continuously', he also probably assumes the cardinality of the continuum. In any case, for the rest of this paper, for simplicity, I will assume the cardinality of this set as being $\aleph_1$, but nothing in this paper depends on this. Maybe this cardinality is $\aleph_2$ or even higher. In fact, if my main reasoning is correct, the higher the cardinality, the more reasonable it becomes to accept the probabilistic argument as sound.

3. Multiplying Empty Worlds

Some authors (see Mawson, 2009; Heylen, 2017 and Rodriguez-Pereyra, 2018) have argued against premise 3 of the probabilistic argument. According to them, there is not only one, there are infinitely many empty worlds, i.e. there are just as many empty as non-empty worlds. As a result, the set of empty worlds has the same probability as the set of concrete worlds: 0.5. In this section I will focus on Rodriguez-Pereyra's strategy of multiplying empty worlds, but my main points may equally be applied *mutatis mutandis* to alternative strategies.

Why should we assume that there are uncountably many empty worlds? Simply, because empty worlds may vary relative to the contingent abstract objects they entail. Rodriguez-Pereyra asks us to consider propositions, in particular, the truth-teller, the proposition that says of itself that it is true. It is an abstract entity whose existence is not grounded in any concrete object (so it can exist in an empty world), and which may be true or false. Since the difference in truth values of a proposition in two worlds is sufficient to make these two worlds different, there are at least two different empty worlds: one with the true truth-teller and one with the false truth-teller. This makes premise 3 false. However, van Inwagen may stick to this point: the probability of the set of these two empty worlds is still 0 (the sum of the two 0s). If there are only a finite number of empty worlds, the probability of this set of just two empty worlds is still 0.

Now, Rodriguez-Pereyra strengthens his claim. He asks us to consider finite loops of propositions, each of which says that the next one is true – for every natural number n there is one such loop. Thus the 1-loop is the truth-teller; the 2-loop is a pair of propositions, each of which says that the other is true; the 3-loop consists of three propositions, the first of which says that the second is true, while the second says that the third is true, and the third says that

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

the first is true; and so on for every natural number *n*. For simplicity, call these loops of true or false contingent propositions 'truth-spoiler loops'. These truth-spoiler loops may exist in the (or: in any) empty world, because they do not depend on concrete objects. Further, the propositions of these loops may consistently be all true or false. Finally, for every such loop there are empty possible worlds where its members are all true, and empty possible worlds where its members are all false. This way, empty worlds can differ according to which truth-spoiler loops have all their members true and which ones have all their members false. Now, according to Cantor's theorem there are uncountably many possible combinations of consistent assignments of truth-values to the members of the set of countable infinitely many proposition loops. Since each such possible combination can obtain in an empty world, there is a continuum of many empty worlds. And given that the cardinality of the set of empty worlds is equal to the cardinality of the set of non-empty worlds, i.e. $\aleph_1$, under the assumption that all worlds have the same probability (which is another issue Rodriguez-Pereyra considers and I will examine in section 4), we may conclude that there is a 0.5 chance that the world contains concrete objects and a 0.5 chance that the world contains no concrete objects.

Given that someone could have serious doubts about these contingent truth-spoiler loops,[4] Rodriguez-Pereyra offers an alternative strategy for multiplying empty worlds based on the variation of the curvature of (non-Euclidean) empty space. There are uncountably many empty worlds, each with a space with a continuously different curvature.[5] In my analysis I will focus on the truth-spoiler variant of empty worlds multiplication. However, the reasoning I propose for defending the probabilistic argument may be applied for the space curvature variant. In fact, although I am sympathetic neither to the idea of contingent abstract objects nor to the idea of empty space, I do not intend to reject the claim that there are uncountably many

[4] According to Rodriguez-Pereyra (2018, p. 7, footnote 14), the loops of propositions example was suggested to him by Øysten Linnebo, who is himself skeptical about the existence of such propositions. I also share this skepticism, but shall not press this point here. J. Lowe (2013, p. 187) is skeptical about abstract objects which do not depend on the existence of concrete objects.

[5] One may certainly reject Rodriguez-Pereyra's assumption that 'the geometry of space is metaphysically independent of whether space is empty or not', but I will let it go for now.

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

empty worlds. I will simply accept it. What I reject is rather the consequence Rodriguez-Pereyra seems to extract from this.

Let's assume that there really are such uncountably many possible empty worlds, which vary according to their truth-spoiler loops. Note that the existence of these many worlds variants is grounded on the assumption that these truth-spoiler loops do not depend for their existence on concrete objects. Fair enough. But, and this is my first point, the existence of contingent truth-spoiler loops is also not inconsistent with the existence of concrete objects. Therefore, just as the empty world (let's represent it by '0c': the 'zero concrete world') can be combined with each of the uncountably many truth-spoiler loops, so can likewise each of the uncountably many concrete worlds. For simplifying the reference to each singular concrete world (this will be convenient from now on), let's use the terms '1c', '2c', '3c',… without meaning with this, of course, that we are trying to enumerate the uncountably many concrete worlds. In this sense, I claim, there are uncountably many truth-spoiler variants of 1c, uncountably many truth-spoiler variants of 2c, and so on.

In fact, in the following it will be convenient to consider an alternative reading of the terms '1c', '2c', … which takes them literally as expressing a strict enumeration of concrete worlds. There is, of course, no obvious way to enumerate the number of concrete objects of a given possible world. It depends among other things on many controversial issues, including mereological composition and the debate on the existence of non-present entities (presentism, eternalism, growing block) that we should best avoid here. For simplicity, let's assume a simple enumeration of particles, according to which '1c' designates a possible world with 1 particle, '2c' a world with 2 particles, and so on (or classes of worlds with n particles, since their distribution may vary continuously). Again, I claim, if there are uncountably many truth-spoiler variants of 0c, there are also uncountably many truth-spoiler variants of 1c, uncountably many truth-spoiler variants of 2c, and so on. I cannot see any reason why we should not accept worlds with infinitely many particles, although someone could be skeptical about it. Anyway, we may assume with some confidence that each singular particle of the actual world is a contingently existing concrete being, and so we can plausibly admit that there are at least as many n-c's as there are particles in our world. (Note, importantly that, even in this case, we can suppose that there are uncountably many concrete possible worlds, for these particles constitute concrete beings which may vary continuously, as stated in premise 1).

Some (including myself) may now have the intuition that Rodriguez-Pereyra is wrong, and the proportion suggested by van

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

Inwagen is safe. For the 'new' logical space is not simply constituted by the uncountably many 0c worlds plus the uncountably many non-empty worlds, but constituted by uncountably many empty worlds, plus uncountably many 1c worlds, plus uncountably many 2c worlds, and so on. In fact, I will defend this intuition below. However, intuition is not a good guide concerning transfinite collections. Transfinite arithmetic tells us that $\aleph_1 + \aleph_1 + \aleph_1 \ldots$ equals $\aleph_1$. Thus, the logical space remains as small – or as big – as before. There are $\aleph_1$ many empty worlds and $\aleph_1$ many concrete worlds. Now, is the probability of the set of empty worlds really 0.5? Probably not.

The attribution of probabilities to events in an uncountable space is a tricky issue. The standard procedure consists in attributing probabilities to sets of possible outcomes, i.e. to partitions of the whole logical space. An uncountable probability space is usually defined as a triple $<\Omega, A, P>$, where Ω is the sample space Ω, A is the event space, and P a function of probability measure (a function of events to [0,1]). In our case, Ω is the set of all possible worlds, A is a set of sets of possible worlds (events), and P an attribution of probability to these sets. Intuitively, what we do here is to split the whole logical space into segments or partitions (in our case: sets or kinds of possible worlds) and attribute to each partition the probability which corresponds to the 'proportion' it has of the whole space.[6]

But, and this is the tricky point, not every partition is permissible, i.e., A is not simply *any* set of sets of possible worlds. It must be what is usually called a 'σ-algebra', i.e., it must satisfy four conditions: (i) it contains both the empty set and Ω, (ii) it is closed under complement (for all $\alpha \in A$, $\alpha^c \in A$, i.e., whenever a given set α is a member of A, so is

[6] Suppose there is a lottery on the interval of real numbers [3,4]. Under the assumption of the equiprobability of each real number, the probability of the result being $\leq \pi$ is *arguably* about 0.1415. Of course, since the set of results $\leq \pi$ and the set of results $> \pi$ have the same cardinality, one may also argue that both should have the probability 0.5. In fact, P is an arbitrary function and so we may attribute any arbitrary value to each partition (as long as P obeys the relevant axioms). For problems concerning this procedure, in particular some paradoxical results in the application of the so-called Lebesgue measure of probabilities, see Bas van Fraassen (1989, Chapter 12). These curious results show that the same possibilities can be differently parametrized and so produce different probabilities. However, these results do not substantially affect the proposal of this paper, since the arbitrary function P, which attributes probabilities to the partitions, can always be adjusted in such a way that these different parametrizations have the same probability in the different partitions. For more details on probability for uncountable domains, see e.g. Peter Schuster (2016).

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

its complement), (iii) it is closed under countable union (for all α, $\beta \in A$, $\alpha \cup \beta \in A$) and – this follows from (ii) and (iii) – (iv) it is closed under countable intersection ($\alpha \cap \beta = \alpha^c \cup \beta^c$). Now, most importantly, there are infinitely many such A's for our Ω. The core of our problem lies in exactly which A we should assume. Intuitively, any legitimate A we choose is a way to cut the whole logical space into partitions to which we may attribute a specific probability. Rodriguez-Pereyra's suggestion gives the class of empty worlds the probability 0.5 – but this is only correct if we assume A = ($\emptyset$, Ω, empty worlds, non-empty worlds) which is only one among the infinite ways to define the event space A. Different As will distribute the probability values among the sections of the logical space in different ways. Infinitely many other ways to define A may attribute to the 0c worlds the probability 0. And note that all this does not depend on my suggestion of multiplying each of the concrete worlds with a truth-spoiler variant. Already Rodriguez-Pereyra gave this result with his picture of uncountably many empty worlds and uncountably many concrete worlds. Thus, only one thing seems to be sure: if there are uncountably many empty worlds and uncountably many non-empty worlds, there are also infinitely many As, and the probability Rodriguez-Pereyra assumes in his argument (empty worlds: 0.5, non-empty worlds 0.5) is only *one* among these infinite As, and thus it is as improbable as anything can be: the probability that the probability of the empty worlds is exactly 0.5 is virtually 0.

Of course, this does not imply that the probabilistic argument is sound. The central question here is the 'second-order' probability question, viz. is the probability that the probability of the set of empty worlds is 0 really equal to 0 or not? This is a highly complex matter that cannot be exhaustively discussed in this paper. In fact, probably there is no absolute conclusive argument on this issue. But I think we have good reasons to assume that something along the lines of the probability suggested by the probabilistic argument is the best choice. In the rest of this section, I shall argue for two claims: (i) that from a purely *mathematical* point of view, virtually every probability distribution is possible, and (ii) that we have suitable *metaphysical* reasons to assume the probability distribution suggested by the original probabilistic argument.

It is relatively easy to show that virtually every probability distribution is possible from a purely mathematical point of view. To understand this, just consider the two following proposals:

(1) We can get the probability 1 for there being nothing concrete. We just have to multiply the number of sets of empty worlds in

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

the event space. Since the set of empty worlds is – *ex hypothesi* – uncountably infinite, we can build an infinite number of proper subsets from it (call them '0a', '1a', '2a', …) and, at the same time, put all worlds with some concrete objects into a unique set (big C). This way we get[7] A = (C, 0a, 1a, 2a, …) and, under the assumption that the function P attributes the same probability to each set of the partition, the probability of there being nothing concrete is 1.

(2) We can create infinitely many probability distributions in which the set of empty worlds has a probability higher than 0 and less than 1. Consider for instance the following partitions[8] (where '*n*' stands for the number of particles):

($\leq$ 0 c-worlds, $>$ 0 c-worlds)
($\leq$ 1 c-worlds, $>$ 1 c-worlds)
…
($\leq$ *n* c-worlds, $>$ *n* c-worlds)
…

We may easily combine this with an equal distribution of probability defining P in such a way that the set of empty worlds has the probability 0.5 only in the first partition, and non-zero (in fact, $\frac{1}{4}$, 1/6, …) on each one of the other partitions.

Of course, (1) and (2) are based on arbitrary *mathematical* choices. The relevant question is however: Is there a partition based not merely on arbitrary mathematical choices but on substantial *metaphysical* considerations? Given that from a mathematical point of view almost everything is possible, which metaphysical considerations could guide us in deciding how to build 'the' correct partition? This question leads us to my claim (ii).

There are two partitions that I claim to be the most natural from the metaphysical point of view. My purpose in multiplying each of the concrete worlds 1c, 2c, 3c, etc., just as Rodriguez-Pereyra multiplied the 0c world, was to give substance to the intuition which supports these partitions. As we saw, if there are uncountably many truth-spoiler variants of the 0c world, then there are also uncountably many truth-spoiler variants of the 1c world, uncountably many truth-spoiler variants of the 2c world, and so on. Thus, the metaphysically more relevant way to divide up the logical space, I claim,

[7] After this, I will leave out of my notation the sets required by (ii) and (iii), i.e. the empty set, the universe, the complement set of each set of A and the union of any two sets. Thus, I will simply assume the suggested partition represents the 'smallest' sigma algebra built from this partition.

[8] Thanks to an anonymous referee for this suggestion.

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

consists in assuming A = (0c, 1c, 2c, 3c, …), where each *n*c stands either for each of the uncountably many concrete worlds (when n> 0) (the 'continuously many ways things can vary' of the original argument) and all its truth-spoiler variants – this is 'partition (3)' – or for the set of worlds with *n* particles and all its truth-spoiler variants – 'partition (4)'. Partition (3) is very close to the original probabilistic argument: we simply substitute each single possible world of the partition of the original argument by the set of the uncountably many truth-spoiler variants of this world. By assuming this we get back precisely to the distribution of probabilities suggested by the original probabilistic argument. Partition (4), in turn, is based on the plausible understanding that the core problem of the fundamental question is the number of basic concrete entities that exist ('why is the number of concrete entities other than zero?'). In any case, 0c is just a single outcome among all these infinite possibilities.[9]

One clear advantage of (3) and (4) over (1) and (2) is that in them all members of each set are, concerning their concrete parts, 'perfectly' similarly constituted, while in (1) and (2) the members of the sets are unequally and miscellaneously constituted. In partition (3), all possible worlds of a given set are perfectly similar in their concrete constitution. In partition (4), all possible worlds of a given set are (concerning their concrete parts) quantitatively similar. In other words, each member of each set is a mere abstract counterpart of each other member of the same set of the partition, and each member of any set is materially different from any member of any other set. This fact supports the intuition of the equal distribution of probability over these sets, even if some combinations of truth-spoilers were more likely to happen than others (which I don't believe). For even in this case, the distribution of probability of the sets of the event space would be equally distributed, since each set entails the same proportion of such combinations of 'loaded' abstracta. This is not the case in (1) and (2). Of course, once we accept the principle of equiprobability of all possible worlds, which is defended in the next section, this is no longer a relevant aspect.

[9] Recall that even if we assume partition (4), and the idea that the highest possible *n* is the finite number of particles of our visible universe, we may still conclude that (i) there are uncountably many concrete variants of each *n*c-word (except perhaps of the 1c world), for these particles may vary continuously concerning their states, and (ii) *n* is so enormous that, even ignoring these variants, the probability of 0c is, for practical purposes, virtually zero. Thanks to an anonymous referee for pressing me on this point.

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

4. Equiprobability of Worlds

Premise 4 is discussed at length by van Inwagen. It is based on the principle of equiprobability, which says that the maximal states of isolated systems have the same probability. An isolated system is one such that no facts about objects external to the system could in any way influence the system, and a maximal state is a state such that, for every other state, either the maximal state entails the other state, or it entails its complement (van Inwagen, 2001, p. 65). Since each possible world is such a maximal state of an isolated system, each has the same probability.

Not surprisingly, van Inwagen (2001, p. 101) characterizes premise 4 as the one that people are going to want to dispute. Indeed, the dialectic of the debate on this issue is quite thin. On the one hand, van Inwagen does not provide any argument for the principle. Rather, he supports its plausibility by appealing to examples that stimulate our intuition. He asks us to consider a computer coming out from an evaporating black hole. The probability that its hard disk contains a novel in English, French, Urdu or Esperanto is equal, for the black hole does not have 'preferences' about languages. On the other hand, the opponents do not offer a strict argument against the principle of equiprobability. Rather, they blame van Inwagen for not making the principle plausible and support its implausibility by appealing to examples that stimulate our contrary intuition. For them, it is perfectly easy to suppose that Reality is not indifferent, i.e., that it may have 'preferences'.

Indeed, I agree with Rodriguez-Pereyra (2018) that much more has to be said in order to support the principle of equiprobability. Now, a far-reaching defense of this principle goes far beyond what I am able to offer in this limited space. All I intend to show here is that Rodriguez-Pereyra's and Kotzen's (2013) counterexamples are inadequate to support the implausibility of the principle. In fact, as I shall argue, the principle of equiprobability is not only plausible, but also helps dissolve counterexamples, if these are rightly considered. Thus, in the end, the burden of proof still lies on the side that rejects the principle.

One central element of van Inwagen's position is his conception of the probability of a proposition in terms of the proportion of the set of all possible worlds that is occupied by the worlds in which the proposition in question is true. Although Rodriguez-Pereyra recognizes this explicitly, his examples for undermining the intuition that supports equiprobability do not really conform to it. His first example is that of a certain coin that has been tossed at moment t and is

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

about to land. He supposes for simplicity that there are exactly three maximal states for the world to occupy at t^*: (a) the coin lands heads up, (b) the coin lands tails up, and (c) the coin lands on its edge.[10] Then, he concludes that

> (…) it is perfectly easy to suppose, and indeed most theories of physical probability entail, that, given the laws of nature and the physical characteristics and position of the coin at time t, one of those four maximal states is more probable than the others (i.e. it is more probable that the world will be at t^* in one of those states rather than the others). (Rodriguez-Pereyra, 2018, p. 11)

The problem with this example is that the proportion that each state (a) – (c) occupies in the space of all possible worlds is not the same, as the example suggests. There is no unique possible world for (a), one for (b) and one for (c). These are rather *collections* or *kinds* of possible worlds that occupy different proportions of the whole logical space.[11]

To make my point clear, it is useful to simplify the coin experiment in two ways. Firstly, let's assume a two-dimensional space (a lateral projection of three-dimensional space) in which the coin is like a segment of a line whose length (the diameter of the three-dimensional coin) is many times its width (the thickness of the three-dimensional coin) and which spins around its middle point until it touches the ground. Secondly, let's assume that the coin may touch the ground at any angle which corresponds to a natural number between 1^o and 360^o. Thus, given the physical properties of the coin, what determines if (a), (b) or (c) occurs (besides some additional physical properties we may ignore here) is the exact angle at which the coin touches the ground. Each angle corresponds to a single possible world. The probability of the coin touching the ground at 90^o is the same as the probability of it touching the ground at an angle of 91^o, 92^o, or any other value between 1^o and 360^o. Each of the 1^o to 360^o touching situations, rather than (a), (b) or (c), is a maximal state (the coin touching the ground at a 120^o angle entails (a), but not the other

[10] In fact, in his original example, Rodriguez-Pereyra considers a fourth state, viz. 'the coin does not land'. For simplicity, I will ignore this case. It would make our point unnecessarily complicated.

[11] It may be noticed that Rodriguez-Pereyra recognizes this in a footnote, 'each of those four states is not maximal since they do not fully specify the way the coin fails to land, or lands heads, or lands tails, or lands on its edge.' (footnote 28 on p. 11). Unfortunately, he does not draw the logical consequences of this, which is central here.

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

way round). Thus, there are many more (a) possible worlds (all the worlds in which the coin touches the ground at an angle between 91° and 269°) and (b) possible worlds (any angle between 271° to 360° and 0° to 89°) than (c) possible worlds (the coin touches the ground exactly at an angle of 90° or 270°). The principle of equiprobability remains plausible. More than this, it grounds our intuition that some *kinds* of worlds are less probable than others. This is the case simply because some kinds entail fewer possible worlds than other kinds. More exactly, if all worlds are equiprobable, the probability of heads is 89.5 times the probability of landing on edge (there are 179 (a) worlds, 179 (b) worlds and only 2 (c) worlds).

Similar reasoning may be applied, *mutatis mutandis*, to Rodriguez-Pereyra's second example, viz. the loaded die which tends to fall on 2. The example is a bit more complicated because the die entails 6 surfaces and 12 edges, and the fact that the die is loaded assures that the die by touching the ground, say, exactly on the edge between 2 and 3, will always 'prefer' falling 2. This makes the probability of falling 2 a bit higher than any other result. Anyway, as with the coin example, there are many more possible worlds than suggested[12], and because of the four possible edge cases (between 2 and each of the other four faces around it), the proportion of possible worlds where the die falls 2 is larger than the proportion of worlds where the die falls with any other result. I will spare the reader the details, which are certainly obvious now. Reality is not loaded when we consider each single maximal state, but only when we consider *kinds* of maximal states.

In 'The Probabilistic Explanation of Why There is Something Rather than Nothing', Kotzen (2013) criticizes the move from the premise that there are 'more ways' for A to be true than for B to be true to the conclusion that A is more likely than B, at least if the move is made *a priori*. According to him, in many such arguments we have to appeal to *a posteriori* considerations. (Recall that for van Inwagen we have good reasons to *a priori* believe in the principle of

[12] Rodriguez-Pereyra explicitly assumes 6 possibilities, for he writes 'There are six possibilities for it to fall on one of its faces. If probability is determined by the proportion of the space of possible outcomes each possible outcome occupies, then the probability of the die falling on any particular face is 1/6. But since the die is loaded, one outcome, say the die falling 2, is more probable than the others' (Rodriguez-Pereyra, 2018, p. 13). Indeed, it is. But falling 1, 2, or any other possibility is not a maximal state, but only a set of maximal states, as we showed with the coin example.

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

equiprobability). Kotzen offers some quite sophisticated counter examples to the principle of equiprobability. Let us consider four of them.

Bomb: Dr. Evil has armed a universe-annihilating bomb and is threatening to detonate it unless his demands are met. The police are pursuing him. Following the principle of equiprobability we should conclude that the police are likely to apprehend him, for there is only one way for the future to go if Dr. Evil detonates the bomb (eternal nothingness) and there are lots of ways for the future to go if he is apprehended. But this conclusion sounds clearly false.

Coin: Consider a system in which a fair coin is repeatedly flipped until it comes up tails, at which point the system self-destructs. There is only one way the coin lands tails on the first flip and infinitely many ways the coin lands heads on the first flip. Should we conclude that the coin is more likely to land heads up in the first flip, as required by the principle of equiprobability? Certainly not.

Restroom: You go to the airplane restroom, and the sign on the door is broken, so you are uncertain whether or not it is occupied. Following the principle of equiprobability you should think to yourself, 'There is only one way for the restroom to be unoccupied (nobody is in the restroom) and there are countless ways for it to be occupied (any one of the many passengers could be inside)'. But this seems like wrongheaded reasoning.

Zebra: Ram is having an experience of a zebra standing in front of him. However, there being a real zebra in front of him and there being a mule cleverly disguised to look like a zebra in front of him are both maximal states of an isolated system. Should Ram conclude that both states are equally probable? This sounds bizarre. (This example is based on the so-called Carnapian worry: the equal assignment of probability to each possible 'state description' lead to the impossibility of 'learning from experience')

I agree with Kotzen that in all these cases we need to appeal to *a posteriori* considerations in order to correctly evaluate the probability of the events. But I do not think that these examples are sufficient to invalidate the principle of equiprobability. For this principle requires the states to be *maximal* and the system to be *isolated* and I think this requirement is not properly fulfilled in them. Notice importantly that I do not claim that van Inwagen's characterization of a maximal state of an isolated system is fully adequate, but I think that with some charity we are able to recognize what is intended by such a notion. Recall that for him an isolated system is one in which no facts about objects external to the system could in any way influence the system, and a maximal state is one such that, for every other state,

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

either the maximal state entails the other state, or it entails its complement.

Restroom and *zebra* are similar. Take *zebra*: The conclusion that the zebra-hypothesis and mule-hypothesis are equiprobable sounds bizarre, because we know from experience (i.e. *a posteriori*) that there are far more zebras than disguised mules in our world. Now, suppose you visit a country where the inhabitants have the curious habit of disguising absolutely all mules as zebras. In the same situation as Ram, you would probably decide the probability of each hypothesis based on an additional information: are there more mules or zebras in this country? Thus, the intuition that one hypothesis is much more probable than the other in the zebra example is due to the fact that this is not really an *isolated* system. Its evaluation goes beyond the Ram-having-an-experience portion of the world: it appeals to the distribution of zebras and disguised mules *outside* or *around* the system.

Something similar can be said about *restroom*. Our intuitive evaluation of the probability of the restroom being occupied is due to our knowledge about the general human 'restroom behavior' outside the system (the airplane) like the average number of restroom visits of a human being in a given time interval, the duration of each visit, our previous airplane restroom experiences, etc. We 'import' this knowledge from outside 'into' the airplane in our intuitive evaluation. Possible worlds are isolated from each other in a more radical way than the zebra and the airplane situations. In the spirit of van Inwagen's suggestion, we could ask the reader to consider a *genuinely* isolated system: an animal emerging from an evaporating black hole. The probability that a zebra or a disguised mule will come out is equal, for the black hole does not have preferences about animals. Or consider an airplane full of passengers suddenly coming out of an evaporating black hole. The probability that a passenger is in the restroom is exactly similar to the probability of any other part of the airplane being occupied (which is, of course, relative to the number of passengers and to the total interior seating space of the airplane), for the black hole does not have preferences about the distribution of passengers over the seats in the airplane.

Bomb and *Coin* are similar. In both examples we have initially two outcomes and a dispositive which destroy the whole system after one particular outcome. In both examples we have the intuition that both outcomes are equiprobable despite the fact that, according to Kotzen, there are more ways for one outcome to be true than for the other one. Let me make three points against these examples.

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

The first point is that the proposed states are not really maximal, at least not in the strict sense in which possible worlds are. More exactly, *pace* Kotzen, there are infinitely many *concrete* ways to have tails on the first flip and infinitely many *concrete* ways to have Dr. Evil not being apprehended. There are continuously many ways the coin may touch the ground (recall our analysis of Rodriguez-Pereyra's coin example assuming any real angle between 0 and 360), and there are continuously many ways the police may not apprehend Dr. Evil (consider all possible mental and microphysical states of the involved persons and environment which can influence the whole system). This explains our intuition about the probability of tails on the first flip or the probability of Dr. Evil not being apprehended, independently of the emergence of 'absolute nothingness' after the outcome.[13]

My second point is that there is an important aspect we must consider for evaluating our intuitions on the probability of events in time such as that proposed by Kotzen. Usually, our intuitions about the probability of an event E at time t seem to be independent of whatever happens after t (unless there were a reason for supposing something like backwards causality or teleology involved in the system, which seems not to be the case in the examples discussed). This explains why the universe-annihilating bomb and the disposition for self-destruction are innocuous for our intuition about the outcome before the explosion. In any case, for deciding the probability of possible worlds, which is at stake in the probabilistic argument, no such temporal aspect is involved. The probability of each possible world is evaluated *sub specie aeternitatis*.

Finally, my third point: I am skeptical about the real possibility of a dispositive with the incredible metaphysical capacity to transform something concrete (a coin or the whole of humanity) into *absolute* nothingness, as assumed in both examples. It seems clear that 'eternal nothingness' in Kotzen's sense must mean the absolute nonexistence of all matter and energy of the state, because otherwise the

[13] Note that, once we accept the existence of the uncountably many truth-spoiler variants of each possible world, as we did in the last section, we should also conclude that there are uncountably many possible worlds with tails on the first flip and the same, of course, for the Dr. Evil not being apprehended outcome. But I will not stick to this point, since, first, as I said before, I am honestly not sympathetic to the truth-spoiler world variants and, second, these abstract worlds variants certainly do not explain our natural intuition that both outcomes in the examples are equiprobable.

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

claim that there is only one outcome after the explosion would be false. An 'ordinary' bomb (or a sufficiently large number of nuclear bombs or a superglue) would transform 'our world', or the coin-flipping-disposal, into a universe of chaotically distributed particles. But then there would be not just 'one' way to be (absolute nothingness) after the explosion, but infinitely many ways to be (all possible distributions of particles in space). For worlds with no humans or no coins are still maximal states (possible worlds) in a full metaphysical sense.

Again, I am not saying here that as it stands van Inwagen's characterization of the notion of maximal states of an isolated system is perfect, or sufficient to exclude Kotzen-type counter examples. Plausibly, some additional work has to be done to properly define this notion. But notice that the logical space of all possible worlds is isolated in such a way that the need to appeal to *a posteriori* considerations is much less probable than in Kotzen's counter examples. For it is hard to see how the coming into existence of a particular possible world, among infinitely many options, could in any relevant way be dependent on *a posteriori* considerations. Even if the existence of a single particle of kind α depends by means of a law (known *a posteriori*), say, on the co-existence of a number n of particles of kind β, and thus the number of entities must be a multiple of $n + 1$ ('a minimal particle package'), nothing *a posteriori* can be concluded about the total number of these minimal packages. And so, even if Kotzen's conclusion that the principle of equiprobability is not universally valid, it seems that we have good reasons to suppose that it is valid in the case at stake: all possible worlds are equiprobable, as stated by premise 4 of the probabilistic argument.

Two last remarks are worth mentioning before we turn to the third criticism. Firstly, I cannot see any reason to suppose that any one among the uncountably many truth-spoiler variants of 0c is more probable than any other, for each is simply the 'result' of the combinatorial procedure of attributing all possible truth-values to propositions of the loops. And even if there were such a 'loaded' 0c truth-spoiler variant, say the 317th variant, we should also assume that also the 1c 317th truth-spoiler, the 2c 317th truth-spoiler variant, etc., are loaded, since the propositions of the loops are disconnected from any concrete objects, and so their 'loadedness' must also be plausibly disconnected from the concrete world parts.

Secondly, even if someone is not convinced by my analysis in this section and accepts, like Rodriguez-Pereyra, that 'it might be a brute fact that a certain possible world is more probable than others' (2018, p. 13), the probability of the empty world remains arguably minimal, at least from a mathematical point of view. For, as far as we have no

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

way to establish the different probabilities of each of the uncountably many possible worlds, it seems wise not to assume that, if there really is one (or are some) 'loaded' world(s), it (they) will be just one (some) among the 0c worlds instead of, say, one (some) among the 1c worlds, or among the 2c worlds, and so on. In fact, the probability of one 0c world to be 'the most loaded' is likely to be 0.

5. On the Significance of the Argument

The third criticism against the probabilistic argument concerns its significance. Rodriguez-Pereyra (2018, section 5) states that to give the probability of a kind of event does not explain *why* this event did occur. Even to say that an event E had probability 1 does not explain why it did occur. Thus, if we are asking for something like the metaphysical ground for the existence of a non-empty world, the probabilistic argument simply begs the question. Indeed, I agree with Rodriguez-Pereyra that to give the probability of a kind of event does not explain *why* this event did occur. Therefore, the probabilistic argument is not a direct answer to the 'why is there something rather than nothing?' question.

However, 'significance' is a quite vague and open-ended notion. Thus, instead of simply dismissing the probabilistic argument as a non-significant reaction to the fundamental question, we should consider four things:

Firstly, sometimes a question is more than a simple question. Some questions require more than an answer, they require a wide-ranging response, which may be verbal or not. For instance, we all recognize that the best answer to 'Could you help me carry these bags?' is not the simple answer 'Yes, I could'. To answer this way is to ignore the pragmatics of communication. Further, some questions have implicit suppositions which may, or even have to, be addressed in an adequate reply. For instance, the question 'Why are some human beings more valuable than others?' could best be answered by questioning its background assumptions, rather than by giving an answer that accepts the implied reality.

In order to evaluate the suppositions of a deep question such as the fundamental question, we should consider its historical and systemic background. Truthfully, the question pervades virtually all cultures and arouses the interest of many religious traditions. It is usually associated with the presupposition that the existence of something is a highly improbable miracle. Thus, the question should be recognized as the expression of awe ('is it not an incredible thing, a miracle, that

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

there is a concrete world instead of simply nothing?'). In his 'The Fundamental Question' Witherall (2001) correctly remarks that asking the fundamental question 'almost always inspires a reaction of awe or wonder'. He examines some responses of important philosophers, including Wittgenstein, Nozick and Heidegger and shows how they all expressed a feeling of awe associated with this question.[14] Witherall argues further that a feeling of awe at the existence of something rather than nothing is appropriate and desirable, and he dismisses as inadequate any response which does not consider this feeling. The probabilistic argument may not give a ground – or a 'straight answer' – for the existence of something, but it indubitably focuses on this feeling of awe. Thus, even if it is not a straight answer to the fundamental question, it is arguably an adequate reaction. It is certainly not inadequate to react to someone who puts this question by saying something like 'you are asking this question because you consider it an astonishing thing that there is something rather than nothing, don't you? In fact, it is not that surprising as it may seem at first glance, and now I will tell you why…' (and then telling more about the probabilistic argument).

Secondly, according to the most natural reading of the argument, which is not the only possible one (as we will see below), its proponent is probably taking for granted the assumption that the world was not created by some intentional act, as conceived for instance in the Christian Tradition. If you believe in a creator God, you will probably believe that there is a *ground* (in the strict sense) for the existence of concrete objects in space and time. Thus, you will not think in terms of mere probability distributions over sets of equiprobable possible worlds (unless you believe that God does play dice), but assume that God created his favorite world.[15] If we accept the creator background, we may expect an explanation in terms of a ground for the existence of this world with concrete things. However, once we exclude the creator hypothesis, each possible world should be considered to be as probable as any other (as premise 4 claims), and the coming into existence of a world will be conceived as a fully random event. This seems to be the natural place for the probabilistic

[14] For Wittgenstein's (1922) approach to the question, see *Tractatus* 6.44 ('Not how the world is, is the mystical, but that it is.') and 'A Lecture on Ethics' (1965); for Nozick see his (1981, pp. 127–28) and for Heidegger see his (1959, pp. 7–8).

[15] This is probably what Sorensen (2019) means, when he says that 'someone who poses the question in a comprehensive way will not grant the existence of the Universal Designer as a starting point'.

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

argument.[16] Now, since against this godless background we are no longer looking for a metaphysical ground for the non-actuality of the empty world, the requirement of a strict ground – as proposed by Rodriguez-Pereyra – is out of place. In other words, the probabilistic argument is an adequate reaction for someone who has already rejected an answer in terms of strict grounding and is still wondering about a purely random matter. Here, only an explanation in a wide sense can be expected. For comparison, consider the question 'how could it be that Jane won the lottery so many times?' It may be adequately answered by 'because she very often bought 90% of all tickets'. This is not an answer in terms of grounding, but it certainly is an 'explanation' in a wide sense. Kotzen (2013) argues convincingly that 'at least some legitimate explanations are probabilistic in nature' and presents some good examples for this.[17] The probabilistic answer shows that the feeling of astonishment can be rationally dissolved. Once this feeling is dissolved, the question is also dissolved, and there is no more need to ask the question at all. Thus, the probabilistic argument is certainly an adequate response to – because it dissolves – the fundamental question. There is no ground for – but also no improbability in – the existence of something.

Thirdly, there is a possibly unexpected and non-natural – but also coherent – reading of the argument's background. One may accept Leibnizian reasoning in its basic lines (that God created the best of all possible worlds) and still wonder why there are concrete objects in space and time (i.e. objects besides God himself)[18] rather than nothing. In this case, the fundamental question amounts to the question of why is the (or 'a') world containing such concrete objects would be better than the (or 'an') empty world? Someone can reject or ignore the traditional thesis of metaphysics that being is better than non-being and wonder why God created something rather than nothing. And even against this curious background, the probabilistic argument plays a role. It makes it plausible that there are

[16] Of course, one might believe in the existence of God, as van Inwagen does, and still for merely speculative reasons consider the probabilistic argument in its inner cogency. Let's recall that van Inwagen himself is skeptical about the argument.

[17] He also refers to Carl Hempel (1965), Paul Humphreys (1989), David Mellor (1976), Peter Railton (1978), Wesley Salmon (1970), and Michael Strevens (2000) for such explanations (see his footnote 3).

[18] According to the definition of *concrete* as something that has causal powers, God must be considered concrete. Thus, the question here can be better understood as 'why is a world containing objects in space and time better than a world with no such objects?'

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

many more concrete than empty worlds (or sets of them), and so the probability for the best possible world to be the (or: an) empty world is as small as something can be: it has probability 0.

Finally, according to the probabilistic argument the probability of each possible world is the same, viz. virtually 0. But then, if we are justified in feeling awe about the fact that the empty world does not exist, shouldn't we also feel awe about the fact that the actual world exists? For it has the same probability as the empty world. Why should astonishment be dissolved by the probabilistic argument? Notice that it does not help recalling that, if we accept the reasoning of section 3, there are uncountably many variants of the actual world (all the worlds with the concrete things that actually exist and all truth-spoiler loops or all space curvatures), for each kind of world (0c, 1c, etc.) has probability 0. However, this criticism overlooks the exact formulation of the fundamental question. It asks why there is *some*thing rather than nothing, and not why *this very thing* is there, rather than nothing. So, what is really at stake according to the fundamental question is not the existence of the actual world (or any of its variants), but of any one of the uncountably many variants of the uncountably many concrete worlds.

References

Donald Gillies, *Philosophical Theories of Probability* (London and New York: Routledge, 2000).

Martin Heidegger, *Introduction to Metaphysics* (New Haven and London: Yale University Press, 1959).

Jan Heylen, 'Why is There Something Rather Than Nothing?', *Erkenntnis*, 82 (2017), 531–559.

John Heil, 'Contingency', in T. Goldschmidt (ed.), *The Puzzle of Existence. Why is there Something rather than Nothing?* (New York and London: Routledge, 2013).

Carl Hempel, 'Aspects of scientific explanation', in Carl Hempel, *Aspects of Scientific Explanation and Other Essays in the Philosophy of Science* (New York: Free Press, 1965), 331–496.

Paul Humphreys, *The Chances of Explanation* (Princeton: Princeton University Press, 1989).

Matthew Kotzen 'The Probabilistic Explanation of Why There is Something Rather Than Nothing', in T. Goldschmidt (ed.), *The Puzzle of Existence. Why Is There Something Rather Than Nothing?* (New York and London: Routledge, 2013), 215–34.

Jonathan Lowe 'Metaphysical Nihilism Revisited', in T. Goldschmidt (ed.), *The Puzzle of Existence. Why is there Something rather than Nothing?* (New York and London: Routledge, 2013).

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press

Tim Mawson, 'Why is there anything at all?', in Y. Nagasawa and E. Wielenberg (eds.), *New Waves in Philosophy of Religion* (Basingstoke: Palgrave Macmillan, 2009).
David H. Mellor, 'Probable explanation', *Australasian Journal of Philosophy*, 54 (1976), 231–41.
Robert Nozick, *Philosophical Explanations* (Cambridge, MA: Harvard University Press, 1981).
Peter Railton, 'A Deductive-Nomological Model of Probabilistic Explanation', *Philosophy of Science* 45 (1978), 206–226.
Gonzalo Rodriguez-Pereyra, 'Why is There Something Rather Than Nothing? A Probabilistic Answer Examined', *Philosophy*, 93 (2018), 505–521.
Wesley Salmon, 'Statistical Explanation', in R. G. Colodny (ed.), *The Nature and Function of Scientific Theories* (Pittsburgh: University of Pittsburgh Press, 1970), 173–231.
Peter Schuster, *Stochasticity in Processes* (Cham: Springer, 2016).
Roy Sorensen, 'Nothingness', *Stanford Encyclopedia of Philosophy*. Palo Alto. Retrieved 20 April 2019.
Michael Strevens, 'Do Large Probabilities Explain Better?', *Philosophy of Science*, 67 (2000), 366–90.
Bas van Fraassen, *Laws and Symmetry* (Oxford: Clarendon Press, 1989).
Peter van Inwagen, 'Why is There Anything at All?', in P. van Inwagen, *Ontology, Identity, and Modality. Essays in Metaphysics* (Cambridge: Cambridge University Press, 2001).
Arthur Witherall, 'The Fundamental Question', *Journal of Philosophical Research*, 26 (2001), 53–87.
Ludwig Wittgenstein, *Tractatus Logico-Philosophicus*. Translation by C. K. Ogden (London: Routledge & Kegan Paul, 1922).
Ludwig Wittgenstein, 'A Lecture on Ethics', in Rush Rhees (ed.), *Philosophical Review*, vol. 74 (1965).

GUIDO IMAGUIRE (guido_imaguire@yahoo.com) *is a Professor of Philosophy at the Federal University of Rio de Janeiro, Brazil and a fellow researcher of the CNPq. His main interests in Philosophy are in Metaphysics, Philosophy of Language, and the History of Analytic Philosophy. He is the author of* Priority Nominalism (*Springer, 2018*) *and* Russell's Frühphilosophie (*Olms, 2001*) *among others.*

https://doi.org/10.1017/S0031819121000371 Published online by Cambridge University Press