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Carbon Offsets and Shifting Harms

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Abstract: Carbon offsets either remove greenhouse gases from the air or prevent emissions thereof. They face questions both economic (is 'net zero' really reached?) and moral. I defend the moral permissibility of offsets. They likely shift climate harms around, but that need not be unjust—and in any case we cannot avoid doing that.

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JEL Classification: Q54, D63

This paper is about a narrow topic: *assuming* that you are morally culpable for some of your carbon dioxide (greenhouse gas or GHG) emissions, can you make it right by offsetting those emissions? In other words, is 'net zero' as good as 'gross zero', or at least not too much worse?

In an offset, you pay for carbon emissions to be reduced or recaptured in another time and place. You might pay for trees to be planted which will remove carbon from the atmosphere, or for fuel-efficient cookstoves to be distributed in the developing world. Offsetting promises that you can enjoy your carbon-intensive goods with a clear conscience—on the GHG matter at least—and for a low price, at least for now.

Offsets have recently been criticized along two dimensions. It's been denied that they really take you to net zero (or whatever the moral threshold is), and it's been claimed that net zero still represents an injustice, because climate-related harms are shifted around. I defend carbon offsets against both such claims.

I. Moral Culpability for Emissions

Air travel distills many aspects of climate change into a single activity. Flying is both carbon-intensive and currently impossible to replace in a

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low-carbon way. I flew from London to Montreal in March 2024 to visit family and friends and see the total solar eclipse, took some shorter flights to see friends in North Carolina, and then back home to the UK. Despite some smugness about choosing the train from New York to Vermont, this trip would not be possible without massive carbon emissions.

Do not be fooled by the lowish total contribution of air travel to global emissions. It may be low compared to food production but whereas everybody eats, very few people fly—especially intercontinentally, especially for pleasure—so the *per capita* emissions of those who do are gigantic. My round-trip flight from London to Montreal had a carbon footprint equivalent to 2.09 tonnes of carbon dioxide per economy seat, according to one of the many online calculators.[1]

I will *assume* that my flight was morally culpable because of its contribution to climate change. Of course, in the context of climate change such individual emissions are a drop in the ocean and for that kind of reason, it has been denied that they are culpable, most famously by Walter Sinnott-Armstrong. He denies that the emissions from a Sunday drive cause any harm: "if I refrain from driving for fun on this one Sunday, there is no individual who will be helped in the least" (Sinnott-Armstrong 2005, 299).

To restate, I'm assuming that Sinnott-Armstrong is wrong about the morality of flying (or driving). There are two ways this could be so. First, it could be that even though my emissions make no difference and do no harm, I am still morally required to keep them below a certain level. On what I will call a 'big bucket' model of climate change and its morality, I act wrongly if I contribute excessive carbon to the atmospheric bucket, even if that particular addition harms nobody. On this model, there seems little reason to doubt the moral efficacy of offsets: why should it matter whether I refrain from adding to the bucket (gross zero) or add-and-offset (net zero)?

But offsets have a harder time on the second way Sinnott-Armstrong could be wrong. Suppose that my emissions cause expected harm and are wrong on that basis, as Broome (2019) argues in his rejection of what he calls the 'individual denialism' of Sinnott-Armstrong and his allies. The causal chain between any particular carbon emission and any particular tornado is opaque and chaotic. Nevertheless, claims Broome, I *do* often (at least partially) cause tornadoes: a tornado happens that would not have happened without my emissions. I was not the sole cause of course—

[1] https://www.carbonfootprint.com/calculator.aspx.

any number of people reducing or even increasing their emissions would also have prevented the whirlwind—but given their emissions, without the flight the tornado would not have happened.

As GHG concentrations rise, harmful events such as thunderstorms, tornadoes, and droughts become more frequent. Because of current high GHG levels and the long-range upward trend in harms, it is slightly but definitely more likely that my emissions will cause an extra tornado than that they will prevent one. So my emissions have a positive expected harm. There remains the task of finding a plausible moral principle that would forbid causing (what will usually be) a very small, expected harm through my emissions, but the door is opened because my emissions do make a difference.

But as we will see, this appeal to the chaotic atmosphere arguably undermines Broome's earlier defense of offsets, which is that if you offset your emissions then you "do no harm to anyone through emissions" (Broome 2012, 87).[2] As a preview, the central problem is that when you buy an offset you almost certainly do not undo any original harm, but instead if you benefit anyone, you benefit somebody *else* (absent an amazing coincidence). It has been argued that this is an injustice, and responding to that argument will be the main task of this paper.

So defenders of offsets seem to be in a bind. On the big bucket model offsets look morally effective if the emission is wrong, but it is hard to see why we should adopt that model. Why would the emission be wrong if it does no harm? On the chaotic model, there is a route to the wrongness of the initial emission—its expected harm—but offsets look vulnerable to the problem of injustice. Offsets are either morally effective but not needed, or needed but not effective.

And that would be a shame, because offsets are a much more feasible route to fighting air travel's climate impacts than abstention would be. Avoiding air travel would be culturally and politically difficult, not least because many of those people—liberal, open-minded, cosmopolitan people—who putatively deplore climate change also tend to value 'travel'. Air travel is also more than just a luxury for those with family or friends only reachable by air, who without it might never see them again.

Offsets can avoid all this, and all for a very low price: the website linked above charged me £14.61 for the cheapest 'global portfolio' offset

[2] This is not Broome's current view, which is more akin to the position I defend in this paper (personal communication). The tension between the chaotic model of the atmosphere and Broome's earlier defence of offsets has also been noted by Bakshi (2023, 89–91).

of my London to Montreal flights; those offsets typically involve installing more efficient cookstoves in the developing world. So let's hope that they are morally effective. I could have splurged £59.40 for UK tree planting instead, but that trip was expensive enough.

II. JUSTICE OR CONSEQUENCES

Suppose that you plan to take the same round-trip route from London to Montreal as I did. You have three salient options. The first and default is

> **FLY+COCKTAIL** Fly and spend £14.61 on an overpriced drink in the departures lounge (or some other minor luxury), rather than on an offset.

Your (gross and net) emissions are 2.09 tonnes, not counting the drink of course. To reiterate, I am assuming *pace* Sinnott-Armstrong that taking this flight is all-else-equal morally wrong because of its carbon emissions.

So you could

> **STAY-HOME** Do not take the flight.

Assuming that you do not take the cost of a ticket and spend it on buying and burning some barrels of oil or something equally carbon-intensive, then in the best case your gross and net emissions are zero. Focusing only on your moral obligations involving the climate, STAY-HOME seems clearly permissible. But it involves a major sacrifice: you go nowhere.

Offsets promise that we can go somewhere but still satisfy our duties to the climate, through

> **FLY+OFFSET** Drink from the water fountains at the airport and spend the £14.61 on a carbon offset.

Your gross emissions are 2.09 tonnes but your net emissions are zero. If net emissions are what matter, then you are morally clean.

In what follows I assume a chaotic model of the atmosphere. Table 1 shows a model of the causal impacts of your emissions (on a big bucket model they'd presumably make no difference).

Table 1 is almost absurdly precise, but it represents the worst case for FLY+OFFSET in terms of justice and it clarifies the issues to come. It is the worst case because it assumes that your actions cause actual—rather than merely expected—harms and benefits to particular individuals such as Jessica, rather than merely in aggregate. We are of course in no position

	Jessica (2027)	Will (2030)	Sumaiya (2057)	Alex (2087)
Stay-Home	—	—	tornado	—
Fly+Cocktail	tornado	—	—	tornado
Fly+Offset	—	tornado	—	—

Table 1: How your offsets shift harm

to know the causal links, but specifying the outcomes in this manner also spares us confusing disambiguations about the likelihood of tornadoes.[3]

If you STAY-HOME then Sumaiya will be hit by a tornado in 2057, partly thanks to carbon already in the atmosphere. This is the 'default' or 'baseline' outcome. Your two other options release a lot of energy into the atmosphere, departing from that baseline.

If you FLY+COCKTAIL, then a tornado will form over Jessica's bedroom in 2027, but Sumaiya will be spared. However, Alex in 2087 will also endure a tornado. You increase the number of tornadoes from one to two by pumping extra energy into the atmosphere, as well as changing when one happens.

If you FLY+OFFSET, then the earlier tornado is shifted so that it harms Will instead. In buying the offset you keep the *total* number of tornadoes at one. Your offset keeps Alex safe and you at net zero tornadoes. Unfortunately if you fly, then there *will* be a tornado in the next decade; there is nothing you can do to prevent that, at least nothing under consideration here.

In a simpler version of the case, your offset purchase does not affect near-term tornadoes at all, and Jessica and Will are the same person, as in table 2. This could happen if, for example, your offset purchase merely sits in a bank account on the other side of the world for the next decade and does not affect the atmosphere until the tree-planting commences. I will assume this simpler version in what follows for ease of exposition.

Now I will turn to the moral challenge for offsets. Stefánsson (2022) forcefully argues that offsetting is an unstable halfway house between

[3] See Barry and Cullity (2022, 244–245) and Stefánsson and Willners (2023, 145–146).

	Jessica (2027)	Sumaiya (2057)	Alex (2087)
Stay-Home	—	tornado	—
Fly+Cocktail	tornado	—	tornado
Fly+Offset	tornado	—	—

Table 2: How your offsets shift harm, simplified version

consequences and justice, and that on neither of these is offsetting morally adequate.

Our moral reason for buying the offset could be a basically consequentialist one of doing the most good, by preventing tornadoes.[4] But there are far better ways to do good—your offset money would go much further fighting malaria instead, for example. Perhaps FLY+OFFSET is still permissible, but we are in the odd situation where something else would be morally *preferable*, and offsetting rather than giving the money to an anti-malaria charity is a somewhat arbitrary choice to do less good rather than more.

Act-consequentialism, at least, would not recommend offsetting. This may not go for rule-consequentialism in the style of Hooker (2000), because a rule such as 'in chaotic or otherwise opaque situations, repair whatever expected damage you do' will plausibly be part of the optimal rule-set.

But turning away from consequentialism, the real challenge is that offsetting seems to be *unjust*, which is the second leg of Stefánsson's argument.

The problem is what I will call *shifting harms*. In flying you cause an extra tornado, so you buy an offset to repair that harm. But even with the offset, you cause somebody—Jessica—to be hit by a tornado who would otherwise not have been. You will never know her identity and cannot compensate her. Given the huge and chaotic atmosphere and the assumption that your flight causes a tornado and your offset prevents one, it is astoundingly unlikely that FLY+OFFSET will look exactly like STAY-HOME on the payoff tables above, with the very same victims suffering tornadoes.

[4] Meeker (2022) also considers offsetting from a virtue-ethical perspective.

You certainly should not plan for such an amazing coincidence, and should expect to shift harms.

This undermines the earlier Broome-style defense of offsets, because it is not true that you 'do no harm to anyone through emissions': you harm Jessica. That is the problem of shifting harms: even if you stay at net zero tornadoes, you redistribute them.

When you harm someone for your own pleasure, you normally owe reparations *to them*: you cannot normally make things right by compensating someone else. Perhaps you can if your victim delegates the compensation, or something of that sort, but in the normal course of things if Teresa wrongly pulls my cat's tail, she cannot offset this harm by paying a friend not to pull *her* cat's tail. Teresa acts unjustly to the cat.

Offsetting differs from pulling tails in many ways, but are any of those differences sufficient to make Fly+Offset *not* unjust? (Stefánsson 2022, 237) thinks not, arguing that any "justice-based duty not to harm others through our emission is not satisfied even though our emitting-and-offsetting, when taken together, causes no expectation of harm to the (time-extended) population of climate vulnerable people".

To reiterate, the problem is that Fly+Offset shifts harms in reaching net zero, by harming Jessica then benefiting Alex. Fly+Offset would be *less* unjust than Fly+Cocktail, because the latter harms both Jessica and Alex, but still, contends Stefánsson, unjust.

III. Shaking the Bag?

I do not think Fly+Offset is unjust. Two facts are crucial to the injustice of Teresa's tail-pulling that are not—or so I will argue—present in carbon offsets. First, the cat is an identifiable individual whom Teresa could compensate (or not harm in the first place!) but chooses not to. Second, there is an antecedent and morally-privileged baseline distribution of harms which Teresa disturbs when she pulls the cat's tail.

The first of these disanalogies has been widely noticed. Even if table 1 or 2 is correct, you have no idea (and no way of finding out) who will be harmed and who will be helped. In common with both sides of the debate, I am interested in your epistemic probabilities, what you know or should know based on the evidence you have or can obtain.

'Both sides are doing it' is not much of a justification for relying on epistemic probabilities, so I will say a little more.[5] There are two obvious

[5] I'm grateful to John Broome for pressing this objection.

alternatives to epistemic probabilities: any objective chances at play in the climate system, and your actual credences or subjective probabilities. I will consider them in turn.

If the system is deterministic and all objective chances are trivial (either 0 or 1), then you will very often have no epistemic access to those chances. Even if there is chance 1 that your flight will cause a particular tornado, you do not know which one. All you have is broadly statistical information, which partially determines your evidential probabilities: they are your guide to the underlying deterministic system. But if there are non-trivial objective chances (that is, not 0 or 1)—either because the system is indeterministic or because it is deterministic but chaotic in a way that engenders non-trivial chances—then insofar as they are epistemically accessible they will also be reflected in your epistemic probabilities. Thus, whether or not there are non-trivial objective chances, all the morally-relevant information about the chances finds its way into your epistemic probabilities. Otherwise we risk holding you morally assessable for things you could not have known. That is not an absurd thing to do, but it is something we should try to avoid.

So what about your actual credences or subjective probabilities? These are relevant to the rationality of (for example) betting behavior, but they introduce difficult moral challenges. If your credences are unresponsive to the evidence and you irrationally have credence 0 that your carbon emissions will harm anyone, does that get you off the hook? I do not think so—*you should have known* that there was a risk. Epistemic probabilities allow us to isolate one of the most distinctive features of climate harms: the system is so complex and chaotic that even our idealized epistemic probabilities leave it unclear what morality requires of us, for example in the case of shifting harms. Once that is settled in an idealized case, we can turn to real agents with real credences.

So let's assume that given STAY-HOME, everyone on Earth (whenever they live) has probability p of experiencing a tornado, as in table 3. It is a gross simplification to assume that p is constant across time and place, but we are concerned with *changes* in likelihood caused by your actions.

If you do FLY+COCKTAIL, everyone has an increased probability of experiencing a tornado because there are two instead of one. But if you FLY+OFFSET, everyone's probability of experiencing a tornado is reduced back to p. In terms of your epistemic probabilities, FLY+OFFSET does not increase anyone's *risk* of suffering a tornado, because one tornado is

	overall risk	risk before 2070	risk after 2070
Stay-Home	p	p	p
Fly+Cocktail	$> p$	$> p$	$> p$
Fly+Offset	p	$> p$	$< p$

Table 3: Risk over time

added and one taken away. You know that you are shifting the harm of the tornado, but you have no idea from whom to whom.

Barry and Cullity (2022) defend offsets in this way, arguing that nobody faces an injustice. Harms are shifted in an opaque way amongst the population, and nobody faces an increased risk of being hit by a tornado. That may be an odd thing to say when we know that somebody *will* be hit by a tornado who otherwise would not have, but remember that the risk is cast in terms of your epistemic probabilities.

Their simplest example is a bag of balls. Suppose that some harm must be apportioned—that is unavoidable—and a ball will be drawn from the bag to determine the victim. They claim that FLY+OFFSET is like shaking the bag before the drawing, which almost certainly changes who is *actually* harmed, but does not impose any extra risk on anyone.

There are then two questions: would shaking the bag be an injustice, and is this case relevantly analogous to carbon offsetting? Stefánsson and Willners (2023) deny the latter, claiming that we should consider a case with *two* bags containing

> **IDENTICAL SETS OF BALL**, most of which represent the people of the world. But some balls are blank. One bag is the 'harm bag': a person drawn from that bag will suffer harm. The other bag is the 'benefit bag': a person drawn from that bag will be benefitted […] A blank ball means that nobody is affected.

They claim that although "in expectation, a draw from both bags leaves aggregate harm unaffected" (146–147), what I've called the problem of shifting harms means that we have 'strong moral reason' not to draw from both. It is vanishingly unlikely that the same person will be both benefitted and harmed.

Let's grant that this case is relevantly akin to offsetting, with drawing both balls being the analogue of Fly+Offset. I do not share their judgement that there is *strong* moral reason to refrain. In justifying my verdict, I reach for the fact that everybody on Earth is represented in both bags, so the situation is opaque and non-discriminatory. I do not believe that we do injustice when we draw a ball from both bags.

Rather than simply appealing to intuition, we can ask a question closely associated with justice: could everybody reasonably accept being represented in the bags and the drawing being made? Yes, I think, because they are not subjected to any increased risk. If they care about the expected consequences of their actions, they should be indifferent about whether the balls are drawn. That is why opacity is so important. Opacity means that risk alone is salient, and because risks are constant all can agree to the balls being drawn.[6] Moreover, this is not a case where average expected harm remains unchanged but massive inequality is introduced, by harming some and benefitting others. The benefit is the *prevention* of harm.

At the other extreme, if Jessica *knew* that she would be the victim of the uncompensated harm, then she could not reasonably accept the ball-drawing without very good reason. The opacity of the climate system puts us behind something like a Rawlsian veil of ignorance.

Behind that veil, we could reasonably accept either the harm-shifting (drawing from both bags or Fly+Offset) or leaving things alone (drawing from neither bag or Stay-Home). But we could *not* reasonably accept an increased risk (drawing from only the harm bag or Fly+Cocktail) for someone else's mere pleasure, so imposing such increased risk would be unjust. From the point of view of the victims, which is central to issues of justice, in the opaque case the drawing of both balls is acceptable.

Justice requires us not to subject anyone to increased risk of harm without good reason. Perhaps we could accept an increased risk of harm if it were a necessary means to some morally important good, such as a medical evacuation flight or using the ball to plug a hole in an oxygen line. Here we see the importance of the ease and low price of offsetting: in almost all cases, if you can afford a flight then you can easily afford to offset it.

[6] See also Lawford-Smith (2016, 75) for a particularly perceptive discussion of the role of epistemic opacity in climate change.

IV. No Baseline

I have argued that Stay-Home and Fly+Offset are equally just, and similarly for drawing from both bags and drawing from neither. But still, I would not gratuitously draw balls. Given a good prudential reason—even one of pleasure—I would probably do so, but I would be a little hesitant, as I have been in buying my flight and offset. Does that hesitancy not suggest I doubt my own arguments?

Not necessarily, because Stay-Home certainly appears the morally safer option: the arguments that Fly+Offset is unjust are not absurd (even though I think they fail), whereas there are no similarly credible arguments that Stay-Home is unjust. Considerations of moral uncertainty should make us a little hesitant, because there is at least some balance of argument on the 'it's unjust' side. In a much more serious analogue, even if we are convinced of the morality of euthanasia in a given case, we might be a little uncertain and hesitant when it comes time to press the button.

We may also worry that shifting harms through Fly+Offset is "playing God"—an expression also used by (Barry and Cullity 2022, 246). I will not try to give a precise account of that term's meaning, but in the two bags there is—or is implied to be—a 'natural' course of events that will unfold if we do not interfere. Playing God is interfering with a natural or otherwise ordained course of things that's somehow not for us to meddle with. Certainly drawing from both bags would be playing God in some sense. There is an *ex ante* baseline distribution of harms, and by not drawing from them we do not interfere with that distribution and do not shift harms. But one might think that by drawing we would play God, by diverting events from that natural course.

But in the climate case there is no such privileged baseline. The distribution of tornadoes chaotically depends on the upshots of my carbon emissions and those of everybody else. As such it is morally arbitrary, because it is not a 'natural' distribution, and we cause no injustice in reshuffling it (*increasing* the total risk is a different matter, of course). The accusation of 'playing God' gets no purchase because the distribution of hurricanes is not something we ought not interfere in; we are all already neck deep in it.

Here is an example, and I will try to recreate the stages of the argument above. Suppose that whilst teaching my Thursday afternoon class—where every seat is occupied—I learn that the air-conditioning unit will explode, injuring the student sitting under it. If I try to warn the student, then eco-saboteurs will injure everyone. Right now, Willemena is sitting

in the 'hot seat'. The seating arrangement is morally arbitrary, but I *would* inflict an injustice on William if I asked him to swap seats with Willemena without explaining why. I would deliberately single him out for the injury instead of Willemena. There is injustice in deliberately shifting harms to identified individuals without an excellent reason, even at net zero.

Here again opacity is crucial. If *every* seat has an air-conditioning unit above it, and I learn that one will explode but not which one, then Fly+Offset is akin to shuffling the seating. If it ends up that William is hurt whereas Willemena would have been, then I have shifted the harm to him but I do not think he has a claim of injustice. It was not a deliberate attack on him in particular. My defense of offsets has taken this form: everybody's risk remained constant, and I do not have the fine-grained control needed to attack or help any particular individual in either case.

Still, was shuffling the class playing God? Why not leave people sitting where they are, and the injury fall where it is 'meant' to? Here we can see the importance of the baseline: if this 'playing God' claim has any force, it is because there is something morally salient about where my students are sitting now of their own free will, and I should not interfere with their 'natural' seating.

That is perhaps not an outrageous claim, but if we make the case more like the atmosphere then it loses force: imagine that news of the impending explosion arrives as we are playing a game of musical chairs. All of the students have moved seats multiple times, partly through their own choice and partly through my pausing the music. I can either pause the game now or allow 30 more seconds of seat-shuffling. Depending on my choice a different person will be injured, but in a wholly opaque way. I do not think I could be accused of injustice or playing God whatever I do: nobody had a right that I either pause the game or continue playing, and neither was the more natural course.

It might finally be objected that in both cases (the explosion and the climate) there is a privileged baseline—that I do nothing, and in particular that I emit no carbon—and that any departure from that baseline risks injustice and playing God. This may be correct for the *level* of carbon emissions, but it is not true of their timing, and their timing is what leads to the accusation of injustice.

We cannot opt out of interfering with the atmosphere. You have already partially determined the distribution of tornadoes by living your life as you have, down to printing this paper or displaying it on a screen. It is quite possible that had you acted differently, then my flight would

not shift a tornado to Jessica. And now, whatever I do I will cause emissions at certain times and prevent them at others. I shake the bag by going to the supermarket tonight instead of tomorrow and thus having leftovers for lunch tomorrow instead of going to Gregg's. It's not even clear what doing nothing would involve. Perhaps it's my immediate death? That too causes carbon emissions and harms through ambulance rides and forestalling the later emissions I *would* have made—and in different ways depending on how I die. Stefánsson and Willners (2023, 146) claim that "by not emitting, you can avoid imposing this expected harm on anyone", but that is not true insofar as we are talking about the *distribution* of harms. 'Not emitting' describes many possible activities, each of which causes the harm to land on someone.

Taking all this into account, let's modify the ball bags once more, to make the case as close to the atmosphere as we can:

> **Chaotic Bags** There are two bags of balls, a harm bag and a benefit bag, each of which contains billions of balls each representing someone on Earth. Every time anyone (including you) drives or takes a step or a breath, the bags are shaken and balls are removed from or added to both bags in a chaotic process. You can either remove a ball from each bag or not.

Whatever you decide to do, your continued walking and breathing will contribute to that maelstrom. You have no ability to remove yourself from the process entirely. Even if you die this will cause some shaking. I do not see any moral reason against drawing balls, and doing so would not be playing God (perhaps because you are inextricably part of the system, not above it, as God is). The current distribution of harms is arbitrary, opaque, and chaotic, so there is no clear reason not to *further* interfere.

So, I have argued, Fly+Offset is just one way of shifting an arbitrary and chaotic collection of harms—something you cannot really avoid doing anyway. It's not unjust. That's not to say it is praiseworthy either: if you fly a private plane purely so you can have the pleasure of emitting carbon and then offsetting those emissions, then perhaps you are playing God in a certain sense and you have a discreditable motive. But I would still not call your actions unjust.

V. CONSUMPTION REDUCTIONS

I have argued that FLY+OFFSET is not unjust. But maybe I am wrong, or maybe you are stubborn and feel on safer ground in reducing consumption. Here are some options for the next decade:

- install more efficient air-conditioning;
- replace your old gas boiler with a ground-source heat pump and solar panels;
- sell your car and buy a bike;
- buy a reusable water bottle and stop using disposable ones;
- cave to flygskam and take the train to that conference in Sweden.

I am assuming for the sake of argument that these actions do reduce total carbon emissions. The problem is, they also shift harms. Manufacturing and transporting heat pumps, solar panels, bikes, and water bottles is hard work, and a multi-day train journey from Reading to Sweden means emissions from trains, hotels, and meals.

I am appealing to the argument of the previous section to attempt classic 'companions in guilt' reasoning: if I am wrong about harm-shifting and offsets are indeed unjust, then why are my bike manufacturer's emissions not also unjust, insofar as harms are shifted? To defend the morality of consumption reductions against such reasoning, we would need a disanalogy between the cases. And as those of us who regularly teach Thomson (1971) know, finding a disanalogy is easy but showing its moral relevance is hard.[7]

Here is one possible disanalogy. Manufacturing a bike is carbon-intensive, but it is a necessary means to the goal of my car not being driven and thus a reduction in gross emissions. Causal necessity to a good end sometimes allows us to harm others without doing them an injustice. If driving quickly is a necessary means to getting a seriously ill patient to hospital, then sometimes an ambulance driver acts justly even as she imposes extra risks on the pedestrians she blows past.

My opponent can contend that the factory's emissions are also a necessary means to preventing a serious harm, at least potentially making them just, and such a defense is not available for FLY+OFFSET. If you fly, the offset is a necessary means to reaching net zero. But (for much

[7] 'Companions in guilt' reasoning is commonly found in environmental ethics, for example in Cripps (2016).

pleasure travel at least) Fly+Offset is not a necessary means to any end so good that harm can be shifted without injustice.

There are two problems with such reasoning. First, many of the items on the list above look somewhat closer to the holiday than to the ambulance ride. The reasoning might suggest that justice requires us to do without air-conditioning or a new bike, or trips abroad: if harm-shifting is by default unjust, then many trivial ends cannot justify even the lower emissions and shifted harms of more efficient means to them. (Though of course some of the ends of flying such as maintaining family relationships are far from trivial.)

Second, we must be clear on what the end is—it is to heat your house or get around town, or whatever. We may think that this justifies a certain level of carbon emissions and expected harm to others. We can achieve the morally-permissible end—such as getting to Sweden for a conference—without excessive carbon emissions either by taking a train or by flying and offsetting. As I have argued, in both cases harms are shifted. If that is an injustice, then switching to low-carbon means of achieving our ends is also unjust. There is no clear reason why one strategy of the two available—invest in low-carbon means or use high-carbon means and offset—should be less just than the other.

The general problem with the 'shifting harms is unjust' attack on offsets is that it proves too much. At least given a chaotic atmosphere, we shift harms all the time, not least when we invest in low-carbon ways to do things. A tolerance for harm-shifting is implicit in, for example, carbon budgets. Reading University has introduced emissions limits on travel, roughly in my academic unit limiting us to the equivalent of one round-trip flight to the West Coast of the USA every two years. But if shifting-harms is unjust, then for example if I think "I was going to travel to the APA this year, but I'd really like to go to that conference next year instead" and so I skip this year's APA, do I act unjustly? If shifting harms is unjust, then I seem to, because in a sense not flying this year is an offset of my flight next year, and so subject to a similar complaint.

I am not contending that this implausibility is a decisive argument: surprising moral views could be true! And in particular it could be true that climate change makes villains of us all. But insofar as the shifting-harms problem was supposed to be a *particular* attack on the justice of offsets, it overgeneralizes.

VI. WHEN DO WE EMIT?

Here is a slightly more concessive point. My defense of FLY+OFFSET relies on everybody's risk of a tornado being p under both STAY-HOME and FLY+OFFSET, with no additional risk imposed on anyone.

But it has been pointed out that offsets are not like that. My plane will inject tonnes of GHG into the upper atmosphere next week but my offset will slowly absorb GHGs over the next century, and we end up with something like table 3. The worry is that I have shifted expected harms from later to earlier and so the situation is not entirely opaque, and plausibly represents an injustice against those living earlier. The problem of *temporal shifting harms* is that our actual levers for affecting the climate (flights and tree-planting) tend to increase GHG levels now and reduce them later. This problem depends on the specifics of those levers, but it nevertheless seems plausible.

To be sure, temporal harm-shifting is not among the most awful forms of discrimination. We expose individuals to more risk based purely on when they live, not on grounds such as sex or race. But I must concede that by my own lights FLY+OFFSET could be unjust. At the very least, my equal-risk *defense* of FLY+OFFSET against injustice fails in that case. The risks are not equal. To return to the classroom example, it is as if I turned the air-conditioning down, knowing that this would delay the explosion until tomorrow. A clear injustice against tomorrow's students!

But in practice and at present this is not a worry. To see this we must consider the problem of additionality.

Sinnott-Armstrong (2005) argues that our individual carbon emissions do not cause harm. But along with nearly everyone else, he implicitly assumes that we can control how much GHG we emit. Writing before electric cars were widely available, he claimed that though I could use a fuel-efficient car for my pleasure trip, they have less *get up and go* (Sinnott-Armstrong 2005, 296). The choice of car is relevant only if it affects your emissions.

Under the heading of additionality, the claim that we can control GHG levels through offsets is often disputed. Focus again on my trip to North America. My offset is additional if and only if without the purchase, the tree or stove *would not* have been installed and so GHG levels would have been higher. Let's specify a time horizon, say a century. I see that my flight's emissions are equivalent to those of a single tree growing for a century, so feeling patriotic I pay for the pricey offset and a single tree is

planted in Wales tomorrow. Whether I reach net zero depends on what *would* have happened if I had not paid for the offset.

Additionality is not an all-or-nothing matter, and here are three possibilities:

1. The tree (or a counterpart—let's avoid difficult questions about tree individuation) would not have been planted for the next century. The offset is additional and I reach net zero, because the GHG emissions from the flight are exactly balanced ('offset') by the tree over the time horizon.
2. After independence a month from now, the Welsh Green Revolutionary Council begins a massive tree-planting programme, and 'my' tree would have been planted by them in two months even without my purchase. There is barely any additionality—merely whatever carbon the tree absorbs during its two-month headstart—and it might even be negative considering the costs of planting and the tree lifecycle.
3. The Revolutionary Council is distracted by infighting between English- and Welsh-speaking factions, and it is ten years before my tree is planted. There is some additionality—the headstart is ten years—but not enough, so I do reduce my net emissions but not to zero.

As we can see, it is extremely difficult to assess additionality. Which is the correct counterfactual baseline for comparison? This is sometimes taken to be an argument against offsets, and Monbiot (2022) writes that offset "schemes often rely on untestable counterfactuals: what would have happened if this money had not been spent?"

This is true. But counterfactuals with false antecedents are always untestable. And more specifically, much the same problems bedevil (attempted) gross emissions reductions, for private individuals at least. The claim that Walter's drive causes extra GHG emissions also relies on a counterfactual baseline: how much would have been emitted without the drive, or had he driven the more boring car? To attach some numbers, consider that the excellent Reading buses app tells me that taking the bus to work from home 'would save 884g of CO2 compared to driving'.[8]

[8] Vanity compels me to mention that I do not own a car, further illustrating the difficulty of finding a baseline for such comparisons.

Presumably this is because some fuel is not burnt that otherwise would have been, in which case 884g would have been released. The petrol's carbon footprint includes the embodied carbon from its extraction and transport and the emissions from burning it in my car, instead of letting it expire. It is too late to do anything about the embodied carbon of the fuel already in my car's tank, so skipping a drive reduces gross emissions insofar as it causes

(1) the fuel in my car's petrol tank to expire instead of being burnt,
(2) some *other* fuel to expire instead of being burnt, or
(3) less fuel to be extracted and refined.

Now (1) is possible but unlikely, because it is far more probable that I will drive the car before the fuel in my tank is no longer usable.

So perhaps (2) is the route to saving those 884g? The idea is that if I do not drive today then I will buy less fuel next time I fill up, or fill up later than I would have. Surely this must mean that less fuel is burnt, unless someone else buys and burns more to precisely cancel out me buying less?[9] I must concede that it is quite likely that gross emissions are sometimes reduced in this manner, so petrol may be one of the best cases for gross emissions reductions.

But we might hope that in general the fuel supply chain is more robust than that, and that once petrol is *en route* to the pumps it will be sold and burnt before it expires, much as 'short-dated' food and drink is sold off at a reduced price. Crucially, however, for most other goods there is no or very limited equivalent of burning after purchase. My television has a reasonable amount of embodied carbon, but it also consumes electricity when I watch it. I may be able to calculate a notional amount of kWh saved by reducing the brightness and this will cause a reduction in my electricity bill, but the causal connection to reduced carbon emissions through electricity generation is tenuous at best.

Similarly, the causal connection between failing to buy a flight ticket and reduced burning of aviation fuel is tenuous. We should not be fooled by the fact that it is often easy to spend less money burning or otherwise using our carbon-intensive goods; actually 'spending' less *carbon* is a further and difficult step.

That leaves (3): decreasing *future* emissions. In many cases, this will be the only impact I have. Market signaling is how I might reduce

[9] I'm grateful to John Broome for pressing this point.

consumption from air travel, for example: I could be the threshold flyer that makes the route unprofitable and hence reduced in frequency, reducing demand for planes and for aviation fuel. I could even be the decisive customer whose abstention makes the oilfield and factory farm unviable. But market effects also go both ways, because I might be so unpopular that when I enter the vegan restaurant twenty cool kids leave and get a burger. Perhaps more realistically, my taking the bus makes the bus slightly fuller and the road slightly emptier, perhaps causing someone else to drive.

I do not wish to overstate how difficult it is to reduce gross emissions. But the earlier claim of Monbiot (2006) that "while the carbon we release by flying or driving is certain and verifiable, the carbon absorbed by offset projects is less attestable" is false—not because offsets are certain and verifiable, they are not, but because emissions from flying and driving are not either. It is very difficult in many cases to trace a causal link between our actions and GHG levels in the atmosphere.

I am not counselling despair about affecting GHG levels. Instead, I am arguing that for an individual, consumption reductions and offsets are on a par: even if additionality and actual reductions cannot be shown in individual cases, it seems likely that there will be *expected* GHG reductions attached to both.

I think that Monbiot-style criticisms of offsets often hold them to a *higher* standard of additionality and verifiability than consumption reductions, and that this is a mistake. It is not clear that we should regard offsets as a 'second best', and at the individual level it might even be easier to obtain genuine additionality through offsets than through consumption reductions. Offsets are certified, though regular scandals warn us against excessive credulity. A tree with your name on it may represent a greater expected reduction in GHG levels than a skipped drive or flight. Here I should reiterate that I am focusing on individuals: large organizations plausibly can directly affect GHG levels, for example by buying an oilfield and refusing to exploit it. Similarly, Sinnott-Armstrong is clear that his denialism extends only to individuals.

Excessive skepticism about the atmospheric efficacy of offsetting betrays a curious attitude toward science. Unless we are arrogant enough to think we can 'do our own research', those of us without comparable training are right to trust the climate scientists that carbon emissions are harmful. But insofar as we are *also* not climate economists, we do not have the expertise to assess the additionality of offsets, beyond the rather

hand-wavy considerations above. We should trust the experts in *both* fields or neither, absent very strong reasons to make a distinction.

I promised that additionality would help respond to the problem of temporal harm-shifting, and you may be wondering what the relevance is. It is that the problem was motivated by thinking that the GHGs from my flight would be released this week but my offset would take a century. And that is indeed true at a physical level.

But discussing additionality, we have seen that through both flying and offsetting I almost certainly do not have a direct impact on GHG levels. The plane will almost certainly fly whether or not I buy a ticket, and similarly whether or not I buy an offset will almost certainly not determine the number of trees planted in Wales. In both cases we are working with *expected* carbon increases or reductions, largely through market signals. Buying the plane ticket helps keep the route running and buying the offset helps to keep the scheme in business.

When we consider that any impact of my ticket and offset purchases is likely to be indirect through market signals in this manner, we lose warrant for the claim that any emissions I cause will be much sooner than any reductions I cause. The most likely outcome is that neither has any actual additionality and so neither has any direct effect on the climate. But when we trace any indirect or expected effects through market signals, *both* are likely to operate on a long timeframe.

The problem of temporal shifting-harms was motivated by looking at the actual mechanisms of flying and offsetting. But when we look further at the expected consequences of *purchasing* a plane ticket or an offset, there is no clear temporal disparity between them.

VII. CONCLUSION

I have often met the following objections to offsetting in conversation: they wrongly imply that it is 'OK to pollute', or they buy into a narrative that emissions are the responsibility of individuals rather than governments or large corporations. I have argued that the former is a misfire, because to put it bluntly, offsets *make* it OK to pollute. FLY+OFFSET is not unjust, even if FLY+COCKTAIL is. As for the second, this paper has not engaged with it because I assumed from the start that we are culpable for our emissions.

But offsetting might still leave us queasy. Such moral emotions can be informative and should not be lightly discarded. If FLY+OFFSET is not impermissible, perhaps our unease is with the motives of those who do it?

In a certain light, offsetting manifests a disturbingly colonial attitude. Flights are a luxury enjoyed only by the rich, but the costs of carbon emissions will be felt most severely by those in poor and middle-income countries, as well as climate-vulnerable (usually poor) people in rich countries. That is true, but by the same token those people will also *benefit* most from offsets. Flights impose risk on the poor for the pleasure of the rich, but offsets remove that additional risk. So the rich are not imposing net risks on the poor for their own trivial benefit—at least not if they offset.

So perhaps the rich in this situation are not 'playing God' but 'playing imperial administrator'? Even if we reach net zero, we do so by shifting harms: we harm some poor people and offset that harm by benefitting *different* poor people. Together with the fact that offset projects often happen in poorer countries—that is one reason they are so cheap—this paints an unsettling picture. Buying a plane ticket is akin to a distant colonial administrator implementing a policy that will harm many imperial subjects, and 'offsetting' that harm by benefitting different subjects.

I have argued, however, that given the opacity of the situation and the lack of a stable 'natural' baseline for emissions and harms, FLY+OFFSET can be just. Ultimately, I think both emissions and offsets manifest the unequal structure of the world we live in, but that does not make them wrong in themselves.

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