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# Freerolls and binds: making policy when information is missing

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**Abstract:** When policymakers focus on costs and benefits, they often find that hard questions become easy – as, for example, when the benefits clearly exceed the costs, or when the costs clearly exceed the benefits. In some cases, however, benefits or costs are difficult to quantify, perhaps because of limitations in scientific knowledge. In extreme cases, policymakers are proceeding in circumstances of uncertainty rather than risk, in the sense that they cannot assign probabilities to various outcomes. We suggest that in difficult cases in which important information is absent, it is useful for policymakers to consider a concept from poker: 'freerolls.' A freeroll exists when choosers can lose nothing from selecting an option but stand to gain something (whose magnitude may itself be unknown). In some cases, people display 'freeroll neglect.' In terms of social justice, John Rawls' defense of the difference principle is grounded in the idea that, behind the veil of ignorance, choosers have a freeroll. In terms of regulatory policy, one of the most promising defenses of the Precautionary Principle sees it as a kind of freeroll. Some responses to climate change, pandemics and financial crises can be seen as near-freerolls. Freerolls and near-freerolls must be distinguished from cases involving cumulatively high costs and also from faux freerolls, which can be found when the costs of an option are real and significant, but not visible. 'Binds' are the mirror-image of freerolls; they involve options from which people are guaranteed to lose something (of uncertain magnitude). Some regulatory options are binds, and there are faux binds as well.

## Introduction

Imagine that a supernatural being suddenly appears before you and asks you whether you want to play a game with the following conditions: *if you*

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*choose to play, you can win something of value, but you cannot possibly lose*. The supernatural being adds, 'I will not tell you the various things that you might win, nor will I tell you the probability that you will win any of them.' The supernatural being concludes: 'I might take away a threat you now face, whether or not you know about it. I might give you money or health. Regardless, I can promise you that you will get something good.' You are being offered a 'freeroll.' You can gain, but you cannot possibly lose.

Our goal here is to suggest that the idea of a freeroll helps identify solutions to a number of problems not only in daily life, but also in public policy and law. As we shall see, the idea bears as well on fundamental issues in political philosophy. The central point is that choosers often lack knowledge, making it difficult for them to know how to proceed. People struggle over options, seeking to obtain additional relevant information that might resolve their uncertainty before choosing, *even though they often have no need to obtain that information to know which option to choose* (Bastardi & Shafir, 1998). The challenge, and sometimes the solution, is to identify freerolls.

As we shall see, life is full of freerolls, even if we do not see them; we often suffer from 'freeroll neglect.' Freerolls can also be found in policy and law, and here, too, they are often ignored. From the standpoint of society, a Pareto improvement is a freeroll; there is a gain, and there is no loss. At the same time, people (including regulators) are often faced with 'faux freerolls,' in which options are presented as costless. Marketeers of multiple kinds, including those involved in politics and law, have a strong incentive to give an option the appearance of being a freeroll, when it is in fact anything but that. A Kaldor–Hicks improvement, by which the winners gain more than the losers lose, is not a freeroll; potential Pareto superiority, in which the winners could compensate the losers and leave a surplus, is merely potential.

The remainder of this article comes in four sections. The first section explores knowledge and ignorance on the part of choosers, with special reference to regulatory policy. It shows that important information is often missing, apparently making it exceedingly difficult to know how to proceed. This problem sometimes can be found when regulators make choices among options with respect to air pollution, homeland security, climate change, pandemics, financial stability and occupational safety. At the same time, the lack of knowledge may be *asymmetric*; choosers may know about costs but not benefits, or vice versa. In some cases, this asymmetry in knowledge can help choosers to identify the right path forward. The section entitled 'Freerolls' elaborates on the idea of freerolls, drawing on the use of the concept in poker and showing how it applies to a wide range of problems in policy and law. It explores cumulative benefits and cumulative costs and the idea of 'binds,' which arise when an option has no benefit, but real costs (whose magnitude is unknown).

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The subsequent section, entitled 'Freerolls, binds and public policy,' shows how the concept of freerolls might be used in thinking about distributive justice and the Precautionary Principle. Some precautions against downside risk are freerolls, a claim that bears on appropriate responses to pandemics and climate change. At the same time, some precautions are only apparent freerolls; analysts or advocates ignore their costs. Faux freerolls are paralleled by faux binds, which appear when analysts or advocates ignore the benefits of an option. This section argues that faux freerolls and faux binds play a significant and unfortunate role in regulatory policy. The paper finishes with a brief conclusion.

## Knowledge and ignorance

Our starting point is that when people are choosing among a set of options, they are usually aware that all of them have both upside potential and downside potential. The upside is composed of the potential gains; the downside is composed of the potential losses. Different options will have different expected values. For example, an investment of $1000 might be 80% likely to produce no gain and 20% likely to produce a gain of $20,000, for an expected value of $4000 (and hence an expected net benefit of $3000). Regulatory choices, involving health and safety risks, might take similar forms, as, for example, when incurring an annual cost of $900 million is 90% likely to produce no benefits but 10% likely to produce annual benefits of $10 billion, for an expected value of $1 billion (and hence an expected net benefit of $100 million).

The cost of $900 million might be designed, for example, to prevent a financial crisis or a pandemic. Analysts might say that it is highly likely that, in any given year, incurring that cost will produce no actual benefits, but that there is also a small chance, which can be quantified, that the benefits will be obvious and very large. In the context of financial crises in particular, something like this is true. Expensive regulations are imposed in the hope of reducing or eliminating catastrophic risks (Coates, 2014).

With perfect knowledge of the ranges of potential upside and downside outcomes, as well as the probabilities of realizing them, choosers can objectively calculate the expected values and variance associated with any option. In order to determine which option is best, they might ask: How does the upside/downside potential of each option under consideration compare given the required investment in each? Which option has the highest net benefits? In regulatory policy, these are standard questions, and there are elaborate instructions about how to answer them (Executive Office of the President, 1993; Office of Management and Budget, 2003).

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For our purposes here, risk is defined as exposure to the downside. Risk tolerance is defined as the downside potential that the chooser is willing to tolerate, determined by both the magnitude and probability of the potential losses. Of course, the chooser will consider the magnitude and probability of the potential gains as well. Unless the latter are very high, a chooser might reject an option that carries with it a risk of exceptionally serious losses, even if they are highly unlikely to occur. A conventional reason for this is that the losses would be catastrophically high if they do occur (and hence have a high negative expected value) (Taleb *et al.*, 2014). If the risk of ruin meets some threshold of likelihood, a chooser may be unwilling to tolerate that risk (Taleb *et al.*, 2014). Alternatively, the potential losses might be moderate but so probable that an option has a negative expected value. Even if not, the chooser might be risk averse, or perhaps loss averse.

### *What choosers do not know*

We have assumed thus far that choosers know a great deal, but it is common in decision theory as well as regulatory policy to make a distinction among risk, uncertainty and ignorance.[1] Situations of *risk* occur when people can identify the potential outcomes and also the probability associated with each. For example, choosers might know that an option is associated with three potential outcomes, one good and two bad, and they might know that each is 33.33% likely to occur. A situation of *uncertainty*, by contrast, is said to exist when people can identify possible outcomes, but do not and cannot know the probability that they will occur (Keynes, 1937).[2] People might be told, for example, that a gamble could produce a benefit of $1000, a benefit of $100,000 or a loss of $50,000, but might not be told the probability associated with any of those possibilities. Under conditions of *ignorance*, people cannot specify either outcomes or probabilities (Harremoes *et al.*, 2002). It is, of course, true that risk, uncertainty and ignorance might be found with respect to gains, losses or both.

1 The distinctions are controversial in some circles (Knight, 1933; Elster, 1983; Taleb *et al.*, 2014; Kay & King, 2020).

2 Consider Keynes' words: 'By "uncertain" knowledge, let me explain, I do not mean merely to distinguish what is known for certain from what is only probable. The game of roulette is not subject, in this sense, to uncertainty; nor is the prospect of a Victory bond being drawn. Or, again, the expectation of life is only slightly uncertain. Even the weather is only moderately uncertain. The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealthowners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know' (Keynes, 1937).

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In countless contexts, choosers might want to make some kind of assessment of expected value, if they possibly can – in deciding, for example, whether to wear a seatbelt, whether to go on a date, whether to go on a skiing vacation, whether to invest in a new company, whether to go to graduate school in psychology, whether to work at a law firm, whether to join the military and so forth. Something similar can be said of heads of public institutions, such as hospitals, universities, high schools and sporting goods stores. In government, policymakers are in the same position. Under prevailing Executive Orders (Executive Office of the President, 1993), for example, US regulators are required to assess the costs and benefits of their proposals and are permitted to proceed only if the benefits justify the costs.

The problem is that sometimes scientists and economists cannot offer anything like point estimates (Coates, 2014). The expected outcomes may fall within a range, and so too the costs; the same might be true of the probabilities. Of course, if the shape of the distribution of the range is known, a point estimate is implied. But under conditions of uncertainty or ignorance, the distribution of possible outcomes remains unknown (Coates, 2014). The choice of what to do under these challenging circumstances is essentially a bet. In some cases, policymakers cannot quantify the benefits or the costs (Coates, 2014; Sunstein, 2014).

### *With and without numbers*

For a glimpse at the challenge of quantification, consider a few numbers from annual cost–benefit reports from the US Office of Information and Regulatory Affairs: (1) the projected annual benefits from an air pollution rule governing motor vehicles range from $3.9 billion to $12.9 billion (Office of Management and Budget, 2015); (2) the projected annual benefits of an air pollution rule governing particulate matter range from $3.6 billion to $9.1 billion (Office of Management and Budget, 2014); (3) the projected annual benefits of a regulation governing hazardous air pollutants range from $28.1 billion to $76.9 billion (Office of Management and Budget, 2013); and (4) the projected annual benefits of a regulation governing cross-state air pollution range from $20.5 billion to $59.7 billion (Office of Management and Budget, 2012).

It is worth pausing over three noteworthy features of those numbers. First, the government does not offer probability estimates to make sense of those ranges. It does not say that the probability at the low end is 1%, or 25%, or 50%. The default implication may be that the probability distribution is normal, so long as it is not specified, which implies that the point forecast is the mean of the upper and lower bounds. But is that what really is meant? It is impossible to know without specifying the shape of the distribution, which one can only derive through assigning probabilities to the possible outcomes.

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Second, the ranges are exceptionally wide. In all four cases, the difference between the floor and the ceiling is much higher than the floor itself (which is in the billions of dollars)! Third, the wide ranges show the importance of whether and to what extent regulators focus on the worst-case scenario – of how bad things could be if they do nothing. If regulators focus on the highest imaginable costs from inaction, the relevant regulation is amply justified in all of these cases; there is nothing to discuss. The matter becomes more complicated if regulators focus on the lowest imaginable costs or on the midpoint. It seems clear that they should consider all three; if they do not attend to the highest reasonable estimate of costs, they will fail to consider the risk, understood as exposure to the downside. It is impossible to make high-quality decisions without understanding the risk of exercising an option (or choosing not to regulate). But in the face of widely divergent expected outcomes without an assignment of probabilities, how should they think about expected value?

When ranges are wide, especially in a data-rich environment, the regulatory focus can easily shift to resolving or narrowing the spread between the upper and lower bounds, rather than attending only to the lower or upper bound and allowing for the uncertainty in the point forecast or the shape of the distribution to remain. Within government as well as in private life, there is a general discomfort with making decisions when decision apertures are wide, and it might seem worthwhile to spend a great deal of time and effort trying to answer the missing questions prior to deciding (Office of Management and Budget, 2003). In other words, 'wait and learn' (Office of Management and Budget, 2003).[3] There are two main problems with this approach. The first is that the information may not be available, even with sustained effort. The second is that choosers do not have an unlimited amount of time to decide. People might be hurt in the period in which information is being acquired. Time is a valuable resource, and choosers must trade off potential gains in accuracy against the costs of delay. Consider the problem of climate change, where waiting and learning might give rise to catastrophically high and irreversible risks (Nordhaus, 2015).

3 OMB Circular A-4 states: 'In some cases, the level of scientific uncertainty may be so large that you can only present discrete alternative scenarios without assessing the relative likelihood of each scenario quantitatively. For instance, in assessing the potential outcomes of an environmental effect, there may be a limited number of scientific studies with strongly divergent results. In such cases, you might present results from a range of plausible scenarios, together with any available information that might help in qualitatively determining which scenario is most likely to occur. *When uncertainty has significant effects on the final conclusion about net benefits, your agency should consider additional research prior to rulemaking. The costs of being wrong may outweigh the benefits of a faster decision. This is true especially for cases with irreversible or large upfront investments*' (emphasis added).

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It would be helpful to find a way to produce sensible decisions under circumstances of uncertainty or ignorance, where the spread between the upper and lower bounds may be wide and the shape of the distribution is unknown. Freerolls offer such a way.

### *Asymmetry*

When people are choosing under risk, where the possible outcomes are known as well as the probability of each possibility, options may be identified that are freerolls. In order for an option to be a freeroll, there must be an asymmetry between the upside and downside potentials of the option such that there are potential gains but *no risk of loss*. In other words, freerolls reveal situations in which the chooser has nothing to lose but potentially much to gain. If risk is defined as exposure to the downside, freerolls carry no risk at all, making them exceedingly attractive to the chooser. Consider an investment: if you give a specified amount of money, you will get it back in 6 months, with interest, and you might also get it back alongside $1 million. That is clearly an attractive investment, and it is a freeroll whether the probability of each outcome is known or unknown since the chooser need not know the probabilities to know that no loss is possible.

A chooser can spot this kind of asymmetry between the upside and downside potential of an option by asking, 'Will I be worse off than I was before I made this decision if the worst of the possible outcomes occurs?' If the answer is 'no,' it is a freeroll. A freeroll exists if the benefit is described either as obtaining a gain from the status quo (say, a health benefit or economic gain) or as averting a loss from the status quo (say, an illness or an economic loss).

Choosers need not know the complete distribution of possibilities or how probable each possibility is in order to identify freerolls as such. In other words, we can still identify freerolls under circumstances of uncertainty and ignorance. Sometimes choosers have (1) little knowledge about the upside potential of an option under consideration, but (2) a great deal of knowledge about the downside potential of an option. Sometimes choosers have (1) a great deal of knowledge about the upside potential of an option, but (2) little knowledge about the potential downside. In other words, it is not just that the upside and downside potentials of an option may be asymmetric; it is also the case that the chooser's knowledge about the two sides of the distribution may be asymmetric. A freeroll can be identified when knowledge is asymmetric such that the chooser is certain that an option has no downside even though the upside potential may remain unclear. Note again that the upside can be characterized or framed as obtaining gains (in terms of, say, money or health) or avoiding losses (in the same terms).

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Thus, we can apply the concept of a freeroll in cases of risk, uncertainty and (partial) ignorance. That is, we can freeroll even if we have very limited knowledge about the magnitude of the potential upside of an option and/or the probability of realizing that upside potential. In this way, freerolls leverage the asymmetries that can exist in our knowledge about the range of possible outcomes of any option. The upside potential does not need to be known as long as there is certainty that there is no downside.

Because it is generally good to obtain information that bears on both the upside and the downside, people might want to obtain that information before making a choice (Bastardi & Shafir, 1998). This can cause freeroll neglect, which occurs when people do not identify an option as a freeroll. The point is that the information they are seeking might be essentially useless, in the sense that it might not be necessary to obtain it in order for people to know what to choose. If an option is a freeroll, they should generally choose it even if they lack information (about, say, the probability that the upside will be very large, large or modest).

## Freerolls

The term 'freerolls' is a common term in betting, and poker more specifically, where they are relatively common. Some poker tournaments are themselves freerolls in the sense that the casino or some other entity puts up the prize money and players enter at no cost. All players in the tournament are freerolling. If they do not win, they will not be worse off financially for having played, but they have the chance to win some or all of the prize money. (One of the authors of this paper won the Tournament of Champions in 2004, which was a freeroll. She had no money at risk but the opportunity to win the sizeable prize pool.)

Another simple example in poker comes up when a player has the very best possible hand (called 'the nuts') and it is the last bet, meaning that the last card has been dealt such that the doubts and questions deriving from the luck of the deal are removed. If the player's opponent bets, it is a freeroll to raise the bet. Since there is no possible hand that the player's opponent could have that can beat her holding, she cannot lose any money by raising. To be sure, she might win no extra money if her opponent decides to fold to her raise. But if her opponent decides to call her raise (or, even better yet, raise the bet again), she will win extra money. The player need not know the probability that her opponent will call (or raise) the bet to make it correct to choose the option of raising, since nothing is to be lost from the decision. (The optimal amount to raise is another matter not relevant to the discussion here.)

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Another common freeroll situation can be frequently observed in certain high/low split games. In these games, the pot is split between the highest hand and the lowest hand. If a player holds both the highest and lowest hands, he scoops the whole pot, meaning he wins both the high and low halves. In these games, it is a common situation that a player will hold the very best low hand, which means that, at minimum, he will win half of the pot. In poker-speak, the player has the low half of the pot 'locked up.' If that is the case, he is freerolling for the high half of the pot. With any bet he places, the player is at least getting his money back, but if he happens to end up winning the high hand as well, he will double any money he bets (against one opponent). Betting with the 'lock' low hand here is a freeroll. The player is no worse off than he was before placing any bet even if he does not win the high half of the pot. Since the player has the low half locked up, the worst case is that he gets his money back.

### *Pure freerolls and near-freerolls*

In life and in policy, it is rarely the case that there is no downside at all. Most decisions, in life and regulatory policy, have some downside associated with them, even if it is just time spent in the pursuit or the opportunity cost associated with options that the chooser forgoes. If a poker player is invited to a tournament in which she has no money at risk, she must nonetheless get there, and spend her limited time competing in the event. In the policy context, it is highly unusual for a regulation to impose no costs at all. For that reason, it is helpful to distinguish between pure freerolls and near-freerolls. A pure freeroll is an option that has no downside associated with it at all or a situation where there is literally nothing to lose. A near-freeroll exists when there is *small and easily tolerated* downside potential associated with an option under consideration. Imagine, for example, that a regulator is asked to repeal a regulation that has essentially no benefits, because it was an error to begin with, or because it has been rendered obsolete.[4] Repealing the regulation has a small or easily tolerated cost.

Whether it is a pure freeroll or a near-freeroll, what matters is that there is an *asymmetry* between the upside potential and downside potential of an option. Again, the asymmetry also applies to the chooser's lack of knowledge. To identify a freeroll, the chooser only requires knowledge about the downside potential and need not know much or even anything about the upside potential. When what the chooser stands to lose is small but the potential for gain is (possibly) very big, the asymmetry reveals that the chooser is risking little for the chance to gain a lot.

4 For an apparent example, see Environmental Protection Agency (2011).

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### *Binds: all pain, no gain*

As we have defined them, freerolls are positive. But they have a mirror-image: situations in which the chooser has little to gain and (potentially) a lot to lose. We can imagine a supernatural being, an evil twin of the one with which we began, saying: 'I have a deal for you. If you take it, you will lose something. It might be a little or it might be a lot. I will not tell you the probability of the possible outcomes. But I can guarantee one thing: you will lose.' That option is a bind, and one should obviously not take it.[5]

Just as there can be an asymmetry where there is little or no downside and a great deal of upside potential, so, too, the asymmetry can go the other way: there is little or no upside but a great deal of downside. Let us call these situations 'binds.' As with freerolls, there are pure binds, where the upside is zero, and near-binds, where the upside is small.

To know that binds are undesirable, the chooser need hardly have full knowledge about the range of possible downside outcomes. Nor need the chooser know anything about the shape of the distribution of those outcomes. The chooser need only identify the limited upside potential of the option under consideration. The decision aperture around the downside potential can remain quite wide.

Once again, we can look to poker for an example of a bind. Let's stipulate, as in the previous example, that there are no more cards to be dealt in the hand, removing the influence of the luck of the deal from the outcome. If a player has a moderate holding that has a substantial chance of winning the hand (so she is not bluffing), her instinct may be to bet in order to cash-in on the holding. However, it is often true in these cases that her opponent will not call her bet with a hand that is worse than her moderate holding. Put another way, the player's opponent will only call with a hand that is *superior* to her holding, guaranteeing she will lose her bet (and the pot) when her opponent calls her bet. When this is the case, the player has put herself in a bind. Her bet can gain her no extra money since her opponent will fold any holding worse than hers. She is risking losing the amount of her bet when her opponent calls with a better hand, with no gain possible, since her opponent will not call with a worse one. (The same situation would be a near-bind if there was a very low probability of a player calling with a worse hand such that there was an

5 Compare with the plays *Doctor Faustus* (Marlowe, 1994) and *Damn Yankees* (Abbott & Wallop, 1955). It is a nice question as to whether *Doctor Faustus* and *Damn Yankees* involved the choice of a bind. We tend to think so, though reasonable people believe that it is very important to beat the New York Yankees.

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asymmetry between the small chance of a gain in comparison to the chance of a loss.)

Players often fail to ask themselves, prior to placing their bet, if there is a possible hand that is worse than their holding that their opponent would be willing to call with. Instead, they focus on the fact that their hand has a substantial chance of winning separate from the betting element of the game. This is common, generally, with binds. In life and regulation, as in poker, they often go overlooked.

We have referred to freeroll neglect, with the hope of decreasing its incidence. 'Bind neglect' is also common, and it is even more damaging. People need to recognize binds and to try to get out of them. For example, a work situation or a romantic relationship might be a bind, and people might fail to recognize that fact (Levitt, 2016). Some policy options are binds as well. Cost–benefit analysis can operate as a corrective (Livermore & Revesz, 2020).

### *Cumulative costs and cumulative benefits*

Suppose that you are asked whether you want to buy a lottery ticket for a cost of $2, with a potential payoff of $10 million. You might not know the probability that you will win that $10 million, or you might know that it is exceptionally low. In either case, you might believe that you have been offered a near-freeroll. After all, the upside and downside potential are quite asymmetric. For many people, $2 is essentially 'nothing to lose.' Why not take a chance on winning a fortune?

In the short run, that might feel like a reasonable way to frame playing the lottery. But what if you make that decision every week of the year for 5 years? Should you take every such chance? Reframing the time horizon reveals we are not dealing with a near-freeroll, despite the small and easily tolerable potential loss of $2 for each iteration. If life presents itself with innumerable opportunities to spend $2 in return for an infinitesimal chance of a large payoff, and if you take advantage of each of those opportunities, you might find yourself running out of money relatively soon. Clever marketers are well aware of this point. They often try to sell their products as near-freerolls, speaking in terms of 'pennies per day' or using other forms of temporal reframing (Dholakia, 2019).

The point is, of course, that risks and costs accrue. Whether it is the decision to play the lottery, forgo wearing a seatbelt, smoke a single cigarette or impose a seemingly modest regulatory cost on the construction industry in a particular month, what might appear to be a freeroll when considered as a single decision is revealed as quite the opposite when viewed through the frame of a longer time horizon.

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The same point holds for options that may appear to have limited benefit in the short run. Those options might be near-freerolls, but people might not see that fact. A decision to set up automatic bill payment imposes burdens, though they are small, and in the short run, the benefits may be small as well, leading people not to proceed. But over time, the benefits of automatic bill payment may well be substantial, certainly in terms of time and perhaps in terms of money as well (because of the avoidance of late fees). Individuals, private institutions and public institutions may neglect near-freerolls in cases in which benefits accrue.

## Freerolls, binds and public policy

Some policy questions take the form of freerolls (pure and near) and binds (again pure and near). A regulator might be able to spend a little money to achieve a gain that might be small, might be large and might be somewhere in-between. A policymaker might see that one option will produce a bind and might take steps to avoid it. A policymaker might show freeroll neglect or (worse) show bind neglect.

### *Distributive justice*

We suggest that an understanding of freerolls helps to illuminate a defining discussion about the requirements of justice. In *A Theory of Justice*, John Rawls explores the principles that people would choose behind a veil of ignorance, in which they know essentially nothing about themselves (Rawls, 1999). Rawls argues that they would choose 'the difference principle,' which means that they would allow inequalities only if they are necessary to benefit the least well-off. The difference principle explicitly focuses on 'the worst that can happen' (Rawls, 1999).[6] In the terms of decision theory, choosers are selecting the maximin rule, which requires choice of the option with the least bad or best worst case. But why should they do that? The answer is that, in Rawls' account, the maximin rule seeks to maximize freerolls while minimizing binds. Simply put, Rawls argues that by choosing the maximin rule, people who face an uncertain danger of being the least well-off lose essentially nothing while gaining some protection against that uncertain danger (uncertain in the sense of having unknown probabilities).

Rawls argues that 'this unusual rule' is plausible in light of 'three chief features of situations' (Rawls, 1999). The first is that we cannot assign probabilities to outcomes, or at least we are extremely uncertain of them. The second

6 Rawls draws on, but adapts, the book *Profitability and Profit* by William Fellner (1965).

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(and the key to our analysis here) is that the chooser 'has a conception of the good such that he cares very little, if anything, for what he might gain above the minimum stipend that he can, in fact, be sure of by following the maximin rule' (Rawls, 1999). For that reason, it 'is not worthwhile for him to take a chance for the sake of further advantage.' The third, also relevant to our account, is that 'the rejected alternatives have outcomes that one can hardly accept.' In other words, they involve 'grave risks.' Under the stated conditions, choosers lose nothing by choosing a rule that eliminates those risks. Selecting maximin is a freeroll: for essentially nothing, they eliminate something bad (and in that respect obtain something good).

Consistent with our argument here, Rawls emphasizes that the three 'features work most effectively in combination,' which means that the 'paradigm situation for following the maximin rule is when all three features are realized to the highest degree' (Rawls, 1999). That means that the rule does not 'generally apply, nor of course is it self-evident' (Rawls, 1971). It is 'a maxim, a rule of thumb, that comes in its own in special circumstances,' and 'its application depends upon the qualitative structure of the possible gains and losses in its relation to one's conception of the good, all this against a background in which it is reasonable to discount conjectural estimates of likelihoods' (Rawls, 1971).

Whether or not we accept Rawls' difference principle, his argument on its behalf is that choosers behind the veil of ignorance have a freeroll, involving a choice in which they can obtain something without losing anything. In such cases, choosing maximin seems quite rational. It is a freeroll.

It would be possible, of course, to reject Rawls' argument on one of another ground. For example, he might be wrong to say that people do not care about what they lose by choosing maximin, which means that a freeroll is not involved. This potential objection to Rawls' argument is that maximin is not, in fact, a freeroll, because it imposes a high cost (Harsanyi, 1975). Engaging that debate is not necessary for our purposes here. Our goal is not to defend Rawls' argument, but to demonstrate that, with its basic structure, it seeks to show that the difference principle is a freeroll. In other domains of distributive justice, or distribution broadly speaking, it is possible to make similar arguments. For example, Robert Frank's argument on behalf of a progressive consumption tax, seeking to reduce positional externalities and to combat a positional arms race, essentially argues in favor of a freeroll (Frank, 2010).

### *When precautions are freerolls*

These points bear on regulatory policy, where the much-contested Precautionary Principle is often called into play (Harremoes *et al.*, 2002). There is no canonical definition of the principle, but it is invoked in many

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settings. For example, the European Union (EU) treaty states that, on the environment, EU policy 'shall be based on the precautionary principle' (European Union, 1992). The closing Ministerial Declaration from the United Nations Economic Conference for Europe in 1990 asserts, 'In order to achieve sustainable development, policies must be based on the precautionary principle … Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.' The widely publicized Wingspread Declaration, from a meeting of environmentalists in 1998, is more specific: 'When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not established scientifically. In this context the proponent of the activity, rather than the public, should bear the burden of proof.'

The Precautionary Principle has been sharply criticized, and on many grounds (Goklany, 2001). For our purposes, the most relevant objection is straightforward: risks are on all sides of social situations. Incurring risks is a gamble; so is eliminating or reducing risks. If policymakers reduce the risks associated with fossil fuels or nuclear power, they will simultaneously be creating other risks, if only because risk reduction is costly (Goklany, 2001). This is a conceptual point, not an effort to speak to the appropriate approach regarding fossil fuels or nuclear power. Because risk reduction imposes risks, the principle is self-defeating; it forbids the very restrictions that it mandates.

We do not mean to say here whether these kinds of objections are convincing. Our focus, rather, is on whether freerolls offer a helpful frame for considering the usefulness of some understandings of the Precautionary Principle.

In response to such objections, Stephen Gardiner draws on Rawls' argument to suggest that, in some contexts, the Precautionary Principle can be seen as a freeroll, or close to it (Gardiner, 2006). To make the underlying intuition clear, Gardiner begins with the problem of choosing between two options, A and B (Gardiner, 2006):

> If you choose A, there are two possible outcomes: either (A1) you will receive $100, or (A2) you will be shot. If you choose B, there are also two possible outcomes: either (B1) you will receive $50, or (B2) you will receive a slap on the wrist. According to a maximin strategy, one should choose B. This is because: (A2) (getting shot) is the worst outcome of option A and (B2) (getting a slap on the wrist) is the worst outcome of option B; and (A2) is worse than (B2).

Applying the concepts of freerolls and binds, we should be able to see that option A is a near-bind, while option B is a near-freeroll, making option B look like the preferred choice.

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Even so, it should also be immediately apparent that if we can reduce uncertainty by assigning known probabilities to outcomes, A might turn out to be the better choice, depending on the chooser's risk tolerance. Suppose that if you choose option A, there is a 99.99999% chance of (A1), and that if you choose option B, there is a 99.99999% chance of (B2). If so, option A might seem better. But let us stipulate that we are dealing with uncertainty, in the sense that assignment of probabilities is not possible. In Gardiner's view, this conclusion helps support what he calls the Rawlsian Core Precautionary Principle in the regulatory setting. When Rawls' three conditions are met, precautions, understood as efforts to avoid the worst-case scenario, should be adopted. As Gardiner puts it: 'If one really were faced with the genuine possibility of disaster, cared little for the potential gains to be made by avoiding disaster and had no reliable information about how likely the disaster was to occur, then, other things being equal, choosing to run the risk might well seem like a foolhardy and thereby extreme option' (Gardiner, 2006). In short, choosers are dealing with a pure or near-freeroll. When probabilities are unknown, seeking to choose the option that is closest to a freeroll and furthest from a bind helps the chooser navigate the decisions without resolving the unresolvable uncertainty.

Gardiner emphasizes that, to justify the maximin rule, the threat posed by the worst-case scenario must satisfy some *minimal threshold of plausibility*. In his view, 'the range of outcomes considered are in some appropriate sense "realistic," so that, for example, only credible threats are considered' (Gardiner, 2006). If they can be dismissed as unrealistic, then maximin should not be followed. Gardiner believes that the problem of climate change can be usefully analyzed in these terms, and that it presents a good case for the application of the maximin rule (Gardiner, 2006). His argument takes the form of seeing the Precautionary Principle, as he understands it, as a near-freeroll:

> The RCPP [Rawlsian Core Precautionary Principle] appears to work well with those global environmental issues often said to constitute paradigm cases for the precautionary principle, such as climate change … For reasonable cases can be made that the Rawlsian conditions are satisfied in these instances. For example, standard thinking about climate change provides strong reasons for thinking that it satisfies the Rawlsian criteria. First, the 'absence of reliable probabilities' condition is satisfied because the inherent complexity of the climate system produces uncertainty about the size, distribution and timing of the costs of climate change. Second, the 'unacceptable outcomes' condition is met because it is reasonable to believe that the costs of climate change are likely to be high, and may possibly be catastrophic. Third, the 'care little for gains' condition is met because the costs of stabilizing

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> emissions, though large in an absolute sense, are said to be manageable within the global economic system, especially in relation to the potential costs of climate change.

Crucial to the argument is the 'care little for gains' condition. Of course, it may be disputed whether that condition is met in the context of climate change; perhaps the costs of reducing greenhouse gas emissions are very high, and perhaps some form of cost–benefit analysis is necessary (Nordhaus, 2015). Our focus is on the structure of the argument, not on any particular application.

The more abstract point is that, in identifiable circumstances, eliminating downside risks is a freeroll. Taken seriously, this conclusion would have real consequences for regulatory policy. It would motivate a search for domains in which regulators, faced with a lack of information about important questions, can find freerolls and proceed accordingly. Doing so would seem to be a high priority, whether the context involves the promulgation of new regulations or the elimination of old ones.

### *Extensions*

Pure freerolls are not exactly common. As we have said, options that carry with them potential gains of uncertain magnitude usually come at a cost. When the cost is low enough, we have a near-freeroll. But when is the cost low enough?

The question of what constitutes costs that are 'low enough' has arisen on multiple occasions in connection with the COVID-19 pandemic. Consider the suggestion, accepted by some governments, that people should be required to wear masks. Such a requirement might be justified as a way of protecting mask-wearers, in which case we are dealing with paternalism, designed to reduce internalities, in the form of costs that people impose on their future selves. Or it might be designed to protect those whom people encounter, in which case we are dealing with a standard effort to reduce externalities. In either case: Are mask mandates a freeroll, or close to it? With respect to benefits, some experts say that masks help to reduce the spread of COVID-19, but that the magnitude of the benefits are unclear. For example, Harvard Medical School's CoronaVirus Resource Center explicitly states '… we don't know *exactly* how much masks and physical distancing help …' (Harvard Health Publishing: Harvard Medical School, 2020). But the benefits do not need to be known to realize it is a near-freeroll (Abaluck *et al.*, 2020).

The reason for this is that the cost of wearing masks is plausibly treated as low, not only at the individual level, but also in aggregate. Suppose that mask-wearing is inconvenient and slightly uncomfortable, but that the inconvenience and discomfort do not amount to much. If the benefits of a mask

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mandate, in some places, are somewhere between significant and very high, then we are dealing with a freeroll.

It is noteworthy that in many domains involving health and safety, public officials might have asymmetric knowledge of the downside and the upside. For example, masks have been in use in medical contexts for quite a long time, which means that we know quite a bit about the downside. But with masks, we are applying a known remedy to a novel situation; while we know little harm comes from wearing a mask, we may not know at the outset how much good will come from doing that.

Something similar can be said of many problems in the general domain of health and safety. Suppose that scientists say that certain chemicals, now in widespread use, might be harmful.[7] Suppose that they cannot specify the probability that they are harmful, and that the magnitude of the harm, should it occur, is unknown or unknowable. A regulator might learn that the cost of banning some of those chemicals is low, or close to zero, because there are safe substitutes, and because they are not more costly than those now in use and potentially harmful. The work that might have gone into careful risk assessments is unnecessary, because we are dealing with a freeroll. We can apply the same framework to some air pollution problems, wherever greater stringency, imposing low costs, is associated with unknown benefits.

## *Faux freerolls*

When the upside potential of an option is significant, choosers may misidentify these options as freerolls by focusing only on the potential for gains while neglecting examination of the risks. We have already discussed cumulative costs, which give the appearance of being freerolls. If the costs of wearing a mask are small to most people, they might nonetheless be large in the aggregate (though it is also reasonable to think that the aggregate costs of wearing masks are far lower than the benefits). Many other regulatory costs, such as safety requirements for automobiles, might be large in the aggregate even if they are small for individuals. A small amount per car might amount to a very large amount per ten thousand cars. We now turn to a different problem: downside risks that are invisible or not salient.

In the presence of a pure or near-freeroll, people often ask the right question: 'What do you have to lose?' The answer might be 'little or nothing' in the medical context, where people who are very sick might be offered a treatment

7 The discussion of the Environmental Protection Agency's consideration of a 'chemicals of concern' rule, and also of 'forever chemicals,' can be approached in this light (Gibbens, 2020; Grossman, 2020).

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whose benefits are unclear but whose costs are close to zero. Trying the treatment might be taken as a near-freeroll. (It is not a pure freeroll because of the time, money and potential emotional loss associated with the effort.) Something like this might also be true in the context of certain investments, in which an investor might be protected against any losses but receive a potential gain of uncertain magnitude (say, 70% of the gain that would come from a well-diversified index fund if and only if the stock market goes up over the next 5 years).

The regulatory examples given above might also be framed by the same question. What, or how much, does a nation have to lose if it were to make a modest investment for a potentially large gain, or to avert a potentially large loss? We can see Gardiner's argument for the use of the maximin rule in exactly these terms.

But in some cases, this logic is misapplied, including in the context of health and safety risks. A prominent and revealing example came in early April 2020 (Zoellner, 2020), when President Donald Trump recommended the use of the drug hydroxychloroquine for the treatment of COVID-19 by offering the rationale, 'What do you have to lose?' (Rupar, 2020; Solender, 2020), suggesting that treating COVID-19 with hydroxychloroquine would be a freeroll. To be sure, given the available information at the time, it was possible that the use of hydroxychloroquine might be associated with significant benefits in the treatment of COVID-19. But realizing that there might be upside potential was not enough to make the use of an untested medication a freeroll, nor would it be with any potential therapeutic. To identify a therapeutic drug as a freeroll, one would also have to understand the risks associated with the use of the drug. (Something similar could be said of many policies that seem at first glance to involve freerolls.)

Without data from well-powered, controlled clinical trials, one could not know the potential benefits of the drug in treating COVID-19. But having certainty about the upside potential of the therapeutic drug would not be necessary in order for it to be a freeroll; the benefits could remain unknown as long as the risks were both known and insignificant. Unfortunately, hydroxychloroquine was known to carry significant risks associated with its on-label uses, particularly related to cardiac damage (United States Food and Drug Administration, 2020). Because the risks were significant and known while the benefits remained unknown, the use of hydroxychloroquine was not a freeroll; in fact, it was closer to a bind.

To clarify the moving parts: if the benefits of a protective measure are known to be positive, but if their magnitude is unknown, we are dealing with a freeroll or near-freeroll if its costs (properly assessed) are known to be zero or close to it. That is our defining case, which involves a special kind of asymmetry in available information. If, by contrast, the benefits of a protective measure are

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known to be positive, regardless of whether their magnitude is unknown, we are not dealing with a freeroll or near-freeroll if its costs are known to be significant. (If the possible benefits and costs of a protective measure are both known, but their magnitudes are unknown, we are dealing with serious epistemic gaps, and with neither freerolls nor binds.)

The hydroxychloroquine example suggests a larger point. In some cases, we will have an illusory or faux freeroll, because the losses associated with an option are not, in fact, trivial. In the domain of regulation, faux freerolls can be found whenever enthusiasts about health, safety or environmental measures attend closely to the benefits but wrongly treat the costs as low or zero (Margolis, 1997). They might believe, for example, that it is essentially costless to improve worker safety or food safety, or to increase the minimum wage significantly, in cases in which such measures may impose real harms on real people. Many people point to the complex trade-offs involved in imaginable approaches to the problem of climate change, and even if they urge an aggressive response, they do not claim that a freeroll is involved (Nordhaus, 2015).

Faux freerolls are accompanied by faux binds, as when critics of regulation pay close attention to the costs of an option, but wrongly treat its benefits as low or zero (Margolis, 1997). Many of those critics think of proposed reform as freerolls, when they are nothing of the kind. They might believe, for example, that it is important to create a regulatory budget, understood as a cap on total regulatory costs. Such a budget would prevent government from going forward with initiatives that would create significant net benefits. In our view, the whole idea of a 'regulatory budget' should be seen as a faux freeroll, and the same is true of the executive order imposing a regulatory cost cap of $0 (Executive Office of the President, 2017).

Of course, it is true and important that some regulations should be repealed, because they do more harm than good. In some cases, a repeal is indeed a freeroll, in the sense that the regulation does no good at all, and hence should be eliminated even if we cannot quantify its cost.[8] But in deciding what to repeal, it is important to look at both sides of the ledger, and not to act as if freerolls are always or generally involved.

## Conclusion

In ordinary life, people may be asked whether they want a freeroll, in the form of a good or opportunity from which they will lose nothing, but from which

8 For apparent examples, see the plays *Doctor Faustus* (Marlowe, 1994) and *Damn Yankees* (Abbott & Wallop, 1955).

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they gain something of value, when the magnitude of the gain cannot be specified. The gain might take the form of the elimination of a risk. More commonly, people are given near-freerolls, because they have to pay something for the option. Often what they have to pay is very low, which makes the deal a good one. The central point here is an asymmetry in what people know. They know the costs, while they have large epistemic gaps with respect to the potential gains. People often fall prey to 'freeroll neglect.' When this is so, they do not see pure or near-freerolls; they seek missing information before choosing among options, even though they have no need to do so.

Freerolls are mirrored by binds, in which people are given an option from which they can only lose, even though they do not know how much they might lose. To know that binds are undesirable, the chooser need not have full knowledge about the range of possible downside outcomes. Nor need the chooser know anything about the shape of the distribution of those outcomes.

Some important policy problems turn out to involve freerolls. Policymakers, including regulators, are asked whether to choose an option that imposes no or low costs, but that promises to produce meaningful gains (of uncertain magnitude). Demonstrating freeroll neglect, policymakers are tempted to wait and seek information. They ought not to do that. They should freeroll.

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## References

Abaluck, J. *et al.* (2020), 'The Case for Universal Cloth Mask Adoption and Policies to Increase Supply of Medical Masks for Health Workers', available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3567438

Abbott, G. and D. Wallop (1955), *Damn Yankees*, available at https://www.amazon.com/gp/video/detail/amzn1.dv.gti.98a9f739-afed-00d2-8c98-a81c60a5e426?autoplay=1&ref_=atv_cf_strg_wb

Bastardi, A. and E. Shafir (1998), 'On the Pursuit and Misuse of Useless Information', *Journal of Personality and Social Psychology*, **75**:19.

Coates, J. C. (2014), 'Cost-Benefit Analysis of Financial Regulation: Case Studies and Implications', *Yale Law Journal*, **124**: 882.

Dholakia, U. (2019), 'The Powerful Influence of Pennies-A-Day Price Offers', available at https://www.psychologytoday.com/us/blog/the-science-behind-behavior/201904/the-powerful-influence-pennies-day-price-offers

Elster, J. (1983), *Explaining Technical Change: A Case Study in the Philosophy of Science*, New York: Cambridge University Press 199.

Environmental Protection Agency (2011), Milk Exemption under the SPCC Rule. https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations/milk-exemption-under-spcc-rule

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European Union (1992), 'Article 130: Treaty on European Union'.
Executive Office of the President (1993), Executive Order 12866.
Executive Office of the President (2017), Executive Order No. 13771.
Fellner, W. (1965), *Probability and Profit*, 140–142.
Frank, R. (2010), *Luxury Fever*. Princeton: Princeton University Press.
Gardiner, S. (2006), 'The Core Precautionary Principle', *Journal of Political Philosophy*, **14**: 33, 46, 49, 51, 55.
Gibbens, S. (2020), 'Toxic 'forever chemicals' more common in tap water than thought, report says', *National Geographic*, available at https://www.nationalgeographic.com/science/2020/01/pfas-contamination-safe-drinking-water-study/
Goklany, I. (2001), *The Precautionary Principle: A Critical Appraisal*, Washington D.C.: Cato Institute.
Grossman, E. (2020), 'What the EPA's 'Chemicals of Concern' Plans Really Mean', *Scientific American*, available at https://www.scientificamerican.com/article/epa-chemicals-of-concern-plans/
Harremoes, P. (2002), *The Precautionary Principle in the 20th Century: Late Lessons from Early Warnings*.
Harsanyi, J. C. (1975), 'Can the Maximin Principe Serve as a Basis for Morality? A Critique of John Rawls's Theory', *American Political Science Review*, **69**: 594.
Harvard Health Publishing: Harvard Medical School (2020), '*Preventing the Spread of the Coronavirus'*, available at https://www.health.harvard.edu/diseases-and-conditions/preventing-the-spread-of-the-coronavirus
Kay, J. and King, M. (2020), *Radical Uncertainty*, New York: W. W. Norton & Company, Inc. 35–49, 106–130.
Keynes J. M. (1937), *The General Theory of Unemployment*.
Knight, F. H. (1933), *Risk, Uncertainty, and Profit*.
Levitt, S. (2016), Steven Levitt, 'Heads or Tails: The Impact of a Coin Toss on Major Life Decisions and Subsequent Happiness', available at https://www.nber.org/papers/w22487
Livermore, M. and R. Revesz (2020), *Reviving Rationality*, New York: Oxford University Press.
Margolis, H. (1997), *Dealing with Risk*, Chicago: University of Chicago Press.
Marlowe, C. (1994), *Doctor Faustus*. New York: Dover Publications.
Nordhaus, W. (2015), *The Climate Casino*, New Haven: Yale University Press.
Rawls, J. (1971), *A Theory of Justice*, Cambridge: Belknap Press 155.
Rawls, J. (1999), *A Theory of Justice*, Cambridge: Belknap Press 132–39.
Rupar, A. (2020), 'How Trump managed to bankrupt casinos', *Twitter*, online at https://twitter.com/atrupar/status/1262482612737712130?s=20
Solender, A. (2020), 'Trump Says He's Taking Hydroxychloroquine Despite an NIH Advisory Against It', *Forbes*, available at https://www.forbes.com/sites/andrewsolender/2020/05/18/trump-says-hes-taking-hydroxychloroquine-despite-an-nih-advisory-against-it/#1d05f9f41cd7
Sunstein, C. R. (2014), 'The Limits of Quantification', *California Law Review*, **102**:1369.
Taleb, N. N. *et al*. (2014), 'The Precautionary Principle (with Application to the Genetic Modification of Organisms)', available at http://www.fooledbyrandomness.com/pp2.pdf
United States Food and Drug Administration (2020), 'FDA Cautions Against Use of Hydroxychloroquine or Chloroquine for COVID-19 Outside of the Hospital Setting or a Clinical Trial Due to Risk of Heart Rhythm Problems'. https://www.fda.gov/drugs/drug-safety-and-availability/fda-cautions-against-use-hydroxychloroquine-or-chloroquine-covid-19-outside-hospital-setting-or
United States Office of Management and Budget (2003), 'Circular A-4'. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf [https://perma.cc/NCK2-VR9G].
United States Office of Management and Budget (2012), 'Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities',

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26. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/inforeg/inforeg/2012_cb/2012_cost_benefit_report.pdf [https://perma.cc/B3U2-MR4L]

United States Office of Management and Budget (2013), 'Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities', 27. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/inforeg/inforeg/2013_cb/2013_cost_benefit_report-updated.pdf [https://perma.cc/27AJ-EJ9C]

United States Office of Management and Budget (2014), 'Report to Congress on the Benefits and Costs of Federal Regulations and Unfunded Mandates on State, Local, and Tribal Entities', 25. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/inforeg/inforeg/2014_cb/2014-cost-benefit-report.pdf [https://perma.cc/H5US-8UJS]

United States Office of Management and Budget (2015), 'Report to Congress on the Benefits and Costs of Federal Regulations and Agency Compliance with the Unfunded Mandates Reform Act', 25. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/inforeg/inforeg/2015_cb/2015-cost-benefit-report.pdf [https://perma.cc/J2RA-687U].

Zoellner, D. (2020), 'What Have You Got to Lose?' Trump Tells Coronavirus Patients to 'Try' Unproven Drug', *Independent*, available at https://www.independent.co.uk/news/world/americas/trump-coronavirus-hydroxychloroquine-anti-malaria-drug-latest-a9447796.html

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