University of Illinois College of Law
Law and Economics Working Papers

Year 2007 *Paper* 72

Bias Arbitrage

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Abstract

The production of law – including the choice of a law's subject matter, the timing of its enactment and the manner in which it is publicized and perceived by the public – is significantly driven by an extra-legal market in which politicians and private parties compete over the opportunity to engage in bias arbitrage. Bias arbitrage is the extraction of private benefits through actions that identify and mitigate discrepancies between objective risks and the public's perception of the same risks.

Politicians arbitrage these discrepancies by enacting laws that address the misperceived risk and contain a "placebo effect" – a counter-bias that attempts to offset the pre-existing misperception. If successful, politicians are able to take credit for the change in perceived risk, while social welfare is enhanced by the elimination of deadweight loss caused by risk misperception.

However, politicians must compete with private parties such as insurers, experts and the media, who can engage in bias arbitrage using extra-legal means. This article analyzes methods in which parties engage in bias arbitrage and the effect of interaction between potential bias arbitrageurs on the production of law.

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Table of Contents:

A significant portion of legal scholarship examines the manner in which law[1] directs behavior. Law is usually seen as directing behavior by manipulating incentives – either by imposing sanctions to dissuade from certain behavior or by offering benefits to encourage a certain behavior.

Laws certainly affect individuals' incentives, and through them they direct individuals' behavior. But laws also have an equally important impact on individuals' behavior through a different mechanism – the manipulation of the individuals' perceptions, particularly perceptions regarding the probability and magnitude of risks.[2] As a result of this effect on perceptions, a law may increase social welfare without having a "real" effect on incentives[3] simply by causing individuals to think that it does have an effect.[4] Because of the superficial

[1] Bias arbitrage uses as its vehicle not only legislated acts, but all types of legal actions – legislative, judicial, administrative and executive. For the sake of simplicity, I use the term "**law**" throughout the article to refer to any type of legal action. The implementation of the legal action will be called "**enacting the law**", and the implementer will be called a "**politician**."

[2] A "**risk**", as the term is used in this article, relates not only to the probability of an event but also to its magnitude. In other words, the disutility to an individual from risk (as the term is used here) may lie not only in the uncertainty itself, but also in the occurrence of the underlying event that is subject to uncertainty. The broad definition of risk is important because, as I will discuss below, bias arbitrage techniques that affect the perceived magnitude of the underlying event are alternatives to (and compete with) bias arbitrage techniques that affect the perceived probability of the event. Both types of techniques correct gaps between perceived and actual risk.

[3] I call a law's effects on incentives "real" because they affect the objective payoffs of individuals, as opposed to effects on perceptions which affect subjective assessments. Both effects cause a "real" (*i.e.*, objective) change in behavior and a "real" impact on social welfare.

[4] This effect (a "placebo effect") should not be confused with a phenomenon known as "psychic utility." Psychic utility is a benefit (or harm) that individuals reap from their satisfaction (or dissatisfaction) with the existence of a law. *See*, *e.g.*, Donald J. Boudreaux, Roger E. Meiners & Todd J. Zywicki, *Talk is Cheap: The Existence Value Fallacy*, 29 ENVTL. L. 765, 768 (1999). Psychic utility is entirely subjective. It is caused by manipulation of subjective perception and has purely subjective effects. Conversely, the placebo effect discussed in this paper, though it is caused by manipulation of subjective perception, has objective effects (an increase or decrease in activity related to the risk that is addressed by the law). To illustrate the difference, a person may derive psychic disutility knowing that a racist law repugnant to her exists, even if it is not effective or even enforced. For example, a colonial Massachusetts law enacted in 1675 prohibits Native Americans from entering the city of Boston. See *Menino Seeks to*

similarity to the placebo effect in medicine,[5] I call this effect of laws on behavior (and on social welfare) the "placebo effect" of the law.[6]

Placebo effects are created when laws are presented in a way that, due to cognitive biases, cause many individuals to either over-estimate or under-estimate the impact of the law on a risk that the law addresses. Some such biases can be created inadvertently, but often they are created deliberately by politicians who reap personal benefits from the law's manipulation of perceptions. This behavior is a form of "bias arbitrage": identifying a risk that is either over- or under-estimated by a segment of the public, and reaping a private profit from an action that mitigates the discrepancy between the actual and the perceived risk.

Enacting laws with placebo effects is only one way to engage in bias arbitrage. Politicians compete with others, such as the media and insurers, who engage in bias arbitrage using methods that do not involve enacting laws. Politicians' behavior in enacting laws that have placebo effects (as many laws do) is better understood in the competitive context in which it operates alongside private players, all of whom struggle to extract private gains from eliminating biases.

In part 1 of this article I survey the forces that create discrepancies between actual and perceived risks, which create the opportunity for bias arbitrage. In part 2, I explain how politicians use laws to engage in bias arbitrage. Part 3 will examine how non-legal actors engage in bias arbitrage. In conclusion, part 4 will discuss the market that forms from competition (and cooperation) between public and private bias arbitrageurs.

Repeal 1675 Law Against Native Americans – Symbolic Act Seen as Step Forward, THE BOSTON GLOBE, Dec. 25, 2004, P. B4. The same law does not create a placebo effect if the person knows that the law is unconstitutional and void because she would know that the law would have no objective effect. Conversely, a law cannot create psychic utility to an individual who does not know about the law, yet the same law can cause a placebo effect, or more precisely, as I will explain in part 2(c), an anti-placebo effect.

[5] This is not to say that the process through which medical placebos affect health is similar to the process in which legal placebos affect social welfare. Medical placebos seem to involve physiological processes. Legal placebos simply utilize cognitive biases to manipulate behavior, as I will explain below.

[6] Amitai Aviram, *The Placebo Effect of Law: Law's Role in Manipulating Expectations*, 75 GEO. WASH. L. REV. 54 (2006).

1. Cognitive Biases Create Fertile Ground for Bias Arbitrage

After Hurricane Katrina battered the Gulf Coast in late August 2005 and subsequent levee failures resulted in the flooding of low lying areas in New Orleans, reports from the city and its surroundings portrayed mayhem, best described as surreal. Police officers in Westwego, Louisiana were told that 400 to 500 armed looters were advancing on their town.[7] In the city's Convention Center, SWAT teams were deployed to capture groups of men who were said to have taken over some of the halls.[8] Media reports included "roving bands of armed gang members attacking the helpless, and dozens of bodies being shoved into a freezer at the Convention Center".[9] New Orleans' police chief appeared on television and reported that "little babies [were] getting raped" at the Superdome.[10]

The reports above, like numerous others, were unfounded. In all of Louisiana, only four of the 841 recorded hurricane-related deaths were due to gunshot wounds.[11] Hurricane Katrina caused a tremendous amount of suffering in New Orleans, but the tidal wave of violent crime that was reported in its wake was grossly exaggerated.

Severe misperceptions of risk are not limited to traumatic situations. They are an inevitable result of the human mind's use of heuristics – mental shortcuts that manifest themselves as "gut feelings". Heuristics facilitate immediate analysis of complex information, but like any analytical mechanism, heuristics sometimes fail. Failures that occur in predictable patterns are called cognitive biases.

Through observation and experimentation, scholars have identified a number of cognitive biases. For example, a cognitive bias known as the illusion of control is a pattern of over-optimism regarding events whose outcome depends partially on an individual's skill and partially on other circumstances.[12] As a result of such a bias an individual may under-estimate the risk to herself from a

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[7] Jim Dwyer and Christopher Drew, *Fear Exceeded Crime's Reality in New Orleans*, NEW YORK TIMES, Sept. 29, 2005, page A1.
[8] *Id*.
[9] Susannah Rosenblatt and James Rainey, *Katrina Rumors*, LOS ANGELES TIMES, Sept. 27, 2005.
[10] *Id*.
[11] *Id*.
[12] *See, e.g.*, Ellen J. Langer, *The Illusion of Control*, 32 J. PERSONALITY & SOC. PSYCHOL. 311 (1975).

car accident because of optimism about her driving skills, even though a car accident may occur despite her best efforts due to another's poor driving.

The availability bias is another cognitive pattern, by which people "assess the frequency of a class or the probability of an event by the ease with which instances or occurrence can be brought to mind."[13] In other words, if we recently encountered, read about, or heard from others of a certain event, we are likely to over-estimate the frequency or probability of that event. The availability bias can be exacerbated by another bias: social amplification, which is the tendency of one's perception of a risk to be influenced by others' perceptions.[14] As a result of these two biases, a highly-publicized event such as the hijacking of a plane may cause over-estimation of the probability of hijacking. Such events receive significant media coverage, which brings to the mind of each individual an instance of a hijacking (an event that, but for the media, they would probably not be aware of). The "availability" of such an event triggers the availability bias and is likely to cause an increase in the risk perceived by each individual. In addition, because the same media coverage is observed by many individuals, the increase in perceived risk would be exacerbated through social amplification, as one person's heightened concern about airplane hijacking would cause an increase in the same concern by others.

The study of cognitive biases is still in its infancy. Cognitive biases are constantly being identified and refined, as more subtle patterns emerge from experiments. At this time a wide range of observed misperceptions is unexplained, or is explained *ex post* as a "just so" story that is not useful for *ex ante* predictions. Nonetheless, our understanding of cognitive biases is improving. This article does not make a contribution to the understanding of cognitive biases, but rather illuminates a process – bias arbitrage – that becomes more feasible (and therefore, presumably, more frequently employed) as cognitive biases are better understood.

How does the study of cognitive biases affect bias arbitrage? In addition to explaining why actual and perceived risks diverge, the research on cognitive biases facilitates bias arbitrage in two ways: first, as our knowledge of biases improves it is easier to predict when a certain group misperceives a risk. It also provides a more accurate estimate of the magnitude of the misperception. This allows potential arbitrageurs to identify the risk that they want to arbitrage.

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[13] Amos Tversky & Daniel Kahneman, *Judgement Under Uncertainty: Heuristics and Biases*, 185 SCI. 1124, 1127 (1974).

[14] Cass R. Sunstein, *The Laws of Fear*, 115 HARV. L. REV. 1119, 1130 (2002).

Second, improved understanding of biases can be used (or abused) to take actions that bias people more effectively. As I will explain below, politicians engage in bias arbitrage by enacting laws that counter-bias the public. Advances in the study of biases may make such counter-biasing more effective and, therefore, increase politicians' desire to engaging in bias arbitrage.

The discrepancies between a perceived risk and the actual risk caused by cognitive biases create opportunities for extracting private benefits through arbitrage. In the next section I will describe how government uses law as a vehicle to engage in bias arbitrage. Then, in the following section, I will describe how private parties compete with government through their own, extra-legal means of bias arbitrage.

2. Government Engages in Bias Arbitrage

(a) Law as a Byproduct of Bias Arbitrage

The enactment, presentation and enforcement of law affect individuals' perceptions, including their perception of risks. Laws signal to individuals the values of their government and society, knowledge of which may modify the individuals' own values.[15] In addition, laws affect individuals' expectations about government's behavior. For example, a law that criminalizes speeding creates an expectation that government will attempt to detect and punish speeders, while a law that organizes an airport security agency creates an expectation of lower likelihood that airplanes will be hijacked. Note that the law modifies expectations not only for those parties to whom the law applies (*e.g.*, drivers in the case of the speeding law), but also for parties who are affected by the behavior of those to whom the law applies (*e.g.*, airline passengers, who are affected by the risk of hijacking caused by terrorists which the airport security law aims to deter).

In a world without information asymmetries or cognitive biases, the change caused by a law to the perception of a risk it addresses would be identical to the change in the objective risk. In other words, if a law reduces a given risk by 10%, it would cause a reduction of 10% in the perceived risk. However, both information asymmetries and cognitive biases frequently cause misperceptions of the effects of a law.

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[15] See: Matthew D. Adler, *Expressive Theories of Law: A Skeptical Overview*, 148 U. PA. L. REV. 1363 (2000); Elizabeth S. Anderson & Richard H. Pildes, *Expressive Theories of Law: A General Restatement*, 148 U. PA. L. REV. 1503 (2000).

Some misperceptions are coincidental, occurring for the same large variety of reasons that cause the public to misperceive risks (as discussed in part 1, above). But other misperceptions are the result of manipulation of cognitive biases by the politicians who sponsor the laws.[16] The politician receives credit (and votes) by creating the perception that the law she sponsored significantly addressed a risk that concerned her constituents. A politician who is better at manipulating public perceptions to over-estimate the benefits of the laws she sponsors will be more successful than her rivals, all things being equal. Such manipulations take many forms, including but not limited to, the way a law is named,[17] the way it is presented to the public (*e.g.*, facilitating a tax cut by sending checks to taxpayers),[18] or simply by the use of the media to create social amplification of the politician's message.

For example, suppose that the probability of hijacking an airplane is 0.001 (1-in-100,000), but following the tragic events of September 11, 2001, the public misperceives the risk to be 1%. At a 1% probability of hijacking, few people fly. Sensing a risk misperception that creates an opportunity for bias arbitrage, a politician sponsors a law to institute airport security. Suppose that the implementation of this law has the effect of reducing the likelihood of hijacking by 50% (to 1-in-200,000). Suppose also that the politician is modest and "undersells" the law, so that the public perceives the law to have no effect. The result is the public still believing that the probability of hijacking is 1% and a

[16] Biases may be in some respects more attractive for a politician to exploit than information asymmetries because it may be harder to prove that one presented information in a manner that induced a bias than to prove that one provided false information or failed to provide information. Such difficulties in detection hinder the ability to prohibit or punish intentional exploitation of biases, compared to the exploitation of information asymmetries.

[17] In an example that does not seem to involve bias arbitrage, in November 2003, President Bush signed into law an act that changed the name of a swamp from "Congaree Swamp National Monument" to "Congaree National Park." Within four months of the name change, and apparently due to it, the number of monthly visitors more than doubled. *See* Andrew Jacobs, *Park Is Still a Swamp, but Please Don't Tell the Tourists*, NEW YORK TIMES (April 5, 2004).

[18] The Economic Growth and Tax Relief Reconciliation Act of 2001, signed into law on June 7, 2001, entitled taxpayers to a rebate of between $300-600. To make the tax cut even more vivid, the Department of Treasury was instructed to mail a check for this rebate to each taxpayer. See U.S. Department of Treasury Press Release, *The Check is in the Mail*, July 20, 2001, http://www.treas.gov/press/releases/po495.htm. Such vivid, tangible presentation may have made the tax cut's effect on individual taxpayers' finances seem greater than a discussion of aggregate, non-tangible figures.

continued pattern of few people flying, thus significantly reducing the objective benefits of the law. In such a case, the politician herself receives no credit for her work.

If the politician were not modest, but merely honest, and persuaded the public that the law would reduce hijacking by 50% (as it indeed does), then the public would perceive the probability as 0.5%, still a lethal risk that would deter most air travelers. The politician would receive some credit for her efforts, but because most travelers are still deterred from flying, the credit due the politician would be as limited as the act's effect in increasing air travel.

Suppose, instead, that the politician persuasively overstates the effects of the law, convincing her constituents that the law she sponsored reduces the probability of hijacking by 99%. To a public that expects (prior to the law's implementation) a hijacking probability of 1%, the law's effect would be to reduce the perceived probability to 1-in-10,000. While the public would still over-estimate the likelihood of hijacking by a full order of magnitude, this reduced probability would likely result in a significant increase in air travel. Individuals who are skeptical of the politician's claims (and still believe that the probability is 1%) may refrain from flying, but as they observe others fly, they would notice that far less than 1% of airplanes are hijacked, supporting the politician's claim of a probability of 1-in-10,000.[19] Thus, even some of the skeptics are likely to eventually credit the law (and the politician who sponsored the law) for the "reduced" risk of hijacking. Beyond the private benefit to the politician, persuasively overstating the law's effects improved social welfare in this hypothetical because the perceived probability of hijacking now more closely approximates the actual probability, resulting in less excessive avoidance of air travel.

This example points out why the opportunity for bias arbitrage affects a politician's choice of what risk to address. Politicians may gain electoral benefit from promoting a law addressing a correctly perceived risk with a solution that objectively reduces risk. However, there would be some uncertainty as to whether the solution would work, and even if it did, objective solutions often reduce an objective risk more modestly than cognitive biases inflate perceived risks. In our airplane hijacking hypothetical, the objective solution reduced the probability of hijacking by 50%, so if (counter to the hypothetical's assumptions) the public correctly estimated the risk of hijacking and the law's effects on that risk, the politician would be credited with reducing the risk to 50% of its

[19] The actual proportion of hijacked flights would be, per our assumptions, 1-in-200,000.

previous level. Instead, in our hypothetical, the politician is credited with reducing the risk 50 times more, to 1% of its previous level.

Addressing a risk that is correctly perceived would also cause "overselling" the law to have adverse results, both to the politician and to social welfare. If, in our hijacking hypothetical, the actual probability of hijacking was identical to the probability perceived by the public (1%), and the politician successfully persuaded her constituents that the law reduced the probability by 99% (to 1-in-10,000), while it in fact reduced the objective probability by only 50% (to 1-in-200), then the public would fly excessively, unwittingly over-exposing itself to the risk of hijacking. In addition, over time the public will observe that airplanes are hijacked more frequently than 1-in-10,000. When notice of this spreads, the politician will face electoral harm and her credibility will suffer, reducing her ability to receive credit for future laws. Therefore, laws that address risks that are over-estimated are likely to offer higher expected payoffs to the politician and pose less risk from "overselling" than laws that address correctly estimated risks. A rational politician may choose to address an over-estimated risk that has less effective objective solutions over a correctly estimated risk (or an under-estimated risk) that has more effective objective solutions.

One does not need to be cynical about politicians' motives to expect them to invoke legal placebo effects by choosing to address risks that are over-estimated and then overselling the laws that they sponsor. A politician who has the public's interests in mind may recognize that she must be responsive to the public's concerns (ill-founded as such concerns may be) or she would not remain in office to implement policies that she believes necessary.

Returning again to the hijacking hypothetical, assume that the public misperceived the 1-in-100,000 probability of hijacking to be 1%. Assume also that no action can immediately prevent future hijackings, but that an effective course of action would take three years to implement. During these three years, the public would continue to believe that the risk of hijacking is much higher than it objectively is, and refrain from flying. For many people and businesses, a three year period without air transportation would be highly disruptive. A politician who bluntly claims that her solution would take three years to implement is likely to lose an election to a rival who promises an alternative solution that would immediately reduce the probability of hijacking to one-in-100,000. Because this is the objective probability of the risk, a law dealing with hijacking need not have any objective effects to "succeed" (though if the law also objectively reduced the risk of hijacking – all the better). The well-intentioned politician may use the time bought by this law to implement the three-year

solution, which would reduce the objective risk of hijacking to the lowest feasible level.[20]

Just as well-meaning politicians may intentionally enact laws with placebo effects, so might well-meaning politicians unintentionally create placebo effects by overselling the laws they sponsor. Politicians, like any other person, are susceptible to the illusion of control, which causes over-optimism regarding events whose outcome depends partially on the individual's skill and partially on other circumstances. Having applied her skill in identifying and crafting a solution to mitigate a risk, the politician is likely to exhibit over-optimism about the solution's effectiveness.[21] In addition, facing the task of persuading the public of the law's expected effects, even the honest politician may fall prey to a self-serving bias and genuinely over-estimate the law's positive effects.[22]

Thus, politicians engage in bias arbitrage, sometimes intentionally, for either self-serving or altruistic purposes, and sometime unwittingly, due to biased over-estimation of the effects of a law they devise and sponsor. To the politician engaging in bias arbitrage the law is a vehicle through which placebo effects are administered (just as a sugar pill is the vehicle through which a medical placebo is administered).

Bias arbitrage is a form of counter-biasing, not de-biasing.[23] In other words, it does not address and eliminate the bias that created the risk misperception. Rather, it creates a new bias that is aimed to offset the original bias. Because the causes of the original bias are not addressed and because counter-biasing may overcorrect or, conversely, fail to fully offset the original bias, from a social

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[20] Naturally, the private gains to the politician from implementing the three-year plan would be low, because the public would no longer be as concerned about hijacking if they correctly perceive the probability to be 1-in-100,000. The reduced pressure from the public and resulting reduction in implementation of objective solutions to the risk is not necessarily lamentable. If the public is over-estimating the risk, then the pressure it puts on the politicians is excessive.

[21] *See*, *e.g.*, Avishalom Tor and Amitai Aviram, *Overcoming Impediments to Information Sharing*, 55 ALA. L. REV. 231, 254-257 (2004).

[22] One form of self-serving bias affects predictions (*i.e.*, an individual believes that a desired outcome is more likely to occur than an undesirable outcome. *See, e.g.*, Linda Babcock et al., *Biased Judgments of Fairness in Bargaining*, 85 AM. ECON. REV. 1337, 1341 (1995)) (finding that self-serving bias affected predictions of the size of a hypothetical judge's award).

[23] On the use of law to de-bias *see* Christine Jolls and Cass Sunstein, *Debiasing through Law*, 35 J. LEG. STUD. 199 (2006).

welfare perspective bias arbitrage is a second best solution. In ideal conditions, de-biasing would be preferable. However, de-biasing is often costly, impractical, and less likely to be employed because it frequently lacks the private incentives that bias arbitrage offers to those that engage in it.

Law serves as a means to bias arbitrage, and so does the risk that the law addresses. A politician must select on which issue (or, differently put, which risk) to focus. Several considerations may influence her decision, but one of the most powerful considerations – largely ignored by the literature – would be the risk's potential for arbitrage (*i.e.*, the existence of a perception gap – a discrepancy between the actual and perceived risk). Indeed, if they do not readily find a suitable risk, politicians may venture to generate a perception gap in a correctly perceived risk in order to create opportunity for bias arbitrage.[24] By identifying an over-estimated risk and conspicuously sponsoring legislation or law enforcement that addresses the risk, the politician can claim credit for more than the law's objective effect on the risk, without ever losing credibility for that claim. Because it does not erode a politician's credibility, bias arbitrage is unlike other forms of politicians' "puffery".[25]

(b) Standing Above the Biases?

The bias arbitrageur identifies risk misperceptions caused by biases. But why isn't she be blinded by those same biases?

Bias arbitrage is possible despite an arbitrageur's susceptibility to biases. Individuals vary in their susceptibility to cognitive biases (or, put differently, in their ability to debias themselves).[26] Bias arbitrage is typically a more certain and less costly way for a politician to create a perception of effectiveness than addressing a correctly perceived risk. Politicians who are able to effectively

[24] I discuss this in detail *infra*, Part 4.B.

[25] If a politician "oversold" the effectiveness of a law addressing a correctly perceived risk, people would eventually notice that the risk is greater than the politician claimed and the politician's credibility would ultimately suffer.

[26] Jeffrey J. Rachlinski, *Cognitive Errors, Individual Differences, and Paternalism*, 73 U. CHI. L. REV. 207 (2006) (pointing to evidence of variance in susceptibility to cognitive biases); Chris Guthrie & Jeffrey J. Rachlinski, *Insurers, Illusions of Judgment and Litigation*, 59 VANDERBILT L. REV. (forthcoming 2006) (suggesting that insurance claim adjusters are less susceptible to some cognitive biases than the general population). For the purposes of this Article, I use "resistance to/susceptibility to cognitive bias" and "ability to self-debias" interchangeably.

engage in bias arbitrage would be, *ceteris paribus*, more successful than their rivals and, through competition, would more likely survive in politics. The average surviving politician is likely to have better than average ability to debias herself in perceiving risks in the areas in which she focuses her political activity.

The politician does not have to be less susceptible to all biases in order to be an effective bias arbitrageur. Politicians specialize, and become known for activity in certain areas (*e.g.*, expertise in defense, foreign relations, government ethics/campaign finance, economic policy, etc.). If a politician has a superior ability to debias her risk perception in a certain area (*e.g.*, correctly perceive the risk of war) she can engage in bias arbitrage in that area, even if she is prone to biases in other areas (*e.g.*, prone to biases causing her to over-estimate the prevalence and severity of corporate fraud), which would preclude her from engaging in bias arbitrage in these other areas. A politician's good judgment in her area of specialization includes not only her knowledge, but also her resistance to the biases that most affect that area. The latter affects her ability to engage in bias arbitrage.

The politician need not know the areas in which she has better resistance to biases. Experience will teach her in which areas she misjudged risk, and competition between politicians would force her to reposition herself as active in another area of political debate, or lose prominence to rivals who have superior debiasing abilities regarding these risks.

Even bias-resistant politicians are not wholly unbiased. Yet despite facing some probability of misidentifying a perception gap (and therefore launching a failed attempt to bias arbitrage), they are likely to attempt arbitrage. Politicians are entrepreneurs, and advance their careers by identifying issues that the public – or interest groups within it – want addressed and remedying them. Like all entrepreneurs, they face a risk of failure, either because they identified the wrong issue, or because they advanced the wrong remedy. The risk of failure in itself does not determine whether bias arbitrage takes place. Rather, it is the relative risk of failure from engaging in bias arbitrage compared to the risk of failure from pursuing an issue that seems more correctly perceived by the public. As long as bias arbitrage offers politicians the possibility of receiving "free credit" for a reduction in an over-estimated risk, politicians are likely to attempt it, despite the risk of failure caused by their own susceptibility to biases. Through an evolutionary process of competition, the less bias-susceptible of these entrepreneurs are likely to prevail.

(c) Social Welfare Effects of Laws with Placebo Effects

Bias arbitrage creates private benefits to the arbitrageur, but also impacts the public's bias gap (the discrepancy between the actual and perceived risk) and thus affects social welfare. I now turn to discuss when placebo effects are laudable for enhancing social welfare and when they are lamentable because they reduce social welfare.

Individuals respond to risk in two ways: avoiding the risk, or, if avoidance is not feasible, expending resources to confront the risk. Recall the example of the excessive perception of crime in New Orleans following Hurricane Katrina. Responding to a perceived dramatic increase in crime, some police officers in New Orleans and its surroundings resigned to avoid exposure to the risk. Meanwhile, some of New Orleans' residents brandished guns and patrolled their property, thereby confronting the risk.

Both activity avoidance and confrontation are costly, though either may be efficient if it is the least costly method for avoiding more costly harm from the risk. Absent information asymmetry and cognitive biases, an individual's decision to avoid or confront a risk should be efficient from the perspective of social welfare.[27] However, as we have seen in the New Orleans example, cognitive biases cause misperceptions of risk. When perceived risk exceeds actual risk, individuals excessively avoid or confront the risk, imposing unnecessary costs on themselves and others.[28] When perceived risk is lower than actual risk, individuals insufficiently avoid or confront the risk, imposing on themselves or others the cost of a higher probability of harm.

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[27] An implicit assumption in this statement is that that any externalities of the decision whether to avoid/confront the risk are internalized. For example, the decision of a police officer to resign has externalities on the welfare of the population that lives in the area in which the officer serves. This externality existed before a crisis formed and was internalized through payment of a salary to the officer. Changes in the perceived risk may destabilize internalization mechanisms (*e.g.*, a police officer's salary would no longer compensate for the officer's heightened perceived risk), though internalization mechanisms can and often are designed with this eventuality in mind (*e.g.*, severe sanctions for soldiers refusing orders during battle; hazardous duty bonuses, etc.).

[28] Risk confrontation may internalize costs on others just as risk avoidance does. For example, heightened perception of risk of crime in New Orleans may cause a property owner who is patrolling his property to misperceive another's actions as hostile and attack that person. As with externalities of risk avoidance, there are internalization mechanisms (*e.g.*, criminal law, tort law), and as with risk avoidance, these mechanisms sometimes become destabilized due to changes in perceived risk.

Looking to the airplane hijacking hypothetical, if the objective probability of a hijacking is 1-in-100,000, but the public perceives the probability as 1%, then most individuals would avoid flying, either staying put and losing the benefit of reaching their intended destination, or substituting another method of transportation and bearing the higher objective risk of accidents.[29] On the other hand, if the objective probability of hijacking were 1%, but cognitive biases caused the population to perceive the probability as 1-in-100,000, then too many people would fly and be hijacked.

The loss of social welfare, from excessive or insufficient risk avoidance or confrontation, increases as the gap between objective and perceived risk grows. Placebo effects may mitigate, or exacerbate, this gap. A placebo effect is a product of cognitive bias and information asymmetry, which causes an individual to perceive the effect of a law on a risk differently from the actual effect of the law. The law, therefore, serves as a vehicle that introduces change to the objective risk, the perceived risk, or both, affecting the gap between objective and perceived risk.

Over time, people can de-bias themselves without the aid of a placebo effect as they track the occurrence of the risk and adjust their perceptions to what they observe. However, placebo effects speed the process and, therefore, reduce the amount of time during which the misperception of a risk causes a reduction in social welfare.

The direction of the placebo effect, relative to the direction of the bias, determines whether the placebo effect has a positive or negative impact on social welfare. If the placebo effect applies in the same direction as the risk misperception that existed prior to enacting the law, then the placebo effect exacerbates the gap between perceived and objective risk and would reduce social welfare. For example, suppose that the public under-estimates the risk posed by traffic accidents (say, the objective probability is 1%, but the perceived probability is 0.8%), and government enacts a law that mandates implementation of safety features in cars. Suppose also that the law objectively reduces the probability of car accidents by 10% (to 0.9%), but the politician who sponsors

[29] Automobile transportation is generally considered riskier than air transportation. *See, e.g.*, Garrick Blalock, Vrinda Kadiyali and Daniel H. Simon, *The Impact of 9/11 on Road Fatalities: The Other Lives Lost to Terrorism* (working paper, Feb. 10, 2005), at: http://ssrn.com/abstract=677549 (claiming that at least 1200 additional driving deaths are attributable to the September 11th attacks, by causing individuals to switch their travel plans from flying to driving).

the law "oversells" it and causes the public to expect the probability to drop by 50%, making perceived probability 0.4%. Despite the reduction in the objective probability, the gap between objective and perceived probabilities has widened from 0.2% to 0.5%. As a result, safety precautions in driving (and avoiding driving), which were already insufficient prior to the law, will be even less sufficient after enacting the law. The reduction of 0.1% in the probability of car accidents will have a positive effect on social welfare, but the placebo effect – that is the reduction in safety precautions that results from more than doubling the gap between the objective and perceived probabilities of car accidents, will reduce social welfare.[30]

On the other hand, if the placebo effect applies in the opposite direction from the risk misperception that existed prior to enacting the law, then the placebo effect mitigates the gap between perceived and objective risk and would increase social welfare.[31] Returning to our example of airplane hijacking, assume that the public over-estimates the risk posed from hijacking, the probability of which is objectively 1-in-100,000, but is perceived to be 1%. Assume also that a politician sponsors a law that reduces the objective probability by 50% but is perceived by the public to reduce the probability by 99%.[32] After enacting the

[30] This effect may seem like a form of moral hazard, but it is not. I explain in detail the difference between this effect (called negative placebo effect) and moral hazard in Aviram, supra note 6, at part V.2. Because this article focuses on bias arbitrage rather than legal placebo effects, I will not address this issue here.

[31] There is an exception to this statement, when the misperception caused by the law 'overshoots' the prior misperception. For example, suppose that prior to enacting a law, the public only moderately misperceived the risk of hijacking (*e.g.*, perceived it to be 1-in-75,000 when it was actually 1-in-100,000). Suppose also that the law reduced the objective probability by 50%, but the public was persuaded that the risk was reduced by 99% (so the objective probability is 1-in-200,000, and the perceived probability is 1-in-7,500,000). Prior to enacting the law, there was an over-estimation gap of approximately 0.00033%; now there is an under-estimation gap of 0.00048%. Thus, the public is more over-optimistic about the risk after the law, than it was over-pessimistic about the risk prior to the law. If risk avoidance and confrontation expenditures are symmetrical for over-optimism and over-pessimism, then we expect a greater cost from insufficient avoidance/confrontation after enacting the law than the cost from excessive avoidance/confrontation prior to enacting the law. This pattern of 'overshooting' is likely to be relatively rare; however, because (as explained in part 2(a)), politicians have a strong incentive to sponsor laws addressing risks that are grossly misperceived, and overshooting is unlikely to happen when the original misperception is severe.

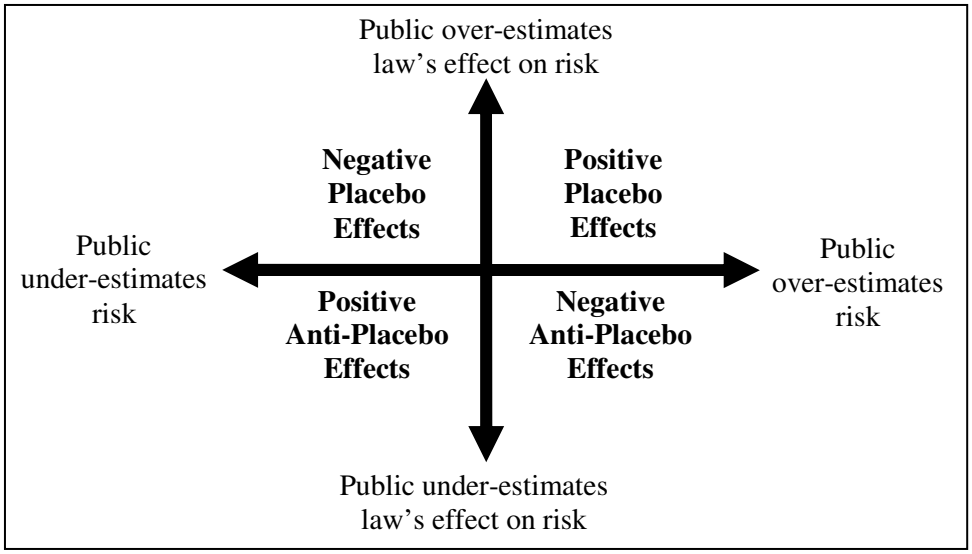
[32] To be clear, "overselling" a law means that in absolute terms, the law reduces the perceived risk probability more than the objective risk probability. Thus, a law may be

law, the objective probability is 0.0005%, while the perceived probability is 0.01%. Prior to the law, the gap had been 0.999%; after enacting the law, the gap has narrowed to 0.0095%. As a result, avoidance of flying, which had been very excessive, is less excessive now. This utility accumulates with the benefits of reducing the objective probability of hijacking. Both increase social welfare.

As these examples demonstrate, there is more than one type of placebo effect. In fact, there are four types, divided by two criteria: (i) whether prior to enacting the law, the public over- or under-estimated the risk later addressed by the law; and (ii) whether the public over- or under-estimated the effect of the law in reducing the risk. The four types of placebo effects are presented in the following figure:[33]

"oversold" even if (unlike in this example) the claimed percentage of risk reduction (in this example, 99%) is smaller than the actual percent of risk reduction (in this example, 50%), as long as in absolute terms the claimed risk reduction is greater than the actual risk reduction. Applied to the above example, if the law reduced the objective probability by 50% (to 0.0005%, a reduction of 0.0005%), but the politician only claimed the law would reduce the risk by 40% (to 0.6%, a reduction of 0.4%), she would still oversell the law, since in absolute terms the law reduced the perceived risk by 0.4% and the actual risk by only 0.0005%). When a risk is extremely over-estimated, the change in the objective risk may barely affect the change in the bias gap because even small changes in the (much larger) perceived risk will be greater in magnitude.

[33] This figure is taken from Aviram, *supra* note 6.



The hijacking hypothetical falls into the category of "positive placebo effects."[34] The public over-estimated the risk of hijacking prior to the law's enactment, and over-estimated the effect of the law in reducing the same risk. As explained above, the misperception caused by the law runs counter to the misperception that existed prior to the law. As a result, the gap between objective and perceived risk was reduced, and social welfare increased.

The car accident hypothetical falls into the category of "negative placebo effects". The public under-estimated the risk of car accidents prior to the law's enactment, and over-estimated the effect of the law in reducing the same risk. As explained above, the misperception caused by the law was in the same direction as the misperception that existed prior to the law. Therefore the law exacerbated the misperception, reducing social welfare. One expects negative placebo effects to be less common then their positive counterparts because politicians have less to gain from addressing risks that are under-estimated. The over-optimistic public would be less concerned with the risk, making it less attractive for the politician to address. If the risk is addressed by a law and the politician manages to "oversell" the law's effects, it will widen the gap between the law's actual

[34] The use of "positive" and "negative" in classifying placebo effects refers to their impact on social welfare.

effects and its perceived effects. Over time, this gap will likely be noticed, and the politician's credibility would suffer.[35]

The other two effects are a result of a misperception that under-estimates the law's effect in reducing the risk it addresses. They are called anti-placebo effects because they are akin to a perverse experiment in which a patient is told that she is taking poison rather than medicine, though objectively the pill she takes is benevolent or benign. If normal placebo experiments demonstrate a positive effect on the patient's health merely by her thinking that she is taking medicine, one would expect the opposite, negative effect on the patient's health if she thought she is taking a harmful substance. Of course, this is why such experiments are not done in the realm of medicine.

It may not be obvious at first blush that anti-placebo effects play a role in the legal realm. Why would the public under-estimate a law's effect in dealing with the risk it was designed to address? Politicians have the incentive to take credit for their initiatives, and successful politicians tend to have skill in persuading the public of the effectiveness of their initiatives. Furthermore, due to their own cognitive biases politicians are likely to genuinely over-estimate the effectiveness of their laws.

However, in some circumstances the effectiveness of laws is under-estimated, and laws may even be perceived to increase certain risks. This may occur when politicians must make a trade-off between the interests of several groups. They may benefit one group (or reduce a risk that concerns it) at the cost of increasing a risk to another group. For example, government may attempt to use eminent domain to solve hold-out problems and facilitate economic development. The purpose of the law is to address economic stagnation or decline. To others who perceive their property as similarly situated, however, the law may also increase the perceived risk of future confiscation. If the effects of government's action on each of these risks are misperceived, those individuals who are concerned about their community's economic decline may experience a

[35] In the car accident example, the public will expect a 0.4% probability of car accidents because of the politician's promise that the law will reduce accidents by 50%. Over time, as the public gradually observes that the actual rate of car accidents is 0.9% (higher than the perceived probability prior to enacting the law), the politician's credibility would be put to question, and the law may be (wrongly) perceived to have increased the objective risk of car accidents.

placebo effect,[36] while those who are concerned about their property's vulnerability to confiscation may experience an anti-placebo effect.[37]

Anti-placebo effects may also occur in situations in which a segment of the population is ignorant of a law, and therefore, the law does not affect this segment's perceived risk, though it does affect the objective risk. If such a law reduces the objective risk, then it creates an anti-placebo effect because its effects were under-estimated – the individuals ignorant of the law perceived an effect of zero, while the law had in fact reduced the objective risk.[38]

Finally, an effect similar to an anti-placebo effect occurs when parties who are interested in engaging in bias arbitrage attempt to create or expand a gap between perceived and actual risk, which they could later exploit. These parties may act in ways that increase the perception of risk, while (unlike the bias arbitrage process) trying not to have the increase in risk perception be attributable to them. I will discuss this type of behavior in part 4(b) below.

(d) Bias Arbitrage and the Literature on Symbolic Legislation

I explained above how law is used as a vehicle for politicians to engage in bias arbitrage. In Part 3 of this article, I will discuss extra-legal methods of bias arbitrage that may compete with law. But before moving to address extra-legal methods, a few words describing the relationship between the concept of bias arbitrage, which uses law to create placebo effects, and the concept of symbolic legislation are necessary.

The study of symbolism in politics was pioneered by Murray Edelman, who argued that a principal function of many forms of political participation is to provide symbolic reassurance to the public.[39] Applied to legislation, "symbolic legislation serves the needs of the public by indicating that Congress is 'doing

[36] Whether this would be a positive or negative placebo effect depends on the misperception (if any) of the risk prior to government's action.

[37] Some people may be concerned with both risks, and therefore be affected by both a placebo and an anti-placebo effect, each addressing a different risk.

[38] I develop this idea in another article. See Amitai Aviram, *The Hidden Effect of Ignorance of the Law* (Feb. 1, 2006) (unpublished manuscript, on file with author).

[39] Murray Edelman, THE SYMBOLIC USES OF POLITICS (Univ. of Illinois Press, 1964).

something' about a perceived problem. . . ."[40] Some legal scholars drew on the concept of symbolic legislation, particularly in tax and environmental law.[41] Though the literature recognized the assurances that many laws provided, it failed to recognize the potential positive impact on social welfare. Most of the scholarship on symbolic legislation treats it as a smoke screen that distracts the public and displaces legislation that could enhance social welfare. One scholar apocalyptically wrote: "[t]he enactment of symbolic legislation reflects a breakdown of the legislative policymaking machinery, a system that all too frequently addresses real social problems in an unrealistic fashion."[42]

There is no doubt that the manipulation of perceived risk (such as via bias arbitrage) can be abused, and this issue will be addressed below in part 4. However, bias arbitrage is no more susceptible to abuse than any other governmental action. The same mechanisms that mitigate governmental abuses – imperfect as they are – limit the ability of politicians to solely engage in bias arbitrage. More importantly, the legal scholarship on symbolic legislation fails to note the objective, welfare-enhancing impact that bias arbitrage has in situations in which the public over-estimates a risk. They examine only what the assurance does to individuals' political behavior, not what the assurance does to individuals' behavior regarding the risk that they face.

Returning to the hijacking hypothetical, if people excessively avoided flying after September 11th, 2001, and the passage of the ATSA[43] reduced their

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[40] Michael S. Kirsch, *Alternative Sanctions and the Federal Tax Law: Symbols, Shaming, and Social Norm Management as a Substitute for Effective Tax Policy*, 89 IOWA L. REV. 863, 921 (2004).

[41] See, e.g., John P. Dwyer, *The Pathology of Symbolic Legislation*, 17 ECOLOGY L.Q. 233 (1990); Steve R. Johnson, *The Dangers of Symbolic Legislation: Perceptions and Realities of the New Burden-of-Proof Rules*, 84 IOWA L. REV. 413, 446-58 (1999); Michael S. Kirsch, *The Congressional Response to Corporate Expatriations: The Tension Between Symbols and Substance in the Taxation of Multinational Corporations*, 24 VA. TAX REV. 475, 507-516 (2005); John W. Lee & W. Eugene Seago, *Policy Entrepreneurship, Public Choice, and Symbolic Reform Analysis of Section 198, The Brownfields Tax Incentive: Carrot or Stick or Just Never Mind?*, 26 WM. & MARY ENVTL. L. & POL'Y REV. 613, 620-621 (2002).

[42] Dwyer, *id.*, at 234. See also Lee & Seago, *id.*, at 620 ("Political science literature utilizes 'symbolism' to mean demonizing 'political enemies' in political discourse, which tends to deflect those seeking substantive reform.").

[43] The Aviation and Transportation Security Act, Pub. L. No. 107-71, 115 Stat. 597 (2001) (codified in scattered sections of 49 U.S.C.) ("ATSA"). This law created the

perception of the risk, they would indeed put less pressure on politicians to further expend resources on aviation safety. But they would also substitute their travel plans back to airplanes and away from cars (a method of travel which objectively has a higher risk of injury), resulting in safer travel.[44] Furthermore, if people over-estimate a risk, then the pressure they put on politicians to enact laws responding to those risks is itself excessive. If bias arbitrage causes the perceived risk to be identical to the objective risk, then the public's pressure on politicians to address the risk would be at just the right intensity.

A charitable view of the literature that is critical of symbolic legislation would be that it implicitly assumes the risk perceived by the public is no higher than the objective risk. If the public correctly estimates the risk or under-estimates it, then a law that assures the public would exacerbate the public's unwarranted optimism and prevent political pressure to further address the risk. Worse, the assurance will cause the public to take insufficient precautions against the risk. Such laws would have negative placebo effects that indeed reduce social welfare.

The literature that is hostile to symbolic legislation does not, however, make this assumption explicit or attempt to support it. There are reasons to suspect that for many laws this assumption would be false. Politicians are less likely to enact a law in an area in which the public under-estimates a risk because such a law would not address most voters' greatest concerns and would forgo the benefit to the politician from bias arbitrage. To appear effective and enhance the prospects of reelection, a politician needs to address those risks that most concern her constituents. A risk is unlikely to be under-estimated by the constituents and at the same time be of great concern to them.

If, contrary to the implicit but unlikely assumption stated above, the risk that concerns the public is indeed over-estimated, then bias arbitrage would both positively affect the public's level of risk avoidance and confrontation, and the public's level of political pressure to address the risk.

Much of the hostility of some of the literature on symbolic legislation is therefore unwarranted. Politicians' own incentives often direct them to focus on symbolic legislation in circumstances in which it is helpful, rather than harmful, to reduce the public's perception of a risk.

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federal Transportation Security Administration, which is responsible for security in U.S. airports.

[44] On the effects of substituting from air transportation to ground transportation, see note 29.

3. Private Parties Engage in Bias Arbitrage

(a) Private Legal Systems

Private legal systems (PLSs) – non-governmental social institutions that enforce norms – engage in bias arbitrage in the same manner as government does, by identifying misperceived risks and then forming and enforcing norms that are designed to address the misperceived risk. These norms are then presented in a manner that attempts to cause an overestimation of the norm's effect on the risk. If successful, the PLS receives credit for the reduction in the perceived risk, while social welfare is enhanced by the convergence of objective and perceived risks.

In the case of government, adherence to enforced norms (*i.e.*, laws) is mandatory and backed with government's monopoly on violence, but individual politicians are not secure in positions of power, and must solicit the constituents' favor (a solicitation which may be less costly when engaging in bias arbitrage).[45] Thus, bias arbitrage is used by government not to maintain support for its existence, but to maintain support for the individual politicians who direct the government's actions.

In contrast, PLSs have no assurance of their existence. Adherence to norms enforced by a PLS is voluntary and depends on the utility constituents derive from the norm. Such utility includes carrots (benefits provided by the PLS, such as the perceived utility to constituents from the norm being enforced) and sticks (perceived harm inflicted on constituents expelled from the PLS). Both the perceived benefit from norm enforcement and the perceived harm from expulsion depend on the perceived risk that is addressed by the norm being enforced by the PLS. Successful bias arbitrage allows the PLS to receive credit for reducing a perceived risk, therefore increasing the perceived benefit it confers and the perceived harm from being expelled from the PLS. Thus, bias arbitrage may be

[45] In democratic governments, politicians are elected (or, in some positions, appointed by elected officials) and therefore need to explicitly receive the public's approval. However, bias arbitrage is important in non-democratic governments as well, since even a dictator would find it much less costly to maintain his hold on power with some carrots (*e.g.*, protecting his subjects from risks that they perceive as significant) in addition to sticks (*e.g.*, risk of imprisonment or execution). Indeed, many dictators rally their subjects around protection from the often exaggerated threat of foes. Dictators differ from their democratic counterparts, however, in their ability to suppress competition with private bias arbitrageurs. *See infra*, part 4(a).

used by PLSs to secure the abidance of its constituents with the norms it enforces.

In addition, many PLSs have centralized structures in which individuals are explicitly or implicitly elected to govern the PLS's actions.[46] Such individuals would have incentives to engage in bias arbitrage identical to those of government's politicians. Decentralized PLSs[47] may also engage in bias arbitrage by expanding to enforce norms regarding misperceived risks, and having these norms perceived to be more effective than they actually are. Decentralized PLSs do not have "politicians" who can deliberately engage in bias arbitrage, but evolutionary forces result in the survival of decentralized PLSs that engage in bias arbitrage. PLSs that engage in bias arbitrage are more likely to survive than PLSs that enforce correctly perceived norms and whose norms' effects are accurately perceived. This is because the former PLSs would likely be perceived to confer greater benefits due to receiving credit for mitigating the over-estimated risk.

Like government, and unlike some other private bias arbitrageurs, PLSs may credibly persuade the public that they can affect through their actions either the probability of a risk occurring (*e.g.*, a group that enforces, at the pain of expulsion, a norm of not lying to another congregation member may cause members to perceive the probability of lying to decline), or the magnitude of the harm if the risk occurs (*e.g.*, a group in which members commit to assist any other member whose house was flooded may cause members to perceive the magnitude of harm from flooding to diminish). PLSs and government each tend to have a relative advantage compared to the other in addressing certain risks.

For example, in the U.S., government is more credible in addressing the risk of theft than, say, one's local religious congregation. Therefore, one would expect to see government politicians, rather than religious officials, engage in

[46] By implicit elections I mean that there is no formal election process, but the individuals who direct the PLS's actions can only do so with the approval of some or all of the PLS's constituents.

[47] Not all PLSs are centralized. Some are decentralized and lack formal control structures. For example, no individual has formal power to direct the PLS that causes most people standing in a queue at a cafeteria to accept the "first in time, first in line" rule (rather than, say, a rule dictating that the hungriest person would be first in line). On the different structures of PLSs see: Amitai Aviram, *Regulation by Networks*, 2003 BYU L. REV. 1179, 1204-1211 (2003).

bias arbitrage of this risk (if it is misperceived).[48] In Iraq immediately following the collapse of Saddam Hussein's regime, however, many Iraqis turned to their religious or social groups for protection against looting by forming neighborhood watches and militias.[49] If these people over-estimated the risk of looting, leaders of the religious or social groups could gain from bias arbitrage (while enhancing social welfare by causing the perceived risk to more closely approximate the actual risk).

(b) Insurance Providers

Some private parties cannot credibly persuade others that they are able to reduce the magnitude of a given risk, but they can persuade that they are able to mitigate the harm imposed by the same risk. Typically, this is done by an insurance agreement – a commitment to reimburse a person for losses she might incur from a risk that materializes.

Insurance can close a perception gap even if the insured party does not believe the insurer can prevent the risk from taking place because the insurance agreement reduces the expected harm (the probability of the harm occurring times the magnitude of the harm if it occurs). At the same time, insuring over-estimated risks can offer private benefits to the insurer because the insurer can charge premia based on the risk perceived by the insured party (*i.e.*, the insured party would agree to pay a higher premium if the perceived risk is higher),[50] while the cost to the insurer is based on the objective risk (*i.e.*, the insurer only pays when the harm occurs and only as much as the harm that was actually inflicted).

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[48] The characteristics of massive looting make it somewhat likely to trigger cognitive biases that cause potential victims to over-estimate its likelihood and impact. I do not have any information as to whether, in the case of post-Saddam Iraq, the risk to Iraqis from looting has been misperceived or not.

[49] *See, e.g.*, *Some Iraqis Try to Stop Looters in Baghdad*, NEW YORK TIMES (April 11, 2003).

[50] This assumes that there is less than perfect competition between insurers. If there were perfect competition, the premium each firm charged would be equal to its marginal cost, which is related to the objective risk. However, few markets exhibit perfect competition. Also, as will be discussed in part 4, if there are sufficiently few parties able to engage in bias arbitrage of a given bias, they are likely to divide arbitrage opportunities among themselves rather than compete over and sabotage one another's arbitrage opportunities.

Consider the following example of bias arbitrage via insurance. Suppose that the objective probability of car theft is 0.01% (1-in-10,000), but the public perceives it as being 1%. Also suppose that the harm to a car owner from theft is $10,000. The expected harm to a car owner is $100 (1% probability of a $10,000 harm), and at that expected harm the car owner may excessively avoid the risk of car theft (*e.g.*, use the car less frequently, park the car only in more expensive or less convenient but safer locations, etc.). An insurance company could offer to insure the car owner for $10. The car owner will gladly insure the car, paying $10 to avoid what she perceives to be a $100 risk. Once insured, the car owner would likely act as if the risk of car theft was significantly mitigated, thus ceasing her excessive avoidance of car theft. Unlike a law with a placebo effect, the insurance does not attempt to make her believe that the car is less likely to be stolen, but with insurance the harm to her from such an event is limited to the hassle of submitting a claim and making arrangements for the interim period until she is reimbursed or provided a replacement vehicle. Meanwhile, the insurer has reaped a healthy profit from this bias arbitrage: it received $10 to bear a risk that has the objective expected cost of $1 (0.01% probability of a $10,000 cost).

Naturally, insurers can only engage in bias arbitrage when they are able to credibly mitigate the expected harm from the risk. In other words, they would be ineffective in arbitraging risks that are incommensurable, cannot be compensated with money, or are of such type or magnitude that the insurer is unlikely to be solvent if they occur. Thus, insurers may have an advantage over government and PLSs in bias arbitraging car theft, but they are at a disadvantage exploiting misperception of risks such as nuclear attack or serial killers.

That insurers face a disadvantage in these circumstances does not mean that they are precluded from engaging in bias arbitrage. Insurers may yet engage in bias arbitrage when other arbitrageurs (e.g., government and PLSs) are unable or unwilling to address the risk. For example, Iraqi insurers are reported to offer coverage for terrorist attacks, assassinations and explosions caused by weapons of war and car bombs.[51]

[51] Robert F. Worth, *New Business Blooms in Iraq: Terror Insurance*, NEW YORK TIMES (March 21, 2006). It is difficult to assess whether this is an example of bias arbitrage. In other words, are the premia priced well above the actual risk in order to capitalize on an excessive perceived risk? The news article suggests that such insurance costs more than 20 times the cost of comparable life insurance in the U.S. I do not have data that would suggest whether the likelihood of the death (from any cause) of the insured person in Iraq is 20 times greater than it would be in the U.S.

(c) The Media

Both bias arbitrage via law and bias arbitrage via insurance tend to be viable for situations that create positive placebo effects, but usually not for other situations. Bias arbitrage is not feasible for the politician or insurer when *ex ante* the public under-estimates the relevant risk (the negative placebo effect scenario). The media, on the other hand, thrives in these situations in which under-estimated risks are exposed.

The media gains prestige and credibility by bringing to the public's attention unknown or unexpected facts or assessments, often in collaboration with experts.[52] Misperceived risks are fertile ground for an expert to research and testify on or for a reporter to expose. While an insurer's benefit from bias arbitrage is (directly) pecuniary and a politician's benefit is electoral, the benefit to the media is in receiving the public's attention and respect – and through them pecuniary benefits.[53]

To illustrate the media engaging in bias arbitrage, suppose that the public is over-optimistic about the risk of avian flu; the actual probability of an epidemic is 1%, but the public perceives the probability as 0.001% (or, alternatively, the public misperceives the disease's magnitude to be negligible, as severe as a common cold, though the disease is in fact deadly). An expert can testify about her research and announce that the disease is more likely or more severe than previously thought. The media will publicize (and probably dramatize) the expert's findings. As with bias arbitrage by politicians, some people will take the

[52] The roles of experts in bias arbitrage are strongly connected to the role of the media. Experts often provide the credibility to the media's manipulation of perceptions. Both experts and media then share in the private benefits of bias arbitrage.

[53] See Cass R. Sunstein, *What's Available? Social Influences and Behavioral Economics*, 97 NW. U. L. REV. 1295, 1308-1309 (2003) ("Whatever the criticisms, the reign of terror is boosting ratings for cable news networks. In fact, they are now at their highest levels since the Sept. 11, 2001, terrorist attacks. At the end of last week, Fox News Channel's average daily audience was up 27% from a month before; CNN's was up 29%; MSNBC's, up 24%. Hence the media's coverage reflects its economic self-interest, at least in part. Gripping instances, whether or not representative, are likely to attract attention and to increase ratings. Often the result is to distort probability judgments. There can be a kind of vicious circle involving the availability heuristic and media incentives, with each aggravating the other, often to the detriment of public understanding.") Statistics in the quote are cited from Johanna Neuman, *In a Sniper's Grip: Media's Role in Drama Debated (pt. 1)*, L.A. Times, Oct. 24, 2002, at 16.

testimony at face value and some will be skeptical but track the risk to compare it with the expert's prediction. The expert and the media will gain credibility when the skeptics find that the expert's assessment is more accurate than the previous commonly-held belief.

As with politicians and insurers, bias arbitrage influences the media's choices of issues to engage. Grossly under-estimated risks are more attractive to address then moderately under-estimated ones, because the media can make more dramatic claims without overstating the risk.

The media also finds it more attractive to exacerbate under-estimated risks than to attenuate over-estimated risks. An amusing (though fictitious) anecdote of the media's slant towards risk exacerbation rather than attenuation comes from the movie "The Shipping News".[54] In this movie, the local newspaper editor, Billy, instructs a new reporter, Quoyle, about journalism. Billy explains to Quoyle the importance of dramatic headlines. Billy then points at dark clouds on the horizon and asks Quoyle to describe the headline for reporting about them. "Horizon Fills With Dark Clouds", tries Quoyle. "Imminent Storm Threatens Village" responds Billy. "But what if no storm comes?" queries Quoyle, to which Billy replies: "Village Spared From Deadly Storm."

One possible explanation for the media's preference for risk exacerbation over risk attenuation is a concept that Timur Kuran and Cass Sunstein named "reputational cascade".[55] Reputational cascade is a phenomenon in which, as a perception becomes popular, more individuals are reluctant to challenge the perception out of fear that their reputation would be harmed if they disagree with the consensus. Sunstein quotes experts who describe the gagging effect of reputational cascades. One sociologist is quoted as saying that a researcher who doubts the health threats posed by mad-cow disease is "made to feel like a pedophile."[56] A medical researcher who questioned the accuracy of some

[54] THE SHIPPING NEWS (2001).

[55] Timur Kuran & Cass Sunstein, *Availability Cascades and Risk Regulation*, 51 Stanford L. Rev. 683 (1999); Timur Kuran, *Ethnic Norms and their Transformation Through Reputational Cascades*, 27 J. Leg. Stud. 623 (1998); Sunstein, *supra* note 14, at 1133-1135.

[56] *Id*., at 1133-1134, *quoting* Andrew Higgins, *It's a Mad, Mad, Mad-Cow World*, WALL ST. J., Mar. 12, 2001, at A13.

diagnoses of Lyme disease bemoaned: "[d]octors can't say what they think anymore. If you quote me as saying these things, I'm as good as dead."[57]

Reputational cascades may explain the media's preference for risk exacerbation over risk attenuation. As explained above, engaging in (and profiting from) bias arbitrage requires identifying a risk that is misperceived. For risks that are over-estimated (*i.e.*, are currently perceived as severe), a consensus about the severity of the risk is likely to have formed. The expert who engages in risk attenuation would need to challenge this consensus, at a risk to her reputation. On the other hand, when a risk is under-estimated (*i.e.*, the risk is currently perceived as insignificant), a consensus is less likely to have formed because the risk is less likely to be discussed and receive attention if it is not considered important. In such cases, the expert who engages in risk exacerbation does not have to challenge an existing consensus. She does not risk the erosion in her reputation that may occur if she confronts a reputational cascade.

Why don't reputational cascades affect politicians, PLSs, and insurers in the same way, causing them to avoid risk attenuation? The difference is that politicians, PLSs and insurers claim to take action against a risk, while the media simply reinterprets the risk without claiming to affect it. The law enacted by the politician, the norm enforced by the PLS, and the commitment of the insurer to compensate each purport to reduce either the probability or the magnitude of the risk for the public. Even if there is a consensus about the severity of the risk, the public is likely to accept that some actions can attenuate the risk. It may be more dubious to claim that the risk is attenuated without the need to take action.

The media has one advantage over other bias arbitrageurs in attenuating risk: because it is proficient in exacerbating risk, it can enjoy a first mover advantage in attenuating the risk it has just exacerbated. For example, an ad for the local news may say: "identity thief steals millions from local residents. Tune in at 10 pm to learn how to protect yourself." The ad and subsequent news report on identity theft exacerbates the perception gap while the following report on how to protect yourself (from the now inflated risk) is a form of bias arbitrage. Had the media not been so quick to engage in bias arbitrage, another arbitrageur would have likely seized on the enhanced perception gap. For example, the Federal Trade Commission could launch an enforcement initiative against identity theft, or credit card companies could offer "fraud insurance" to cardholders. But either

[57] *Id.*, at 1133, *quoting* David Grann, *Stalking Dr. Steere*, N.Y. TIMES, July 17, 2001 (Magazine), at 56.

of these responses takes longer than it does for the local TV station to offer its advice.

In sum, the media is disadvantaged compared to other bias arbitrageurs in that its palette of actions that purport to attenuate risks is limited to providing information. At the same time, its effectiveness in disseminating information quickly makes it nimbler than other arbitrageurs in responding to perception gaps (including those that it creates), so it has an advantage over other potential arbitrageurs when the risk is of a type that is perceived to be reduced by the dissemination of information to the public.

4. The Market for Bias Arbitrage

(a) Competition v. Cooperation of Bias Arbitrageurs

More than one person, and usually more than one category of persons (*e.g.*, politicians, insurers, reporters, etc.), can engage in bias arbitrage of a given risk. However, engaging in bias arbitrage is usually a rivalrous activity: A's engagement in bias arbitrage of a given risk reduces the private benefits B can reap from bias arbitraging the same risk.

For example, suppose that the relevant risk is car theft in the town of Springfield, and that the citizens of Springfield significantly over-estimate this risk. The Springfield local government can engage in bias arbitrage by conspicuously ordering the Springfield police to operate against car thieves. If it operated alone, Springfield's citizens would over time observe that the prevalence of car theft is lower than they perceived it in the past and credit the police for the reduction in car theft. Alternatively, the local insurance company can engage in bias arbitrage by marketing an insurance product tailored to address any financial harm from car theft. If it operated alone, it would sell policies at a premium that reflects the high perceived risk of car theft while paying claims at a rate that reflects the lower objective risk. Meanwhile, Springfield's citizens' concern with car theft would be attenuated because, if insured, they would not bear the financial consequences of having their car stolen.

However, if the police acted first and assured the public that its actions were reducing the probability of car theft, then the premium the insurance company could charge for car theft insurance would decline. Similarly, if the insurance company acted first, then the citizens of Springfield would be less concerned

with car theft. The Springfield local government would face less pressure to address car theft and would receive less credit for reducing this risk.

In other words, just as with other forms of arbitrage, one person's engagement in bias arbitrage dissipates the potential benefit for others who would engage in bias arbitrage of the same risk. As a result, competition may take place over the ability to engage in bias arbitrage. Such competition may involve positive efforts (*i.e.*, attempting to arbitrage before another competitor will) or negative efforts (*i.e.*, sabotaging a competitor's bias arbitrage efforts).

Negative efforts are likely to be less common than positive efforts because the main form of sabotage of bias arbitrage is exposing that the action has a placebo effect.[58] Such exposure, however, may close the perception gap (and eliminate the saboteur's bias arbitrage opportunity) without benefiting the saboteur. It may also make the public cynical of solutions to the relevant risk, making the success of the saboteur's bias arbitrage efforts less likely.

When competing, each potential arbitrageur has a limited palette of vehicles it can credibly use to convey the placebo effect: legislators can enact or amend laws; agencies and the executive branch can enforce laws conspicuously, insurers can underwrite policies, and the media creates newspaper, radio or TV reports. Competition between them shapes how law is created and enforced. For example, if a misperceived risk is already addressed by an existing law, a legislator may rush to create a specific law to bias arbitrage before a law enforcement agency does the same through enforcement of existing law. Thus, Congress enacted a law creating a separate crime of "car-jacking", even though the act of car-jacking had already consisted of a set of serious crimes, including

[58] For example, suppose that the public over-estimates the risk of terrorism, and politician A enacts a law to increase security (over-selling its effects so as to bias arbitrage). Rival politician B can call A's bluff and say that A's law does nothing (or not much) to reduce terrorism. This would likely be a poor strategy because, if indeed the public over-estimates the risk of terrorism and they hear A claiming that the risk will decline and B claiming that it will not, they would sway towards A and against B when they see over time that the risk of terrorism is lower than they originally perceived (presumably, they would think, because of A's law). B's credibility will suffer even if she is right in claiming A's actions are ineffective. Alternatively, B can engage in a conspicuous action that purports to reduce terrorism (e.g., enact another law or conspicuously enforce an existing law) and claim that it is her actions, not A's, that "reduced" the risk of terrorism. Employing this strategy, B will not lose credibility – at best, people will believe it is her actions and not A's that "reduced" the risk of terrorism; at worst, that it was A that gets credit for the risk reduction and she was neither helpful nor harmful.

robbery, theft, assault, and possibly kidnapping). Similarly, identity theft laws may create crimes for acts that are already forms of theft or fraud. Law enforcers and courts, meanwhile, may attempt to preempt legislators by expanding their interpretation of existing laws and enforcing them against the misperceived risk. This competitive dynamic may explain the growing complexity of both legislated law and the case law and agency precedent that interprets it. Of course, when law complexity itself becomes an issue of excessive concern, legislatures may rush to assuage fears by conspicuously wiping the slates clean and rewriting a simplified law.

Because competition dissipates the potential arbitrageurs' profits, they may find it beneficial to collude. In many circumstances, the market for bias arbitrage would be attractive for collusion. Barriers to entry tend to be high and the number of potential competitors tends to be low. Politicians and PLSs can only engage in bias arbitrage if the public perceives them as able to affect by their actions either the probability of the relevant risk occurring or its magnitude. An insurer can only engage in bias arbitrage if the public perceives it as financially able to honor the insurance agreement. An expert can only engage in bias arbitrage if the public perceives her as very knowledgeable in the area pertaining to the risk. All of these potential competitors and the media must have the ability to reach many people in the relevant population in order to manipulate their perceptions. All potential competitors also must have some ability to detect a misperception of a risk in order to target the risk in their bias arbitrage.[59] Thus, for any given risk, the number of people who are likely to successfully bias arbitrage is small and is unlikely to increase significantly in the short term.

The mechanisms of cooperation and the suppression of competition between bias arbitrageurs are a fertile ground for future research and are too vast to address in this article. One expects profit-maximizing politicians to vacillate between suppressing extra-legal competition to protect their own legal placebo effects and accommodating private bias arbitrage when they cannot successfully exclude it (or when it is complementary rather than competitive with

[59] In other words, a would-be bias arbitrageur must be less susceptible to the cognitive biases that create the misperception than the population that misperceives the risk. This limits the spectrum of would-be bias arbitrageurs, but evidence suggests that some individuals are likely to be less susceptible to a given cognitive bias and are therefore able to recognize and exploit a misperception. See Rachlinski, *supra* note 26; Guthrie & Rachlinski, supra note 26. Cf. Chris Guthrie, Jeffrey J. Rachlinski and Andrew J. Wistrich, *Inside the Judicial Mind*, 86 CORNELL L. REV. 777 (2001) (suggesting that judges are susceptible to several cognitive biases).

government's bias arbitrage). In this respect, bias arbitrage may differ vastly according to the political culture of the state, from *laissez faire* through government interventionism to central planning. The more interventionist the government, the greater its ability to suppress private bias arbitrageurs, which would allow politicians not only to reap all of the benefits of bias arbitrage, but also reduce the need for government to provide placebo effects quickly. Absent competition with other bias arbitrageurs, the only temporal constraint on the politician is the gradual de-biasing of the public as people adjust their perceptions to observations of the objective occurrence of the risk.

(b) Artificial Creation of Perception Gaps

An opportunity for bias arbitrage occurs when a gap exists between the objective and perceived risks, and the benefits of bias arbitrage (both private and to social welfare) increase as this gap grows. Knowing this, potential arbitrageurs have the incentive to first create a perception gap (or exacerbate an existing gap) and then exploit that gap.

For example, a politician may first foster a scare campaign, attempting to exploit cognitive biases to manipulate the public into thinking that a security risk or ecological threat is more severe than it objectively is. Then, if successful, the politician would sponsor a law that would address the security risk or ecological threat and would attempt to persuade the public that the risk has been attenuated by the law. Private bias arbitrageurs may similarly attempt to exacerbate the perception of risk prior to engaging in bias arbitrage (*e.g.*, an insurance company may support publicity that suggests terrorism is a grave, nearly uninsurable risk, and then offer "special" policies to insure the risk).

Unlike bias arbitrage, the artificial creation or exacerbation of perception gaps is unambiguously harmful to social welfare. As discussed in part 2(c), perception gaps cause either excessive or insufficient avoidance of activities that expose one to the misperceived risk, as well as excessive or insufficient efforts to confront the misperceived risk. Unfortunately, the ability to engage in bias arbitrage makes the development of perception gaps attractive to potential arbitrageurs.

The private incentive to create a perception gap depends on the degree of competition over the subsequent bias arbitrage. Once a perception gap is created, any potential bias arbitrageur can engage in bias arbitrage to close it. Therefore, the arbitrageur who expended efforts creating the gap may find that another

arbitrageur free rides on her efforts and closes the bias gap through bias arbitrage. For example, a local politician may launch a scare campaign over crime in her town, causing the public to over-estimate the likelihood of car theft in the hope of later receiving credit for directing the police to focus operations on car theft. Before the politician concludes her scare campaign and moves on to engage in bias arbitrage, the local insurance company may market policies specially tailored to address car theft, mitigating the public's concern and preempting the politician's plans. Conversely, the insurance company could direct the scare campaign in the hopes of selling high-priced car theft policies, but be preempted by a politician who enacts a law to reduce car theft.

Competition, besides deterring some arbitrageurs from creating perception gaps that others would free ride, also reduces the extent of a perception gap that is artificially created. For example, a "monopolist" politician may want to scare people about terrorism up to a level of complete hysteria, before offering the panacea (of a newly enacted law or of a law enforcement initiative) and taking credit for solving a gargantuan problem. But if that politician faced competition by the time he would create a moderate scare some other arbitrageur would already jump into the fray and offer a solution, mitigating the perceived risk before it reached peak profitability (to a monopolist). If the first politician foresees this, she can preempt the second politician and offer a remedy (thus stopping the scare campaign) earlier. The result is that increased competition over bias arbitrage results in faster but lower magnitude fluctuations in risk perception.

Thus, the private profitability of creating perception gaps depends on the degree of competition in the market and the ability of the perception gap creator to collude or to suppress competition. This suggests that a political culture that is more interventionist (and thus better facilitates government's ability to suppress private bias arbitrageurs) is more likely to create perception gaps to support politicians' engagement in bias arbitrage. These incentives become even more powerful when the political structure allows certain politicians to exclude rival politicians from dissipating their rents from creating a perception gap. Thus, at the extremes, a hierarchal, centrally planned regime is likely to have more perception gaps artificially created by its politicians (*e.g.*, via scare campaigns) than a pluralistic, laissez faire regime.

(c) Conclusion: The Future of Bias Arbitrage

This article engaged in a descriptive analysis of bias arbitrage, not a prescriptive one. I am not attempting to address the morality of bias arbitrage. However, it is noteworthy that moral reservations have been raised as to actions that exploit perception gaps, even when the transaction seems to improve social welfare and the arbitrager's main goal was not to profit from the transaction.[60]

The study of cognitive biases is in its infancy. Improvements in this nascent field will increase the viability of bias arbitrage in two ways. First, better understanding of cognitive biases would allow for more accurate predictions of the degree to which a given risk is misperceived. This, in turn, would make it easier for potential risk arbitrageurs to identify suitable risks to arbitrage and reduce the likelihood of "overshooting" by counter-biasing in excess of the ex ante perception gap. Second, better understanding of cognitive biases would provide more exact tools for the counter-biasing that takes place in bias arbitrage. This enhanced capacity to cause cognitive biases is prone to abuses, but if available, it would very likely be used, including for the purpose of bias arbitrage.

Bias arbitrage is probably as old a phenomenon as any other form of arbitrage. Not too long ago, the arbitrage of commodities and currency was in a similar state as bias arbitrage is today – common but not ubiquitous or exact. Transportation and information costs caused significant price gaps between different markets. For example, at the end of the seventeenth century, "a bolt of muslin cost 3 reals in the mill at La Mans, 6 in Spain and 12 in America" (300% more than La Mans).[61] In the late nineteenth century, an Ottoman Pound (a gold coin) traded in Jerusalem for 124 Ottoman Grush (a silver coin). In Jaffa, about 35 miles from Jerusalem, the Pound traded for 144 Grush. In Gaza, only about

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[60] One example involves volunteers for testing drugs that prevent breast cancer. Such volunteers risk unknown and possibly very serious side effects of the tested drug, in return for the hope to prevent the onset of the disease. Doctors expressed concern that women who over-estimate the risk from breast cancer may be too willing to risk the drug's potential side effects. Rob Stein, *Study of Breast Cancer Pill Raises Hopes and Concerns*, THE WASHINGTON POST (May 22, 2005) A01 ("'Women have an increased fear of getting breast cancer over and above what the true likelihood is,' said Heidi Malm, associate professor of bioethics at Loyola University Chicago. 'That could lead people to enroll in studies with probably a bigger hope of benefit than is actually realistic.'")

[61] Fernand Braudel, THE WHEELS OF COMMERCE (English trans., Phoenix Press, 2002) 168.

55 miles from Jerusalem, it traded for 216 Grush (74% more than Jerusalem).[62] Perception gaps today mirror these wide price gaps.[63]

As transportation, communication and information technology improved and prices dropped, currency and commodity arbitrage became less expensive, more ubiquitous, and price gaps closed. Price gaps that persisted in the past for months and years now close within fractions of a second. For example, a Kansas City stock arbitrageur recently moved his firm's computers from Kansas City to New York to reduce the time it takes for his trading orders to be executed. Since the computer signal travels at nearly the speed of light, orders from Kansas City take only 2/100 of a second to be executed. Apparently, many price gaps are closed within this short time. The arbitrageur stated that without moving the computers to New York, which reduced order execution time to 1/1000 of a second, he would be out of business.[64]

It is hard to imagine perception gaps survive no more than fractions of a second, perhaps because it is hard to imagine computers engaging in bias arbitrage. But we may well see an analogous trend of increased bias arbitrage leading to smaller and less sustainable perception gaps, as the relevant technology advances. The study of cognitive biases serves the same role in bias arbitrage as technologies of transportation and information transmission serve in commodity and currency arbitrage. Reductions in the cost of information technology allow traders to learn faster about discrepancies in the price of a commodity in different markets, just as improved knowledge of cognitive biases allows better estimates of discrepancies between actual and perceived risk.

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[62] Shmuel Avitsur, DAILY LIFE IN THE LAND OF ISRAEL IN THE NINETEENTH CENTURY (in Hebrew, 1972) 292 (the author does not give a precise date for these figures).

[63] Though both examples demonstrate significant price gaps, they also indicate that some arbitrage did in fact take place. Muslin was not produced in America, so its availability at any price at all suggests some merchants arbitraged and narrowed the price gap from infinite to a "mere" 300%. Likewise in the currency example, the official value of the Ottoman Pound was 100 Grush. Yet the Pound was exchanged for a higher amount, suggesting that merchants arbitraged by buying gold Pounds for silver coin and selling the under-priced gold to goldsmiths and foreign mints, reducing the availability of Pounds and pushing up their price in silver.

Bias arbitrage today is in a similar situation: it occurs and mitigates perceptions gaps despite the nascent state of the science of cognitive biases, but it would likely increase in volume (and reduce perception gaps further) if our ability to evaluate and manipulate cognitive biases improved.

[64] Aaron Lucchetti, *Firms Seek Edge Through Speed As Computer Trading Expands*, WALL STREET JOURNAL, Dec. 15, 2006, p. A1.

Similarly, just as reductions in the cost of transportation allow arbitrageurs to close the price gap by shipping the commodities to higher-priced markets, so do improvements in understanding how to cause cognitive biases allow for more effective counter-biasing, which closes the perception gap.

A reduction in the cost of engaging in bias arbitrage may increase the role of market structure (in the mixed public-private market for bias arbitraging) in determining the volume of bias arbitrage that takes place. Competitive markets would see relatively few artificial creations of perception gaps and more immediate closure of perception gaps through bias arbitrage. Less competitive markets would see an increase in artificial creations of perception gaps, governmental and private actions aimed at either suppressing arbitrage rivals or coordinating bias arbitrageurs and dividing arbitrage opportunities among them. Either way, such markets would likely have slower elimination of perception gaps and greater private payoffs to the bias arbitrageur. In markets of either structure, the amount of legal activity that is driven by bias arbitrage is likely to increase. As it does, legal scholarship would need to heed to the role law plays, not only in manipulating incentives, but also in manipulating perceptions.