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Jennifer Arlen  
NYU School of Law, jennifer.arlen@nyu.edu

Stephan Tontrup  
NYU School of Law, stontrup@googlemail.com

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Jennifer Arlen\textsuperscript{+} and Stephan Tontrup\textsuperscript{++}

Jennifer Arlen
Jennifer.Arlen@nyu.edu
310-463-0880
New York University School of Law
40 Washington Square South, Room 411D
New York, NY 10012

Stephan Tontrup
Stephan.Tontrup@nyu.com
Law and Economics Fellow
NYU School of Law
New York University School of Law
40 Washington Square South, Room 411D
New York, NY 10012

\textsuperscript{+} Norma Z. Paige Professor of Law, New York University School of Law.
\textsuperscript{++} Law and Economics Fellow, NYU School of Law; Max Planck Institute of Economics.

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Abstract

In this article, we show experimentally that individuals can adapt their decision making to social environments, like markets, and respond strategically to biases, such as regret aversion. We find they can employ herding as a behaviorally rational strategy to improve their expected outcomes and shift anticipated regret when regret would otherwise bias them towards a suboptimal status quo. Herding can improve decision making when people observe the choices of professionals and businesses, who are less likely to be biased by regret. Focusing on others’ choices can allow decision makers to shift their reference point, and their bias, to favor their optimal choice. We find that decision makers exploit this process to shift their bias strategically. They seek information when their reference point is not optimal, but block it otherwise. They also strategically select among different types of decision makers and focus on those that made the better decision. Our research suggests that decision makers employ strategies to reduce the welfare effects of biases in certain domains. Policy responses may support private ordering by seeking to complement, rather than substitute for, these strategies.
Strategic Bias Shifting: 
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1. Introduction

People are not the rational actors that Rational Choice Theory predicts them to be. Their decision making is biased. Yet these biases need not cause them to make suboptimal decisions. We claim that people can adopt behaviorally rational strategies to improve their decision making. In this study, we focus on regret aversion, which causes behavioral anomalies like the status quo bias, endowment effect and the sunk cost fallacy. We analyze how decision makers in social contexts, like markets, can use herding to improve expected welfare and reduce anticipated regret.

Decision making is biased by regret aversion across a wide range of domains. People anticipate regret over any decision whose future outcomes are uncertain, and could fall short of expectations. Anticipated regret causes disutility, reducing the expected welfare of the choice it burdens. It also can bias decision making towards a suboptimal choice, because people anticipate systematically more regret over losses from some choices than others. For example, decision makers tend to experience more anticipated regret over losses if they decide to deviate from the status quo than if they decide to retain it, even when their expected economic welfare would be higher if they deviate. Thus, they exhibit a status quo bias. Anticipated regret also induces an endowment effect: owners resist selling entitlements or increase the sales price because they experience more anticipated regret over selling in error than over failing to make a deal when they should have (Thaler 1980; see Loomes and Sugden 1982; Landman 1987; Knetsch and Sinden 1984; Bar-Hillel and Neter 1996; Connoly and Zeelenberg 2002; see Nicolle et al 2011, providing fMRI evidence; see generally Korobkin 2014).

Scholars have proposed intervening in private ordering to address the biases caused by regret. Some recommend shifting the status quo by altering default terms in contracts; others offer proposals to weaken the status quo, for example, by substituting liability rules for property right protection of entitlements (see, e.g., Sunstein 1986; Jolls, Sunstein, and Thaler 1998; Korobkin 1998; McCaffery, Kahneman, and Spitzer 1995; Rachlinski and Jourden 1998; Buccafusco and Sprigman 2011).

Our research project has a different goal. We do not focus on possible government interventions in private ordering. Instead, we analyze whether individuals can adopt behaviorally rational strategies to improve expected outcomes and reduce regret. In a prior study, we found that people can mute anticipated regret, and thus debias, by deciding through institutions, such as agents and voting, that allow them to share decision-making responsibility. People anticipate less regret over decisions when they share responsibility (Arlen and Tontrup 2015). In this article, we show that individuals can improve their expected outcomes even when they cannot mute overall regret: they use herding as a strategy to shift regret bias to favor the choice that would be optimal absent regret.
To explain why regret tends to bias people towards the status quo, and how herding can shift this bias, we must analyze how reference points in decision making affect anticipated regret. Decision makers anticipate regret over potential losses they blame themselves for because they could avoid these losses by making an alternative choice. Anticipated regret thus roots in a comparison: the decision maker compares the potential low outcome of the choice in question with the perceived benefit of the alternative choice (see Bell 1982; Loomes and Sudgen 1982; Connolly and Zeelenberg 2002; Zeelenberg and Pieter 2004).\footnote{Anticipated regret also is larger the more responsibility the decision-maker experiences for the decision that could produce a loss (Zeelenberg, van Dijk, and Manstead 1998; Arlen and Tontrup 2015). Thus, institutions, like voting and agency relationships that enable decision-makers to share responsibility with others can reduce or eliminate anticipated regret by letting people share perceived responsibility for the decision (Arlen and Tontrup 2015). Regret aversion also should be affected by the individual’s personal level of regret sensitivity (see Schwartz et al. 2002).} \footnote{Our concept of reference point dependence is different from the conception of Kozegi & Rabin (2006). For Kozegi and Rabin, an individual has exogenous expectations about her own behavior and her future outcomes that determine her reference point. The reference point determines whether an individual perceives an outcome as a gain or a loss. For example, a decision maker who expects to earn 5, will treat 5 as the reference point. He will perceive any outcome lower than 5 as a loss, and anything larger as a gain. By contrast, we assume that the reference point is determined by attention and the focus of the decision maker. The decision maker focuses on salient choices, such as the status quo, treating it as her reference point for many decisions. The reference point determines the weight benefits receive in the decision making process when assessing anticipated regret. In our theory, the reference point can be endogenous. The decision maker may shift focus to the choices of others, and treat their choice as a reference point, in order to reduce regret and make a better choice.} Therefore anticipated regret over a potential loss is stronger the greater the perceived benefit of the path not chosen (Loomes and Sudgen 1982).

Anticipated regret can bias decision-making towards a suboptimal choice because people assessing the opportunity cost of alternative choice options tend to focus on the more salient choice, taking it as their “reference point” (Ashby, Dickert, and Glöckner 2012; Glöckner, Tontrup and Bechtold 2015; Pachur and Scheibenne 2012; Bhatia and Turan 2012).\footnote{Anticipated regret also is larger the more responsibility the decision-maker experiences for the decision that could produce a loss (Zeelenberg, van Dijk, and Manstead 1998; Arlen and Tontrup 2015). Thus, institutions, like voting and agency relationships that enable decision-makers to share responsibility with others can reduce or eliminate anticipated regret by letting people share perceived responsibility for the decision (Arlen and Tontrup 2015). Regret aversion also should be affected by the individual’s personal level of regret sensitivity (see Schwartz et al. 2002).} Because of this focus, they more readily construct the benefits of their reference point choice when they make a decision. As a result, they give more weight to the foregone benefits of their reference point choice than to the benefits of the alternative choices when they assess anticipated regret in the decision making process (Johnson et al 2007; Bhatia and Golman 2012). Therefore, they anticipate more regret over a loss if they decide to deviate from the reference point because the foregone benefits of the reference point choice loom larger than those of the alternative choice. The asymmetry in anticipated regret can bias decision makers towards the reference point choice.

This decision making process explains why individuals tend to exhibit a status quo bias. They take the status quo as their reference point when the existing state of the world is more salient than the alternative state (Bordalo, Gennaioli, Shleifer 2012). The status quo choice tends to be salient because it is immediately available, while the alternative choice is often hypothetical. As a result, people give greater weight to foregone benefits of the status quo than to foregone benefits of the alternative choice (see Kahneman and Miller 1986; Connolly and Zeelenberg 2002; see also Johnson et al. 2007, providing evidence that the benefits of the status quo receive more weight). This asymmetry in the perception of
foregone benefits leads them to anticipate more regret over a potential loss after deviating from the status quo than if they retain it (Landman 1987; Baron and Ritov 1994; Connolly and Zeelenberg 2002; Nicolle et al 2011).³

Yet decision makers are not bound to treat the status quo as their reference point. As the reference point depends on the subjects’ attentional focus, it is an endogenous element of the decision making process in our theory. We claim that individuals can use herding to change their reference point by focusing on the choices of others. People who make decisions in social environments, like markets, can focus on the choices of others to shift their bias to favor the majority choice. Herding can improve decision-making because many markets are dominated by professional traders (List 2003) and businesses that decide through institutions, such as agency relationships and voting (Arlen and Tontrup 2015). These decision makers are less likely to be biased by regret aversion. An individual who focuses on the majority choice can better construct the benefits of this choice. As a result, she gives greater weight to the foregone benefits of the majority choice, and thus anticipates less regret if she selects this choice than if she retains the status quo. Thus, a biased individual can improve expected outcomes by shifting his reference point to the choice of this majority.

We expect people to use herding strategically to alter their decision-making process. We have shown in previous research that people are aware when regret biases them against a choice that would improve their expected welfare (Arlen and Tontrup 2015). The opportunity to make a better choice without raising regret costs should motivate decision makers to use strategies like herding, even when other motivations to conform their behavior—such as information and peer effects (Asch 1995; see generally Sunstein and Thaler 2008)—are not present. We claim that people can make a strategic decision to seek information in order to deliberately change their own reference point. We assume that their decision making is behaviorally rational: when biased towards a suboptimal choice, individuals seek information on others’ decisions and use this new reference point to improve their expected welfare. By contrast, when their reference point is optimal, they should refrain from getting that information. In this case, information on others can make them worse off by biasing them against their optimal choice if others made an inferior choice.

We also expect people to respond strategically when presented with multiple types of decision makers who make different decisions. Markets regularly are populated by different types of decision makers, some more likely to be biased than others. For example, agents, corporate actors, and professional traders are less likely to be biased than occasional buyers and sellers (Arlen and Tontrup 2015; see List 2003). When decision makers can observe different groups of market participants, we predict they will select

³ Reference point choices also can explain why some types of decision-makers do not exhibit the status quo bias. People do not always treat the status quo as their reference point when making decisions. For example, people who acquire entitlements with the intention to trade them can be expected to have selling as their reference point decision (see Heath et al, 1999). They should place greater weight on benefits from trading and focus less and place less weight on benefits of the status quo. As a result, they should not anticipate heightened regret over the decision to sell (see Johnson et al. 2007; see List et al 2003, finding that sports cards owners who regularly trade their cards do not exhibit an endowment effect).
their reference point strategically: they should focus on the decision which will lead them to the higher expected outcome.

We test our theory with a series of experiments in the laboratory and online. Our Base condition builds on an experimental design that has been shown in past studies to induce a robust status quo bias triggered by regret (e.g., Knetsch and Sinden 1984; Bar-Hillel and Neter 1996; Isoni et al. 2013; Arlen and Tontrup 2015). We endowed each participant with a lottery ticket. The lottery contained two tickets, marked either heads or tails. Each ticket was equally likely to win the same monetary payoff. Subjects were offered the option to exchange their ticket for the alternative ticket plus a bonus of 25 €-cent. We obtained evidence on trading choices and reported anticipated regret over losing the lottery after deciding to trade or keep the ticket. Rational Choice Theory with standard preferences (hereafter RCT) assumes that all subjects should trade. By contrast, and as expected, we find a significant number of subjects exhibit a status quo bias and keep their ticket compared to RCT’s prediction.

In our Herding treatment, subjects were accurately informed that the majority of participants in a prior study decided to trade. The subjects understood that the participants in the earlier study could not have better information about the outcome of their lottery. Supporting our theory, we found that, subjects in Herding were significantly more willing to trade than subjects in Base. As we predicted, subjects in Herding reported less anticipated regret over trading than keeping, whereas subjects in Base reported more anticipated regret over trading than keeping. Two additional treatments support our claim that Herding improves outcomes because participants shift their reference point choice from keep to trade. In one treatment, we placed subjects in the Base condition except that we induced them to focus on the decision to trade. We predicted they should behave like subjects in Herding. In line with our claim, these subjects trade as frequently as those in Herding, reporting less anticipated regret over losses from trading than keeping, just like Herding subjects. In the other treatment, we placed subjects in the Herding condition except that we focused them on the benefits of keeping. We expected them to behave like subjects in Base. As predicted, after learning that the majority traded, these subjects nevertheless exhibit a status quo bias.

In a final set of three treatments we tested our theory that people herd strategically. In Seek Information, we analyze whether subjects are willing to incur an opportunity cost to seek information on other participants’ choices in order to trade with less regret. Questionnaires confirmed that subjects are aware that others are not better informed. RCT suggests that no subject should incur a cost to seek the information. By contrast, and supporting our theory, we find that half of the subjects get the information notwithstanding the opportunity cost. As expected, subjects who seek information overwhelmingly trade and report less regret over trading than keeping. Comparing treatments, we find that access to information leads to significantly more trading than in Base. Subjects’ motivation to become informed should depend on how much they expect the information to reduce the

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4 RCT with standard preferences predicts that choices are made based on expected monetary returns alone, absent regret. We therefore refer to the behavior of the subjects in our study as behaviorally rational, that is, that is they decide rational conditioned on their bias.
anticipated regret over trading. Supporting our theory, we find that the subjects who get information anticipate a greater reduction of regret over trading than those participants who did not get information. Our results suggest that subjects make a behavioral rational decision: they seek information if the expected benefit of trading with reduced regret outweighs the opportunity cost; otherwise, they decide without the information.

In *Block Information* we pay our subjects 25 €-cent if they keep their ticket and instruct them that they will learn subjects’ choices from a previous study unless they incur an opportunity cost to the block information. Compared to the RCT prediction that participants should not incur a cost to avoid the information, we find that a significant number of subjects do block it. The information cannot make them better off as they already have the optimal reference choice, but learning that the majority traded could reduce their welfare by biasing them against their optimal choice. We also show that the subjects who block information expect a greater increase in regret over making the optimal choice to keep if they learn the majority traded than those who decided not to block.

In the last treatment, we present our subjects with two different trading decisions from separate treatments of a prior study: in the first treatment, a majority of participants traded; in the second treatment, the majority kept their ticket. Each group provides a potential reference point for our subjects. As predicted, we find that subjects were significantly more willing to trade than in *Base* and were as likely to trade as in *Herding*. They also reported a significantly lower level of regret over trading than subjects in *Base*. The results are consistent with most subjects using the group that made the optimal decision as the reference point for their own choice.

This article suggests that individuals adapt their decision making strategically to their social environment when regret aversion prevents them from making an optimal. Our research illustrates the benefits of identifying behaviorally rational strategies and determining the domain in which they are and can be used effectively. We suggest that policy responses may aim to enhance private ordering by seeking to complement, rather than substitute for, these strategies.

This article proceeds as follows. Section 2 presents a formal model of our basic experimental setting. Section 3 presents the experimental test of how herding influences the decision making process. Section 4 first models strategic herding and then presents evidence that people in fact use the strategy. Section 5 discusses the internal and external validity, and the policy implications of our results. Section 6 concludes.

2. A Formal Model of Our Experimental Treatments

This section presents a formal model of our theory. We show how anticipated regret can bias decision making towards a suboptimal status quo and how herding can reduce regret by shifting people’s reference point enabling them to make a better choice. The model is based on our experimental setting.

Consider an individual endowed with an entitlement, E1. Assume that there is a 50% chance that this entitlement will have a high value, given by B, and a 50% chance that it will be worthless. The individual can trade this entitlement for an alternative entitlement,
E2. To focus on the role of regret, we assume that E2 earns nothing in the state of the world where E1 earns B, and earns \(B + g\) in any state of the world where Entitlement 1 is worthless (where \(0 < g < B\)). Thus, the expected value of E1 is \(0.5B\) while the expected value of E2 is \(0.5(B + g)\). RCT with standard preferences predicts that everyone will trade in this setting since the expected benefit of E2 is higher.

The expected valuations alone do not represent the expected utility that an individual would derive from trading E1 for E2, however. Individuals predicate decisions on what they perceive as the expected outcome minus the regret they anticipate over making the choice (Loomes and Sugden 1982).

Anticipated regret depends on the loss the selected choice may cause. This loss is determined by the low outcome of the choice under consideration, here 0, as compared with the benefit the decision maker would have obtained had he selected the alternative choice.\(^5\) Since the low outcome of E1 and E2 is zero, the loss of selecting E1 or E2 is based on the benefit of the alternative not selected entitlement, which is \(B+g\) or \(B\) respectively.

Yet how an individual values the benefits of the foregone choice depends not only on their actual magnitude, but also on the weight they receive in the decision making process. Some choices are more salient than others. People tend to focus on the choice that is more salient, taking it as their reference point choice. In the process of decision making they more readily construct, and thus give greater weight to, the benefits of their reference point choice. Since the foregone benefits of the reference point choice loom larger, people tend to anticipate more regret over a loss if it is caused by a decision to deviate from the reference point than if it results from a decision to retain it. Thus, anticipated regret can bias a decision making against their optimal choice. To model this bias, we assume that, when assessing anticipated regret, the benefits of the reference point choice receive a weight of one, whereas the benefits of the alternative decision are discounted by \(\alpha\), where \(0 < \alpha < 1\).

This process allows us to model status quo bias. People tend to take the status quo as their reference point choice (Kosegai and Rabin 2006; see Johnson et al 2007). Thus relative losses from a decision to deviate from the status quo choice loom larger, all else equal. We model the status quo bias by assuming that the decision maker gives a weight of 1 to the benefits of the status quo, \(B\), but give a weight of \(\alpha\) to the benefits of the alternative entitlement, \(B+g\), when assessing anticipated regret. Thus, in our model, a person endowed with E1 will predicate anticipated regret over a decision to retain the status quo on the difference between the low outcome of that choice, 0, and the foregone benefit of selecting E2, which she discounts by \(\alpha\):

\[
\alpha(B+g)-0
\]

By contrast, if the person selects E2, she will predicate anticipated regret over a decision to trade on the difference between the low outcome of E2, 0, and the benefit of E1, \(B\), which receives full weight:

\[
\alpha(B+g)-0
\]

\(^5\) In addition, anticipated regret depends on the decision maker’s perceived responsibility for the decision (Zeelenberg, van Dijk, and Manstead 1998; Arlen and Tontrup 2015).
As a result, even though the decision to trade E1 for E2 produces a lower potential loss when compared with the actual foregone benefits of the alternative, B, the decision maker will anticipate more regret. This holds as long as α is sufficiently small relative to the gains from trade, g, such that \((1-\alpha)B > \alpha g\). In this situation, anticipated regret biases the individual towards the status quo. The decision maker will fail to trade if the gain from trade, \(0.5g\), is less than the difference between regret\(_{\text{trade}}\) and regret\(_{\text{keep}}\).

We can now also model the bias-shifting effect of herding. People are not invariably biased towards the status quo because their reference point choice can change. Consider a decision maker who learns that the majority of others traded E1 for E2. If she focuses on their decision, she will take it as her reference point. As a result, she should accord more weight to the benefits of trading, \(B+g\), and should discount the benefits of the status quo by α. Thus, the regret she anticipates over a low outcome from keeping E1 is based on a perceived loss of 

\[(B+g)-0.\]

By contrast, she anticipates regret over a decision to trade based on perceived losses of 

\[\alpha B-0.\]

As the latter is always less than the former, the decision maker is not biased towards the status quo. Instead, herding shifts her bias towards the optimal decision to trade. With the majority choice as reference point, trading E1 for E2 provides both, the higher perceived economic benefit and the lower anticipated regret. Herding thus leads her to trade.

### 3. BASIC HERDING EXPERIMENT

In this section, we test our theory that herding can shift the bias of people who are biased by anticipated regret towards a suboptimal status quo. We find herding improves outcomes and reduces regret over trading even when individuals do not have any information or social approval reasons to herd.

#### 3.1. EXPERIMENTAL DESIGN

Our *Base* condition is designed to replicate the status quo bias in an experimental setting in which subjects make their choices in strict isolation, without observing or being observed by others. The condition provides us with a benchmark against which we measure the welfare-enhancing effect of herding on others’ choices.\(^6\) The *Base* condition contains the fundamental structure of the experimental design shared by all treatments. We conducted our treatments both in the lab and online with marginal differences in the design that we will report below.

Each subject was endowed with a randomly selected lottery ticket marked either “Heads” or “Tails.” Subjects won 8 € (~$11) in the laboratory or 4 € in the online study if the ticket they held at the end of the session matched the outcome of the lottery (“Heads”

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\(^6\) The full instructions for all our treatments are available in the Appendix published by the journal online.
or “Tails”); if their ticket lost, they earned nothing. Thus, both tickets had a 50% chance of winning the same payoff. Participants were informed that they could trade their original ticket for the alternative ticket plus a monetary payment of 25 €-cent. Since each ticket had the same expected value, RCT predicts that each subject should trade. Any subject who retains the ticket deviates from RCT, and exhibits a status quo bias.

Our Herding treatment tests whether subjects are more likely to trade their ticket after being instructed that a majority of participants in an earlier treatment traded their lottery ticket. In the laboratory, we informed subjects that 31 out of 45 subjects in a prior treatment traded. The data was obtained from an earlier experiment in which most subjects traded because a principal-agent relationship allowed them to share responsibility for the trade with an agent, reducing the regret they anticipated over the decision (Arlen & Tontrup 2015). We informed subjects accurately that the data was collected in a prior treatment in the same laboratory with the same subjects pool. Participants were not given any further experimental details about the prior treatment.

The online Herding treatment used the same design except that we informed subjects not only about the trading outcomes of a prior treatment but also about the decision making process. Subjects learned that participants in the prior study voted about whether they wanted to trade, with each subject having a right to veto concerning their own ticket the majority. Subjects learned that 89% of these participants traded their tickets (Arlen and Tontrup 2015). This design tests whether people will nevertheless take others’ choices as their reference point even when they know that the other participants were placed in a different decision making context and procedure.

To analyze whether people herd to reduce anticipated regret over an optimal decision to deviate from the status quo, we structured the experiment to eliminate alternative motivations for herding, such as asymmetric information, expertise, peer pressure, and social approval (see generally Sunstein and Thaler 2008). In our study, subjects had no reason to rely on the majority’s choice for its informational value because no one else had better information than they did. Each ticket had the same expected value with its outcome being entirely random; the game itself was easy to understand. Control questions confirm that subjects understood that trading lead to the better expected payoff. We also asked participants whether they learned anything about the potential outcome of their decision from the other participants’ choices: 97% answered correctly that they did not. As we explain below, our subjects decided anonymously and in isolation to ensure that they were not influenced by a preference for social approval.

Our main observation is the trading choice. In addition, in our online treatments we obtained data on anticipated regret. We asked subjects to report their anticipated regret over losing the lottery after subjects made their trade decision but before they learned the outcome. In online Base, participants were first asked to report how much regret they expect to experience assuming that they lost the lottery after trading their original ticket; they then were asked to report anticipated regret assuming that they kept their ticket and lost. For both items we used a ten point Likert scale ranging from 1 (very little regret over

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7 This conclusion holds regardless of risk preferences since the decision to trade did not affect either the expected value or the variance of the outcomes of the lottery.
the negative outcome) up to 10 (very strong regret). In the online Herding treatment, we asked subjects to report the regret they expect to experience assuming first that they kept their ticket and lost after learning the majority traded and, second, that they traded their ticket like the majority they were informed about and lost.

3.2. EXPERIMENTAL PROCEDURES

We conducted the laboratory study at the University of Jena. In order to implement a clean control treatment, we ensured that subjects in the Base condition made their decisions without any influence from other participants. We seated subjects in sound-isolated separate booths with no ability to observe the other subjects. The online study provides a similar degree of isolation.

In the laboratory experiment, the subjects received paper-based instructions. Subjects obtained their lottery ticket, marked Heads or Tails, by withdrawing a ticket from a box containing multiple sealed tickets. To ensure that subjects were aware that the outcome of the lottery was truly random, the experimenter tossed a coin for each participant, covering it without revealing the outcome. Subjects were informed that they could either accept the outcome of the experimenter’s toss or toss a coin for themselves after the session was over. Prior to making their choices, subjects were asked questions to control for their understanding. They had to calculate their earnings, assuming that they traded or kept their ticket and won or lost in the lottery. They had to answer these questions correctly to proceed with the experiment. All but two subjects succeeded and completed the laboratory study. In order to impose the same effort on subjects regardless of whether they kept or traded subjects had to express their decision explicitly by marking either “Yes” to trade or “No” to keep. Subjects who decided to trade were given the alternative ticket and handed their original one to the experimenter. Payments were made in cash. Most participants were students from a variety of disciplines. We obtained demographic variables, as reported below, these demographic characteristics did not affect our main findings.

The online experiment required two modifications of the general procedure. First, subjects did not receive a physical lottery ticket. We sent them a code assigning them a Heads or a Tails ticket before the experiment began. Participants were instructed that the code would be explained after the session and would reveal whether they initially had received a Heads or Tails ticket. To convince subjects that the lottery’s outcome was truly random, subjects determined themselves whether the Heads or Tails ticket won the lottery.

All subjects in the online study were students from the University of Münster from various disciplinary fields. To ensure that subjects could not repeatedly participate in the study, each e-mail invitation contained a personal key which became invalid once the subject used it. Online participants were paid immediately after completing the study via electronic bank transfer or PayPal.

3.3. BEHAVIORAL PREDICTIONS

We expect participants in Base to use the status quo as their reference point. Subjects who focus on the status quo should weigh the benefit of the status quo ticket
stronger than the benefit of the alternative ticket, causing them to anticipate a greater sense of loss over the foregone benefit if they trade their ticket and lose than if they retain their ticket and it loses. We expect this asymmetric perception of foregone benefits to lead subjects to experience more anticipated regret over losses from a decision to trade than a decision to retain the status quo. Accordingly, we predict that subjects should exhibit a significant status quo bias induced by regret aversion in Base, measured against the prediction of RCT\textsuperscript{8} that everyone should trade (Hypothesis 1).

In Herding, we expect the reference point to change, because subjects will tend to focus on the decision of the majority, using it as the reference point for their own choice. Subjects who treat “trade” as the reference point choice should experience more regret over a decision to keep than a decision to trade because they give more weight to the foregone benefit of trading. This enhances their anticipated regret should they keep their ticket and learn that they would have won the lottery had they traded. Thus, as the decision to trade produces both the higher expected welfare and less anticipated regret we expect subjects who adopt “trade” as their reference point to trade. Not everyone should trade however. Because subjects in Herding are presented with two potential reference points, the status quo and the majority decision, some may retain the status quo as their reference point. These subjects should exhibit a status quo bias. On treatment level we predict that significantly more subjects will trade their ticket in Herding than in Base (Hypothesis 2).

We expect to observe two effects on regret: one within subjects and one between treatments. First, our theory predicts that Herding subjects should tend to take the majority’s decision to trade as reference point, leading them to report less regret over losing the lottery following a decision to trade than a decision to keep, (see Hypothesis 2). Second, subjects should anticipate less regret over losses from a decision to trade in Herding than in Base (Hypothesis 3).

3.4. RESULTS

Table One presents the summary statistics of participants’ trading behavior across treatments, in the laboratory and online. In the logistic regressions, we report in Table Three we controlled for demographic variables (sex, discipline, work experience outside of the university). We found that including the demographic variables in the analysis did not change the pattern of our results.

**Hypothesis 1:** A significant number of subjects in Base should keep their ticket compared to the RCT prediction that everyone trades.

As expected, subjects in the Base condition exhibit a strong status quo bias: 70.3% of the laboratory subjects and 44.4% of the participants in the online treatment keep their ticket, as shown in Table One. Both results are significantly different from the RCT prediction that all participants should trade (p<0.01**) and are consistent with the findings reported in the literature (e.g., Knetsch 1989; Bar-Hillel and Neter 1996; Isoni et al. 2011). Our finding that fewer subjects trade in the laboratory than online is consistent with the different experimental protocol we used. The stakes were half as large in the online study.

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\textsuperscript{8} See supra note 4 (defining RCT).
as in the laboratory study. Thus, subjects should anticipate more regret over trading in the laboratory. Also, the status quo in the online study may have been less salient because the subjects did not have physical possession of their lottery ticket.

[Insert Table One here]

**Hypothesis 2:** *Subjects trade significantly more often in Herding than in Base.*

We find that significantly more subjects exchange their ticket in Herding than in Base, both in the laboratory and online. As reported in Table One, 55.1% of the laboratory participants trade their tickets in Herding, as compared to only 29.7% in the Base condition (Fisher two-tailed p<0.01**). Similarly, 72% of the online subjects trade in Herding as compared with 55.5% in Base (Fisher two-tailed p=0.02*). The finding that some subjects nevertheless keep their ticket in Herding is consistent with these participants not switching their reference point from the status quo to the majority choice.

**Hypothesis 3:** *In Herding subjects anticipate less regret over losses from a decision to trade than over either the alternative decision to keep or a decision to trade in Base.*

Subjects in Base report less anticipated regret over losses from a decision to keep than a decision to trade (6.5 vs. 7.2; p=0.02*; regret\text{Keep} - regret\text{Trade} = -0.7), as shown in Table Two, suggesting a bias towards the status quo. By contrast, in Herding we find the opposite asymmetry: subjects indicate significantly more anticipated regret over losses assuming that they keep than if they assume that they trade their ticket (6.40 vs 5.12; p<0.01**; regret\text{Keep} - regret\text{Trade} = +1.28).

We also find the expected treatment effect when we compare Base and Herding: participants in Herding reported to anticipate significantly more regret over the decision to trade than did subjects in Base (5.12 vs. 7.2, p<0.01**), as shown in Table Two.9

[Insert Table Two here]

Logistic regressions show that subjects’ trading behavior in Base and Herding is strongly correlated with the level of anticipated regret they report: the less regret they report over trading, the more likely they are to trade, as shown in Table Three.

[Insert Table Three here]

3.5. **Induced Reference Point Treatments**

According to our theory, the information that others traded induces subject to focus on the benefits of trading. This shift of attentional focus changes their reference point and increases the relative weight they give to the benefits of trading over the benefits of keeping, causing subjects to anticipate less regret over trading than keeping their ticket.

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9 As reported in Arlen and Tontrup (2015), we explored subjects’ motivations for keeping in a pilot study by asking them to explain their decision in a free-form format. The majority of subjects who did not trade indicated that they could not improve the probability of winning by trading and preferred not to intervene. Others said directly that they would feel bad about causing a loss in the lottery by trading.
Our experimental design rules out some alternative explanations such as a goal to benefit from the expertise of others or a preference for social approval.

Yet the literature suggests an additional explanation for herding: subjects may choose not to choose (Sunstein 2014). Thus, rather than being motivated to reduce regret and improve their choices, as we theorize, people might herd because they prefer to let others decide for them. To test whether our Herding results are driven by a shift of focus, as we claim, or subjects’ preference to not make their own choice, we conducted an additional pair of online treatments: Herding with Focus on Keep (HFK) and Base with Focus on Trade (BFT).

3.5.1. Treatments and Behavioral Predictions

Herding with Focus on Keep places subjects in the Herding condition except that they were first asked to list reasons favoring a decision to keep their ticket. After they completed this task, we instructed them to write down reasons favoring a decision to trade. This design should induce them to focus on, and in consequence give greater weight to, the benefits of keeping (see Johnson et. al 2007), even though they were informed that the majority had traded.

Base with Focus on Trade is identical to Base except that subjects were first asked to list the reasons favoring the decision to trade. After participants completed this task, we asked them to write down the reasons favoring a decision to keep the ticket. This design should induce subjects to focus on, and give greater weight to, the benefits of trading, when making their decision, even though there are no choices of others that could shift their attention from the status quo to “trade.” In both treatments, we collected data on trading outcomes and reported regret over losses from a decision to trade and a decision to keep.

If subjects in Herding would indeed follow others because they prefer to let them decide our manipulations in these two treatments should not substantially affect trading outcomes or anticipated regret: In HFK subjects should behave like subjects in Herding and in BFT they should behave like the participants in Base. By contrast, our theory suggests that we should find the opposite results. If Herding influences behavior in our study by shifting people’s reference point, as we theorize, then subjects induced to focus on the benefits of a particular choice should be biased towards making that decision, independent of whether they receive information about the majority decision or not.

Thus, our manipulation of the subjects’ focus in HFK should induce them to take “keep” as their reference point. Accordingly, HFK subjects should exhibit a status quo bias and experience more anticipated regret over trading because they give more weight to the benefits of keeping. They also should report more anticipated regret over trading than subjects in Herding (Hypothesis 4).

BFT should focus subjects on the benefits of trading, changing their reference point to trade. As a result subjects should focus on the benefits of trading making be significantly more likely to trade and report less regret over trading than in Base. They should also anticipate less regret over trading than keeping (Hypothesis 5).
3.5.2. Results

**Hypothesis 4:** Subjects in Herding with Focus on Keep should be less likely to trade, and should experience more regret over trading, than subjects in Herding.

Supporting our theory, subjects in HFK do not follow the majority decision to trade that they were informed about. Instead we find that HFK subjects are significantly less willing to trade than subjects in Herding (59.7% versus 72%; p=0.01*). Indeed, trading frequency is not significantly different from Base (55.5%; p=0.62).

Reported regret results also are in line with our predictions. We find that HFK subjects anticipate significantly more regret over losses from trading than participants in Herding (6.3 vs. 5.12; p=0.03*). HFK subjects anticipate more regret over trading than keeping, consistent with subjects in Base: regret\text{\_keep} – regret\text{\_trade} = -0.78 for HFK subjects and -0.7 *(p=0.85) for participants in Base. By contrast, in Herding, regret\text{\_keep} – regret\text{\_trade} is strongly positive (1.28); the difference is highly significant (p<0.01**). Thus, on average HFK subjects exhibit a regret-driven status quo bias whereas subjects in Herding are biased towards trading, as predicted by our theory and inconsistent with a preference for not deciding.

**Hypothesis 5:** Subjects in Base with Focus on Trade should be more likely to trade, and should experience less regret over trading, than subjects in Base.

The results of BFT also provide support for our theory. Subjects in this treatment trade significantly more often than subjects in Base (75.3% vs 55.5%; p=0.01*) even though they do not obtain information on others’ choices such that a motivation to follow others and let them decide cannot explain their behavior. Trading frequency in BFT is not significantly different from the trading frequency we observe in Herding (75.3% vs. 72%; p=0.7), as our theory suggests.

Reported regret provides further support for our theory. As predicted, BFT subjects anticipate significantly less regret over losses from trading than subjects in Base (5.44 vs. 7.2; p<0.01**), as shown in Table Two. The level of regret over trading is similar to Herding (5.44 vs. 5.12, p=0.35), as we would expect if both herding and our manipulation of subjects’ focus shifts subjects reference point from “keep” to “trade.”

We conclude that subjects in Herding are not motivated to trade because they prefer to let others decide for them. Instead, the information that others traded induces them to focus on the benefits of trading, shifting their reference point from “keep” to “trade”.

4. STRATEGIC HERDING

In this section, we show that people can use herding as a behaviorally rational strategy to improve their decision making. Individuals can recognize when anticipated regret deters them from making a better choice. They understand that information on how others decide can help them to reduce the regret they anticipate. We present evidence that people strategically seek such information when regret would otherwise keep them from making an optimal decision. They refrain from seeking the information if they do not expect it to reduce their anticipated regret over making an optimal choice; they even avoid
it if the information may lead them to a suboptimal choice. Our results also suggest that people behave strategically when they observe multiple groups that each selected a different decision. They tend to focus on the benefits of decision made by the group that selected the optimal choice. This leads them to a better outcome with the least regret. We conclude subjects behave rational given their bias. We test our claims in the following section.

4.1. STRATEGICALLY SEEKING AND BLOCKING INFORMATION

A strictly rational actor would not benefit from seeking the information on the decisions of others. She cannot learn from the information, as the other participants have no better knowledge about the lottery’s outcome and as the rational actor is not biased, she cannot benefit from reducing anticipated regret either; she can always make the optimal choice on her own. By contrast, behaviorally rational actors who would make a suboptimal choice because they are biased by anticipated regret can improve their expected welfare by obtaining information on others’ choices. When they recognize that they are biased against the optimal decision, they can respond rationally and seek information to reduce their expected anticipated regret over selecting their optimal choice.10

People can realize when regret prevents them from making a better choice. They are motivated to reduce their regret over making their preferred decision to increase their expected welfare (Arlen and Tontrup 2015; see Connolly and Zeelenberg 2002).11 We assume that they expect that others may not be biased towards the status quo, and may thus be able to trade. For example, professional traders (List 2009) or people who decide through institutions that let them share responsibility (Arlen and Tontrup 2015) tend not to be biased against trading.12

Our claim that people herd strategically implies that they understand that they can shift their anticipated regret by obtaining information on others’ choices. In our theory, the majority decision reduces regret by inducing decision makers to focus on the benefit of the majority choice and take it as a reference point. Yet people do not have to understand this mechanism in order to herd strategically. It is sufficient if they expect to experience less anticipated regret when they decide like others.13

We claim that people adapt their decision making and respond rationally to their bias by seeking information on others’ decisions. We expect them to seek information if their expected welfare is higher if they are biased towards the majority decision. By contrast, they should not access information when they are at least as well off deciding on

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10 In our study all decision makers have the same information on the economic costs and benefits of each choice. We discuss other situations in section 5.

11 People can employ herding as a behaviorally rational strategy if the decision maker correctly identifies the optimal decision absent regret. Yet the decision maker can be unsure of, or may incorrectly identify, the optimal choice. We discuss the implications of this scenario in section 5.

12 In Arlen and Tontrup (2015) we show that people employ institutions strategically to self-debias. The results show that decision makers understand that people deciding through institutions are likely less biased by regret.

13 People may predicate this latter expectation on past experience of feeling less regret when deciding consistent with others. Alternatively, they may simply have imagined how they would feel at the end of the experiment with and without the information.
their own. Thus, whether the decision maker seeks information depends on her initial reference point and the expected quality of the others people’s choices. We expect decision makers to act behaviorally rational. They should always seek information when regret prevents them from making an optimal choice and the decision they face is binary. In this case the information will improve outcomes and reduce regret if others made the optimal choice; it will not reduce welfare if others selected the inferior choice. If the decision maker faces a range of choices, then she will seek information if the expected choice of the majority provides greater welfare than her own reference point decision.

By contrast, people whose reference point is optimal should not seek information on others. Accessing the information cannot benefit them and might reduce welfare if the majority selected an inferior choice.

4.1.1. Formal Model

We can formalize strategic herding using the basic model from Section 2.1. Assume that the individual facing the choice of whether to trade E1 for E2 can incur a cost of $\varepsilon$ in order to learn how others decided before she makes her own decision. We now consider whether the individual will seek this information, even though the people whose choices she can observe are not better informed about the decision she has to make. We assume that $(1-\alpha)B > \alpha g$. Thus, absent the information, she is biased by regret towards the status quo. If she obtains the information, the probability she learns that the others traded is given by $\beta$, where $0<\beta<1$.

The decision maker in our model predicates her decision whether to seek information on her expected welfare, with and without this information. Without information, she selects the status quo. Accordingly, her expected welfare is given by

$$0.5B - 0.5 \text{Regret}(\alpha(B+g)-0).$$

where Regret($\alpha(B+g)-0$) is experienced over keeping and losing when her reference point choice is keep.

Should she decide to get the information, the decision maker expects to be biased by regret towards the choice the majority made. Thus, if she learns that the others retained E1 she will keep E1 as well. If she learns the others traded, she also will trade, since trading would provide the highest expected outcome (.5(B+g)) and the lowest anticipated regret. Thus, her expected welfare with information is given by

$$\beta \left[0.5(B+g) - 0.5 \text{Regret}(\alpha B-0)\right] + (1-\beta)\left[0.5B - 0.5 \text{Regret}(\alpha(B+g)-0)\right].$$

Hence, obtaining information only enhances welfare if she learns that others traded, which occurs with probability $\beta$. Accordingly, the marginal benefit of obtaining the information is given by

$$\beta (0.5g) + \Delta \text{Regret} > 0.$$

where .5g is the marginal expected benefit of trading instead of keeping (absent regret) and $\Delta \text{Regret}$ is the reduction of anticipated regret over selecting the reference point choice.
when it is optimal. As long as this marginal benefit exceeds the opportunity cost of accessing information, ε, she will seek the information. The strategic decision to seek information increases her expected welfare.

By contrast, the decision maker will not seek information if her initial reference point is the optimal choice. To see this, assume that our decision maker starts with a reference point of “trade.” Absent information, she will trade, since this maximizes expected outcomes and produces less anticipated regret. By contrast, should she get information on others’ decisions, she may learn that they traded, in which case she be no better off than she would be without the information (aside from the opportunity cost, ε). But if she gets information, she faces a (1-β) probability that she will learn that the others retained E1. In this case, the information would make her worse off because it would lead her to use the status quo as her reference point, biasing her towards keeping E1. Accordingly, she is worse off if she seeks the information compared to making the decision on her own. Our decision maker thus will decide strategically whether to obtain information or not: She seeks information when she otherwise is biased against the optimal choice but she does not get it when she would make the optimal choice without the information.

4.1.2. Seeking and Blocking Information: Experimental Design and Procedure

We tested our claim by implementing two treatments: Seek Information and Block Information. Both treatments were conducted online using the same subject pool and experimental procedure that we reported in detail in Section 3.3.

Seek Information is based on Herding except that subjects were not automatically informed about the trading decisions of the subjects in the prior treatment. Instead, before making their trading decision, participants were offered a choice to either obtain information about the majority choice or decide without this information. If participants decided to access the information, they were given the same information about the majorities’ trading choice as in the Herding treatment (see supra Section 3); then they made their decision whether they wanted to trade or not.

To ensure that subjects only seek the information if they value it for making their choice, subjects had to incur a cost if they wanted to get the information. If they wanted to be informed, they had to wait one minute in front of an empty screen prior to the data being displayed. If they decided not to seek the information, they immediately proceeded to the trading decision. This opportunity cost takes the same form that people often experience in reality: they have to invest time to research what others decided to do. To ensure that online participants had to actively wait, instead of checking their emails for example, subjects had to press a button within three seconds after the minute was over to receive the data. We calibrated the waiting time by estimating the amount a subject would earn per minute in an average student job. In Münster, students earn around 10-12€ per hour, yielding per minute earnings of 16 to 20 €-Cent. We implemented a one minute delay.

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14 Regret over selecting the reference point choice should be smaller when the reference point is the optimal choice to trade because the foregone loss of trading is smaller than the foregone loss of retaining E1: \(\alpha(B-0) < \alpha(B+g)-0\)
to keep the opportunity cost below the 25 €-Cent bonus subjects are paid for trading in the study.

Our design ensures that subjects will seek the information only in order to trade with reduced regret. As in the Herding treatment, the choices of the others have no informational value. The subjects’ identity and the decision she made remained unknown to other participants—ruling out learning and peer pressure as alternative motivations. We used control questions to confirm that subjects understood their payoffs and knew that the other subjects were not better informed about what choice would lead to a better outcome. Subjects were instructed that if they did not get the information, they would not learn it at any later stage in the experiment.

We elicited subjects’ choice to seek or reject information and their trading decision. In addition, we asked subjects to report the regret they expected to experience over a loss from trading assuming two separate scenarios. First, subjects had to assume that they decided to trade and lost the lottery, after they obtained the information and learned that the majority had traded. Second, we asked them to assume that they did not obtain the information, traded, and lost in the lottery. The difference between these two scenarios measures by how much subjects expect the information to reduce their anticipated regret over trading.

Block Information tests whether subjects are willing to incur a cost in order not to learn how the others decided when the information may lead them to make an inferior choice. In this treatment, participants were offered a 25 €-Cent bonus to keep their ticket, making the status quo the optimal choice. Subjects were instructed that they would be automatically informed about the decision of subjects in a prior treatment unless they decided to block this information. The instructions explained that subjects who decided not to be informed would be required to wait one minute in front of a blank screen before proceeding with the experiment. To ensure that subjects waited actively, subjects had to press a button within three seconds after the minute was over. Subjects who did not block the information were immediately informed that 91% of the participants in a prior treatment kept their ticket. Subjects then decided whether to trade or keep their ticket.

Subjects in Block Information also were asked to report the regret they anticipated to experience in two scenarios. First, they were asked to assume that they kept their ticket, and lost in the lottery after they received the information that the majority traded. Second, they were asked to assume that they blocked the information, kept their ticket, and lost in the lottery. Measuring the difference between the two scenarios allows us to determine how strongly subjects expected to reduce their regret over keeping by blocking the information.

4.1.3. Behavioral Predictions

RCT predicts that subjects should not incur a cost to obtain information on others’ decisions in our experiment because the information has no value for a rational unbiased
decision maker. By contrast, we predict that subjects in *Seek Information* should be willing to incur a cost to obtain information because if they learn the majority trades they can trade with less regret. The information provides the largest benefit if anticipated regret would otherwise deter subjects from trading. In this situation, subjects improve their expected outcome and reduce regret.\(^\text{16}\) Yet participants who would have traded in spite of being biased towards the status quo also can benefit from the information: It enables them to trade with less regret. Both types of subjects should obtain the information if the benefit exceeds the opportunity cost of the waiting time.

Not all subjects should decide to obtain the information, however. Subjects whose initial reference point is “trade” have no reason to seek information. Also participants who have only a small bias may expect little benefit from a shift in reference point. These two types of subjects should trade in *Base* and should report little difference in anticipated regret over trading with and without the information.

Accordingly, compared to the RCT prediction that no subject should incur a cost to learn the information, we expect a significant number of subjects in *Seek Information* to ask for the information *(Hypothesis 6)*.

Participants who seek information should trade because the information that others traded should induce them to experience less regret over trading than keeping. In this group we expect participants who would have kept their ticket absent the information, as well as those who would have traded in *Base* even without the information. As a result, on average subjects in *Seek Information* should be more likely to trade than in *Base* *(Hypothesis 7)*.

We expect subjects to anticipate less regret over trading if they seek information and learn the majority traded. By contrast those who decide not to access the information should anticipate the same regret over trading as they would in *Base*. Thus comparing treatments, subjects in *Seek Information* should on average anticipate lower regret over trading than subjects in *Base* *(Hypothesis 8)*.

We posit that subjects are motivated to seek information to reduce their regret over trading. Subjects should be more willing to seek information the greater its impact on anticipated regret over trading. We expect that the difference between regret\(_{\text{Trading Without Info}}\) and regret\(_{\text{Trading With Info}}\) should be greater for subjects who seek information than for those who decide not to *(Hypothesis 9)*.

The predictions for *Block Information* mirror those we presented for *Seek Information*. In *Block Information*, the status quo (keep) is the optimal choice. Subjects whose reference point is the status quo are biased towards the optimal choice without the information. They should not be interested in the information as it does not provide a benefit. Indeed, it can only be detrimental as it may lead them to either keep with more regret or trade should they learn that the majority traded. Therefore, contrary to the RCT prediction that all subjects should accept and ignore the information rather than incur an opportunity cost to avoid it, we expect a significant number of participants to incur the

\(^{16}\) Subjects increase their expected welfare if they learn the majority traded and are unaffected should they learn the majority kept.
opportunity cost and choose to block the information to avoid learning the majority’s choice (Hypothesis 10). Yet subjects who do not expect the information to shift their reference point should not be willing to incur a cost.

We assume that subjects block the information in order to keep their ticket. Thus, any subject who blocks the data should not trade, leading us to the hypothesis that the rate of subjects who keep their ticket after blocking should not differ from the RCT prediction that everybody keeps (Hypothesis 11).\(^{17}\)

We expect subjects should be more motivated to block the information the greater its expected impact on their anticipated regret over keeping. We measured the difference between \(\text{regret}_{\text{Keep With Information}}\) and \(\text{regret}_{\text{Keep Without Information}}\). This difference should be significantly greater for subjects who block the information than those who do not (Hypothesis 12).

4.1.4. The Results

**Hypothesis 6:** Subjects Incur an Opportunity Cost to Learn the Majority Choice.

We find that half of the subjects in Seek Information (32; N=64) decide to get the information, as shown in Table Four. The result is significantly different from the RCT prediction that people will not incur any opportunity cost to obtain the information (p < 0.01**).

**Hypothesis 7:** In Seek Information Subjects Trade More Often than in Base.

The vast majority (90.1%) of subjects who obtain the information that the majority traded also trade their ticket. As predicted, subjects are significantly more likely to trade in Seek Information than in Base: 78% vs. 55.5%; p<0.01**, as shown in Table One.

To support this evidence, we asked participants in a post-experimental questionnaire whether they would have traded without having the information: 46.8% of the participants who decided to get the information and then traded indicated that they would have kept their ticket without the information.

[Insert Table Four]

**Hypothesis 8:** On Average Subjects in Seek Information Should Anticipate Less Regret over Trading than Subjects in Base.

As predicted, subjects in Seek Information report that they anticipate significantly less regret over trading if they assume that they obtain information and learn the majority traded than subjects in Base: 5.49 vs. 7.2 (p<0.01**), as shown in Table Two. Also in support of our theory, subjects who assume that they do not access the information report that they anticipate a similar degree of regret over trading as subjects in Base (7.52 vs 7.2; p=0.68).

We condition regret on whether subjects in fact sought information or not in order to estimate the effect of access to information on average anticipated regret over trading.

\(^{17}\) Participants who do not block the information learn that the majority kept. Thus, they keep as well, since keeping is both the reference point choice and the optimal choice.
Subjects who seek information (N=32), report anticipated regret over losses from trading of 5.91 assuming that they obtain information and learn the majority traded. Subjects who reject the information (N=32) report an average anticipated regret over trading of 7.06. The results lead to an average regret over trading of 6.48 conditioning regret on subject’s actual decision whether to get information or not. A comparison with Base (7.2) yields that access to information leads to a significantly lower level of anticipated regret over trading (p=0.08+), even though only half of the subjects actually seek information.

Hypothesis 9: Subjects who seek information benefit more from having the information and thus are more motivated to get it, than those who reject it.

Supporting our claim that people seek information because they expect it to reduce the regret they anticipate over trading, we find that subjects in Seek Information report they would experience significantly less regret over trading if informed that the majority traded than if they trade without this information: 5.49 vs. 7.52 (p<0.01**), as shown in Table Two.

Subjects should be more likely to get the information on others the more they expect it will reduce their anticipated regret over trading. Indeed, we find that the difference, regret\textsubscript{trading without info} - regret\textsubscript{trading with info}, is greater for subjects who seek information than for those who do not: -2.26 vs. -1.09; p=0.08+, as shown in Table Five.

Hypothesis 10: Subjects in Block Information incur an opportunity cost to avoid learning the majority’s choice.

In Block Information, 46% of the subjects (29; N=63) decide to reject the information and wait for one minute, as shown in Table Four. The result is significantly different from the RCT prediction that people should accept the information to proceed with the experiment immediately (p < 0.01**).\(^{18}\)

Hypothesis 11: Subjects who Block the Information Keep their Ticket.

Consistent with our theory, the majority of subjects who block the information keep their ticket: 24 out of 29; 82.8%. Nevertheless, the result differs from the theoretical prediction that everybody should keep their ticket (Fisher test p=0.06+).

Hypothesis 12: Subjects who block information expect the information to have a greater impact on the regret they anticipate over keeping than those who do not block it.

Supporting our theory, we find that subjects who block the information expect the information to have a greater impact on regret over keeping than those who do not block it. The difference regret\textsubscript{KeepingWithoutInfo} - regret\textsubscript{KeepingWithInfo} is greater for subjects who blocked the information than for those who did not: -1.83 vs. -0.44; p<0.03*, as shown in Table

\(^{18}\) The finding that 54% of participants accept the information does not contradict our theory. As explained, several types of subjects have no reason to incur a cost to block the information, see hypothesis.
Five. Thus, subjects who expect to experience more disutility from learning that the majority traded are more likely to block the information.

4.2. MULTIPLE REFERENCE POINTS

Market participants are not all the same type. Some are professional dealers who trade regularly. Others operate within organizations and decide through institutions that divide responsibility. Others transact infrequently and decide alone. These differences can affect regret aversion (Arlen and Tontrup 2015; see List 2003). The presence of multiple types can allow decision makers to identify majority decisions of distinct sub-groups that may differ from the dominant behavior in the overall market. As a consequence, a market may not just reveal a single reference point choice, but a set of choices favored by different types of market participants.

We claim that decision makers who can identify multiple groups of market participants—e.g., professionals and nonprofessionals—making different choices, can decide strategically which group to take as a reference point for their own decision. Instead of taking a reference point at random, they tend to select the reference point that allows them to make the perceived optimal choice.

4.2.1. Experimental Design and Procedure

The Multiple Reference Points treatment (MRP) extends the Herding treatment by presenting subjects with the trading decision of two different groups of subjects who made opposing decisions about whether to trade. Subjects were informed that the first group of participants decided on their own whether they wanted to trade: 70% of these participants kept, 30% traded. Subjects were informed that the second group of participants did not decide alone but they could either accept or reject the recommendation of an agent who suggested to trade; subjects in this group were instructed that the agent could not have any better information about the lottery’s outcome than the principal: 77% of the participants exchanged their tickets.19

In this setting, subjects could focus on either majority choice when making their decision. Subjects who do not distinguish between the groups but aggregate the information would have faced a nearly equal split between trading and keeping, leaving them with no salient reference point choice. Subjects who therefore did not have a focal group choice could have focused on the status quo as in Base. Subjects should only be able to use the information to change their reference point from the status quo of “keep” to “trade” and reduce regret over trading if they select the group whose members by majority made the optimal decision as their reference point. Note, we measured regret using the same protocol as in Herding.

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19 The agent was incentivized to trade for the principal, but the principal had a right to veto the agent’s choice and make the decision himself. As the lottery was random, the agent could not have better information about the outcome than the principal. The data for these treatments is reported in Arlen and Tontrup (2015).
4.2.2. Behavioral Predictions

The treatment presents subjects with multiple reference points. One group, who decided by majority, traded their ticket; a second group of participants, who decided alone, kept their ticket. In addition, subjects also could have used the status quo as a reference point for keeping the ticket. Thus, three reference points are available two of which favor keeping the ticket. We predict that subjects will behave strategically and focus on the group who decided to trade, because it enables them to trade with less regret.

If subjects are able to strategically select their reference point as we claim, and focus their attention on the trading majority, then the trading frequency in MRP should be significantly higher than in Base, where the status quo is presented as the only reference point. Instead, the frequency of trading should be similar to the one we observe in Herding as subject in both treatments should focus on a group who made an optimal choice (Hypothesis 13)

We claim that subjects in MRP systematically choose the reference point that leads them to the better outcome. Accordingly, they should report less regret over trading than over keeping their ticket, just as the participants in Herding. They also should anticipate less regret over trading than subjects in Base (Hypothesis 14).

4.2.3. Results

**Hypothesis 13:** Subjects are more likely to trade in MRP than in Base.

In support of our theory, that subjects can strategically select the reference point that allows them to trade, we find that MRP subjects are more likely to trade than subjects in Base: 70.3% (64/27; N=91) of the MRP participants trade, which is significantly more than the 55.5% (50/40; N=90) of the subjects who traded in Base (p=0.04*), as shown in Table One.

Indeed, our results suggest that subjects can switch to the optimal reference point as effectively as in Herding, where they are presented only with a trading majority. We find that subjects in MRP are at least equally likely to trade as subjects in Herding (70.3% vs. 72%; odds ratio= 0.923; confidence interval 95% lower bound 0.56 compared to confidence interval of perfect equivalent with odds ratio 1 = 0.53; difference < 10%). Note that this result is unlikely to occur if subjects focus randomly on one of the groups taking either “keep” or “trade” as their reference point. In that case we would not expect them to be as likely to trade as participants in Herding.

**Hypothesis 14:** Subjects in MRP report less regret over trading than keeping; regret over trading is smaller than in Base.

Our findings on regret support the choice data on trades we reported above. Subjects in MRP expect to experience less regret over trading than over keeping: 4.9 vs 6.23, p< 0.01**. The treatment effect suggests that subjects select which group to focus on strategically; they reduce regret by taking a reference point of “trade.” Indeed, subjects in

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20 Note if subjects are at least equally likely to trade as subjects in Herding, we can conclude that more subjects take the trading majority as a reference point as we claim. Therefore we refer only to the lower bound of the confidence interval.
MRP report they would anticipate significantly less regret over a negative outcome from trading than subjects in **Base**: 4.9 vs 7.2; \( p<0.01^{**} \). By contrast, subjects do not anticipate more regret over trading than in **Herding** (5.2), a result that should not occur if subjects take their reference point randomly, rather than systematically choosing the optimal reference point “trade.”

Our study leaves open how individuals select the best reference point. One possibility is that they use heuristics to identify the group most likely to have made an optimal choice. For example they may focus on the decisions of professional traders and those deciding within organizations because these actors are less likely to be biased by anticipated regret (see Arlen and Tontrup 2015). A Another possibility is that decision makers evaluate multiple reference points in the process of decision making, compare results, and then select the reference point that leads them to the better outcome.

5. DISCUSSION AND POLICY IMPLICATIONS

In this section we discuss the internal and external validity of our results, and possible policy implications of our research.

5.1. INTERNAL VALIDITY

Plott and Zeiler (2005, 2007, 2011) analyzed endowment effect studies, and identified methodological problems that can distort results and undermine internal validity. We designed our experiment to address the concerns they identify.

Our experimental design ensures that subjects in **Base** should trade their ticket unless they are biased by anticipated regret. The two lottery tickets the subjects could exchange were identical—with the same expected value and risk of loss. Trading earned the subjects a bonus of 25 €-Cent. Each subject received his original ticket through a random process: Laboratory subjects drew their own ticket and online participants were informed that the computer assigned the tickets randomly. The process ensured that subjects could not believe that the experimenter assigned them a more valuable ticket. Subjects also incurred the same transaction cost whether they kept or traded their ticket: in each case they had to actively select their choice. To avoid another source of error that Plott and Zeiler discuss, misperception and confusion, we did not employ a complex pricing or valuation mechanism (see Plott and Zeiler critiquing the Becker-Degroot-Marshak mechanism; Cason and Plott 2014). Instead, we presented subjects with a simple exchange of one entitlement for its economically identical counterpart plus a monetary bonus. We verified subjects’ comprehension with control questions. Our result that people exhibit the status quo bias in the **Base** condition is consistent with Isoni et al. (2011) who

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21 The finding of Arlen and Tontrup (2015) that subjects use agents and voting to mute anticipated regret suggests that they understand that people deciding through institutions are less likely to make decisions that are biased by anticipated regret.

22 Of course, this selection may be biased by the processing order. The order may influence how people perceive and how much weight they assign to the information during the rest of the evaluation.
also find that people exhibit a status quo bias after controlling for many confounds Plott and Zeiler describe.\(^\text{23}\)

In addition to attending to Plott and Zeiler’s critique of endowment effect studies, we addressed potential confounds specific to our experiment. Risk aversion should not influence subjects’ choice whether to trade or keep their tickets because both tickets have the same probability of losing the same prize.

We designed the Herding treatments as a clean test of our claims: first herding can change people’s reference point and shift their anticipated regret over losses to favor trading and second, that people refer to the choices of others strategically to improve their outcomes. To isolate people’s strategic motivation, we designed our treatments to eliminate other possible motivations for herding, such as the desire (1) to obtain social approval (see generally Thaler and Sunstein 2011, p. 54; Cialdini & Trost 1998, Krupka & Weber 2008), (2) to benefit from others’ expertise (see Thaler and Sunstein 2011, p. 54-55), or (3) to reduce cognitive costs (see Kahneman 2012). Subjects were aware that they could not obtain approval from others for their decisions because they knew that no other subject in their treatment or the prior treatment could observe or learn about their choices. Subjects also were aware they could not rely on others for expertise or superior knowledge because no other subject could know whether trading or keeping the ticket would lead to a better result. The lottery’s outcome was random, with each ticket having an equal probability of winning or losing. Our control questions confirmed that subjects understood that nobody could have better knowledge than they did. The decision making task was simple and subjects grasped it immediately so subjects should not have relied on others to save cognitive effort either. Indeed, the results of Herding with Focus on Keep demonstrate that subjects did not simply follow others to reduce cognitive costs. Finally, in Seek Information, we imposed an opportunity cost on subjects for accessing information to ensure that subjects did not obtain information either randomly or out of mere curiosity.

5.2. EXTERNAL VALIDITY

Our laboratory experiment places subjects in a stylized situation: Subjects can trade an unusual good, a lottery ticket, for an identical alternative good in strict anonymity. It is a one shot game. While we have shown before that this stylized design enables us to cleanly isolate the behavioral effects we report, we must address whether our results apply to decision-making outside the lab.

We decided to use lottery tickets for our exchange experiment instead of physical goods to provide a clean test of the impact of herding on anticipated regret. Participants cannot learn about the value of the goods from each other. By contrast when trading physical goods, participants may believe that other subjects have better knowledge about the true value of the good. Yet even though the good is unusual, we do not expect our subjects to make systematically different choices than they would when deciding over other standard entitlements whose future valuation is uncertain, such as material contract terms, legal settlements, stocks, or physical goods. People anticipate regret when they

\(^{23}\) For a critique of their results, which does not apply to our experiment, see Plott and Zeiler (2011).
make a decision where future outcomes could fall short of expectations. Lotteries make the uncertainty of their outcome salient. Therefore, although lotteries may seem to be more likely to trigger regret aversion than usual goods, in fact uncertainty about the future outcomes and value is characteristic of many transactions, such as the settlement of legal claims, the selection of material contract terms, and transactions of real and intellectual property. Anticipated regret can even distort trading over simple consumer goods whose market values may be relatively certain. People seem to resist trading at their true Willingness to Accept value when they anticipate feeling regret over making a bad deal compared to market prices. Expected regret induces people to insist on the assumed market price, even when they may not be able to sell for that price (see Weaver and Frederick 2012). All these choices can lead to salient losses and therefore trigger anticipated regret, just as the lottery tickets in our experiment. Indeed, evidence that investors hedge and contracting parties include terms to reduce and allocate losses from uncertain future events suggest that potential losses from these transactions are salient and considered by decision makers.

The use of lottery tickets also may have suppressed other driving factors of the status quo bias and the endowment effect, however. For example, endowment with a physical good might trigger a greater sense of attachment than possession of a lottery ticket (Tunçel and Kammitt 2014). Note that attachment differs from sentimental value. Sentimental value arises from a person’s relationship to the good and thus increases both Willingness to Accept and Willingness to Pay (see generally Korobkin 2014). For example, sentimental value will lead an individual to have a higher valuation for a house owned by her family for generations independently whether she owns the house or finds it owned by others. By contrast, attachment can be caused by endowment alone, and can bias people towards goods they own or possess. Attachment causes an individual to values a house more because she owns it. Yet even though the nature of the good should affect attachment, and thus the magnitude of the status quo bias, we do not expect attachment to weaken the validity of our results for two reasons. First, people’s sense of attachment, and its biasing effect, depends on their reference point. When individuals focus on their endowment and take the status quo as their reference point, the perceived benefits of the good are enhanced. People feel attached and exhibit a status quo bias. By contrast, professional traders who acquire goods to sell them, and thus have a reference point of trade, focus on the benefits of trading and not the benefits of the good. They are reported not to feel attached and do not exhibit a status quo bias (see List 2003). Thus, while it is true that the nature of the good can influence attachment, and affects the magnitude of the status quo bias, people should only experience attachment when they have a reference point of “keep.” Herding changes this reference point and enables decision makers to take a reference point of “trade.” Herding thus should not only affect regret but also attachment. Second, the results of Weaver and Frederick (2012, p. 699) seem to suggest that anticipated regret, not attachment, may be a primary driver of the status quo bias for physical goods as well (see Loomes and Sugden 1982; see generally Korobkin 2014). For example, Weaver and Frederick eliminate the disparity between subjects’ Willingness to Accept and Willingness to Pay for a pen through a manipulation that reduced the seller’s expected regret over making a bad deal compared to market prices.
In addition, subjects in our experiment are offered an unusual exchange: to trade one good whose value is purely monetary for an identical good of the exact same value plus a bonus. Subjects in our design, thus, have a strong reason to focus on the others’ choices because they faced the same decision and should likely have similar preferences over the goods’ only attribute, economic returns. When selecting between choices with more complex attributes, people may not be as confident that other decision makers will value those attributes the way they do. Thus, they might not focus as much on the choices of others as the subjects in our study did. Yet people who are motivated by regret aversion to seek information about the choices others have made may be able to identify people with similar preferences even when goods have multiple attributes. They can focus on those people who selected goods with the attributes they value as well. For example, automobile owners who place a high value on speed can focus on the choices of those who purchased sports cars; those who value safety can focus on the choices of those who purchased cars with high safety ratings.

Our experimental design that lets subjects exchange perfectly identical goods also makes it salient for subjects that regret aversion is biasing them against the optimal choice. Since the goods are identical, the bonus makes it salient which choice maximizes expected welfare absent regret. When people value an entitlement across multiple attributes, people who are biased by regret towards a suboptimal choice might try to avoid admitting their bias by defending their choice on other grounds. They may select a suboptimal choice to minimize regret, and then rationalize their decision by referring to the attributes that favor their choice. However, our results suggest that this response to the status quo bias is unlikely. People who are biased by regret need not select, and then rationalize, a suboptimal choice in order to minimize regret. We show that they are motivated and able to seek information on others’ decisions in order to both minimize regret and improve expected outcomes.

Yet in real environments the decision maker may not realize her bias at all: the reference point can affect both anticipated regret and people’s assessments of the expected value of each choice. When people are exchanging goods that are not identical there is a greater likelihood that their biased perception of benefits could cause them to conclude that their choice is optimal when it is not. Yet even when people are not aware of their bias, herding should be effective at reducing anticipated regret over making the optimal choice in markets dominated by professionals and businesses. People should focus on the majority and change their reference point, if the majority traded. As a consequence they should be biased towards the optimal trade. Nevertheless, people who fail to realize that they are biased may not engage in strategic herding. People will not actively seek information, if they believe incorrectly that they make an optimal choice: in their perception, herding cannot improve their expected outcome. Our strategic herding evidence shows that people can determine in spite of their bias that the alternative choice provides higher expected monetary welfare. However, when entitlements have multiple attributes, the reference point choice may bias the perceived benefits more.

The design of our herding treatments eliminates all other motivations individuals may have to consider the choices of others in their decision making process. In our
treatments, we asked subjects to decide in strict anonymity, unobserved by others, in order to eliminate the desire for social approval as a motivation to herd (e.g., Asch 1995). Our design also ensures that our subjects cannot learn to make a better choice from the decision the other participants made. Learning can be a strong motivation to herd, either because others have better information or because it enables the decision maker to save the cognitive effort needed to figure out the best choice (see generally Thaler and Sunstein 2008). Nevertheless, the decision making situation we put subjects in is not uncommon. People make many important decisions anonymously, free from social approval effects. For example, people decide anonymously when they transact online, through agents, or through shell companies; they also may be able to settle legal disputes in secret. Decision makers also face decisions where others are not better informed about their optimal choice.

On the other hand there are also many situations, such as the sale of real estate, where people’s choices are observable and may be affected by their desire for social approval (see Asch 1995), or where other people have expert knowledge the decision maker does not have. These alternative motivations to herd should not undermine the results of our Herding treatments. Indeed, they provide an additional reason to take the majority decision as the reference point choice, enabling the decision maker to make the same choice with less regret. But the motivations can have a downside: They can limit the decision maker’s ability to herd strategically and seek information only when her own choice would otherwise be suboptimal, but not access it, when she can make an optimal decision in expectations without it. For example, a desire for social approval could lead people to seek information because they want to fit in, even at the cost of giving up an otherwise optimal choice. The benefits of social approval will undermine strategic herding whenever they are so substantial that they exceed the perceived marginal benefit of selecting the optimal choice instead of the majority choice. Similarly, people who herd to obtain information might not block information optimally if they incorrectly conclude that others have additional knowledge about the decision they face. While subjects may seek information optimally in expectations considering their uncertainty in this situation, herding can cause information cascades and multiply decision errors should the majority make a suboptimal decision. Of course, herding will increase welfare if the others indeed know more and make superior decisions. We will discuss the implications of the limits of strategic herding in the policy section.

Finally, our study is a one shot game which does not give subjects the opportunity to learn from outcomes. In real environments, people are likely to make some decisions, such as trading a specific entitlement, repeatedly. This gives them an opportunity to learn. Thus, while we find a substantial status quo bias in our study, this result might dissipate if subjects were able to repeat the experiment. Yet empirical evidence contradicts this objection. List shows (2003) that learning effects are slim: the status quo bias persists even when people engage in repeat decisions. Repetition alone does not shift people’s

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24 In an experimental study Engelmann et al (2010) report that forced trades—that require people to part with the good at the end of the session—also increase trading. While Engelmann attributes the effect to learning about the process of trading, this result also is well explained by our theory. Forced trades shift subjects’ reference point to trade because subjects know that they necessarily will have to part with the good.
reference point. Repetition may reduce regret, but only when it leads people to take a different reference point, as happens with professional traders for example. Thus, we do not expect our results to change with repeat play alone. Note also that the one shot game is particularly representative of the trading behavior we are interested in: trading by non-professionals, as these are the decision makers most likely to exhibit a status quo bias (List 2003; see Arlen and Tontrup 2015).

5.3. POLICY IMPLICATIONS

The literature on behavioral law and economics has tended to focus on policy interventions to reduce the magnitude and negative welfare consequences of regret aversion, and the biases it causes, for example the status quo bias, the endowment effect, the sunk cost fallacy, choice referral, defensive decision making, and the zero risk bias. Scholars have proposed interventions such as shifting entitlement allocations and weakening people’s rights to their entitlements (e.g., Sunstein 1986; Coates and Subramanian 2000; Jolls et al. 1998; Korobkin 1998; McCaffery et al. 1995; Rachlinski and Jourden 1998; Buccafusco and Sprigman 2011; see generally Korobkin 2014).

The goal of our research program is different. We try to identify behavioral strategies that decision makers employ themselves to address regret aversion. These strategies can enhance the efficacy of private ordering. In Arlen and Tontrup (2015), we found that people can self-debias by deciding through institutions, such as agents or voting, that allow them to share decision making responsibility with others. When they share responsibility, they mute regret aversion. People are willing to pay to use these institutions because they can improve their outcomes and reduce the disutility of regret. In this article, we explore another behavioral strategy, herding. We have shown that, unlike voting and agency institutions, herding does not enable decision makers to make a decision unbiased by regret. Instead, it improves outcomes by shifting expected regret relieving the preferred choice and burdening the suboptimal choice instead.

Our theory and evidence suggest that people may use herding effectively to address regret aversion when deciding in social contexts such as markets. Markets regularly support strategic herding. First, they allow people to observe others’ choices in many social environments, either directly or online. For example, property owners can easily access offers or exchanges by other entitlement holders of real and personal property online on sites such as eBay, Edmunds, or Craigslist. Producers of intellectual property have access to trade journals, online forums, and advisors that provide information on transactions by other owners of similar entitlements. Information on existing and proposed contract terms and their adoption by others often is available through trade organizations (Bernstein 2015) and law firm memos. Thus, decision makers operating in today’s information-technology-based markets often easily learn the choices others have made.
Markets also enable decision makers to observe others who are less likely to be biased by anticipated regret: e.g., professional and repeat traders (List 2003) and those deciding through institutions like agents (Arlen and Tontrup 2015). Focusing on the choices of these market participants enables a biased decision maker to set her reference point at the choice she should expect to prefer were she unbiased. Our results demonstrate that decision makers can use herding effectively even when markets include both biased and unbiased market participants. We show that people presented with multiple groups of decision makers can strategically focus on the choice of the group that made the better decision. Thus, we expect people to be more likely to focus on the choice of professional traders and those deciding through agents.

Of course, people will not always be able to use herding effectively. Information costs may be too high. People may err in their assessment of the optimal choice and not refer to others when they should. They may also seek information when they should not because they are uncertain and believe others have more information. This may result in informational cascades, if the majority makes a suboptimal decision. On the other hand, strategic herding shows that decision makers are aware that relying on others’ choices can be a double-edged sword: People make behaviorally rational decisions to block information on how others decided because they anticipate a negative effect on their decision making. We need additional research to identify the domains where herding is an effective behavioral strategy.

Behavioral strategies, such as herding, warrant particular attention because they may complement, or even be superior to, external intervention. External interventions designed to alter outcome through mandates or influential defaults have to apply generally and cannot refer to the utility function of a particular individual. Thus, they may push some people towards a suboptimal choice (see Bubb and Pildes 2014). For example, people who would decide optimally absent intervention may be worse off with a new default if it is optimal on average but not optimal for them. The government-provided default is likely to bias their choices, which could make them worse off. By contrast, herding allows decision makers to use the choice of the majority strategically to reduce anticipated regret over selecting the choice that they expect to be optimal for them. They then can use their own preferences and information to determine whether this reference point is their optimal choice. Behavioral strategies may in particular be superior to intervention in dynamic environments. When markets are populated by professionals and businesses who can adapt quickly should the environment change, their decisions are likely better informed than the policymakers who may fail to adjust mandated reference points to new circumstances.

Thus, our results indicate the value of analyzing the adaptive decision making strategies that people employ to respond strategically to their biases. Understanding the effectiveness and limits of these strategies may enable policymakers to better determine when external intervention is needed and what form it should take. It also may allow policy makers to identify interventions that are designed specifically to complement the behavioral strategies people use. For example our study suggests the potential benefit of

26 Past studies that analyze herding did not give subjects strategic options to block information.
disclosure aimed at increasing market transparency, even when other market participants
are not better informed. In specific domains, transparency would allow people to obtain
information on others’ choices in order that they can use them strategically to change their
reference point and reduce regret. Standard disclosure proposals by contrast aim to provide
people with information about costs and benefits of potential choices. Further research may
be able discover additional behavioral strategies and identify complementary interventions
that enhance the functioning of private-ordering.

6. Conclusion

Regret aversion biases individual decision making across many domains. The bias
can reduce welfare because people experience regret as a source of disutility; it also can
deter individuals from making an optimal choice. We find that people can be aware when
regret biases them against a better choice. They can respond by employing behavioral
strategies to reduce anticipated regret over the choice they want to make. In some contexts,
people can use or decide within institutions that reduce the bias, enabling people to make a
rational choice (Arlen and Tontrup 2015). In others contexts, people employ strategies that
can enhance welfare, even though they do not debias.

We present evidence that people can use herding as a behavioral rational strategy to
overcome the negative impact of regret aversion. Our results show that herding allows
people to shift their bias by using the choices of others as their reference point. Focusing
on the optimal decision of an unbiased majority enables people to make the same choice
with less regret. We find that people can herd strategically. They obtain information on
others when they otherwise would be biased against their optimal choice. They block
information when their own reference point is optimal to avoid the risk of being biased by
others towards a suboptimal choice. When people are presented with multiple reference
points, for example different groups of market participants make opposing choices, they
strategically focus on the group that allows them to make the best choice.

Our analysis expands the scope of responses to behavioral biases, opening up paths
for both research and policy. Our approach of identifying behaviorally rational strategies
expands the scope of responses to behavioral biases, suggesting new paths for both
research and policy. It differs from “nudging.” Nudges use external intervention and often
operate behind the back of the decision maker. While they are designed to shift people’s
bias towards a better choice, they have to generalize what this better choice is and
generally cannot consider individual preferences or restrictions. By contrast, the strategies
we identify enable people to shift their bias themselves towards the choice they personally
prefer. People will employ these strategies only when regret aversion reduces their welfare
and they can improve their expected outcomes. Our approach also differs from government
interventions designed to debias. We find that debiasing is not necessary to improve
choices. Herding does not eliminate regret aversion; instead people shift their bias to favor
their preferred choice.

Future research should provide more evidence to determine the domains where
behavioral strategies can effectively substitute or complement government intervention to
overcome behavioral anomalies like regret aversion.
<table>
<thead>
<tr>
<th></th>
<th>Total N</th>
<th>Trade</th>
<th>Keep</th>
<th>Fisher test 2-tailed (compared to Base)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Laboratory Study</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base</td>
<td>64</td>
<td>19</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(29.7%)</td>
<td>(70.3%)</td>
<td></td>
</tr>
<tr>
<td>Herding</td>
<td>49</td>
<td>27</td>
<td>22</td>
<td><strong>p&lt;0.01</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(55.1%)</td>
<td>(44.9%)</td>
<td></td>
</tr>
<tr>
<td><strong>Online Study</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base</td>
<td>90</td>
<td>50</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(55.5%)</td>
<td>(44.4%)</td>
<td></td>
</tr>
<tr>
<td>Herding</td>
<td>82</td>
<td>59</td>
<td>23</td>
<td><em>p=0.02</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(72%)</td>
<td>(28%)</td>
<td></td>
</tr>
<tr>
<td>Base With Focus on Trade</td>
<td>65</td>
<td>49</td>
<td>16</td>
<td><em>p=0.01</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(75.3%)</td>
<td>(24.7%)</td>
<td>*p=0.70 (Herding)</td>
</tr>
<tr>
<td>Herding with Focus on Keep</td>
<td>63</td>
<td>32</td>
<td>31</td>
<td><em>p=0.62</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(50.7%)</td>
<td>(49.3%)</td>
<td><em>p=0.01</em>* (Herding)</td>
</tr>
<tr>
<td><strong>Strategic Herding</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple Reference Points</td>
<td>91</td>
<td>64</td>
<td>27</td>
<td><em>p=0.04</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(70.3%)</td>
<td>(29.7%)</td>
<td></td>
</tr>
<tr>
<td>Seek Information</td>
<td>64</td>
<td>50</td>
<td>14</td>
<td><strong>p=0.01</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(78.1%)</td>
<td>(21.9%)</td>
<td></td>
</tr>
<tr>
<td>Block Information</td>
<td>63</td>
<td>34</td>
<td>29</td>
<td><strong>p&lt;0.01</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(54%)</td>
<td>(46%)</td>
<td></td>
</tr>
</tbody>
</table>
### Table Two - Anticipated Regret

<table>
<thead>
<tr>
<th></th>
<th>Regret Trade</th>
<th>Regret Keep</th>
<th>P value trade vs. keep</th>
<th>Regret Difference (Trade-Keep)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base</strong></td>
<td>7.2</td>
<td>6.5</td>
<td>0.02*</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Herding</strong></td>
<td>5.12</td>
<td>6.40</td>
<td>&lt;0.01**</td>
<td>-1.28</td>
</tr>
<tr>
<td></td>
<td>0.01*</td>
<td>0.79</td>
<td>&lt;0.01**</td>
<td></td>
</tr>
<tr>
<td><strong>Base with Focus on Trade</strong></td>
<td>5.53</td>
<td>6.43</td>
<td>0.04*</td>
<td>-0.91</td>
</tr>
<tr>
<td></td>
<td>&lt;0.01**</td>
<td>0.88</td>
<td>&lt;0.01**</td>
<td>(0.37 – vs. Herding)</td>
</tr>
<tr>
<td><strong>Herding with Focus on Keep</strong></td>
<td>6.3</td>
<td>5.52</td>
<td>0.09*</td>
<td>0.78</td>
</tr>
<tr>
<td></td>
<td>0.02*</td>
<td>0.02*</td>
<td>(&lt;0.01** - vs. Herding)</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>(0.03* - vs. Herding)</td>
<td>(0.02* - vs. Herding)</td>
<td></td>
<td>(&lt;0.01** - vs. Herding)</td>
</tr>
<tr>
<td><strong>Multiple Reference Points</strong></td>
<td>4.9</td>
<td>6.23</td>
<td>p&lt;0.01**</td>
<td>-1.33</td>
</tr>
<tr>
<td></td>
<td>&lt;0.01**</td>
<td>0.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Seek Information</strong></td>
<td>5.49</td>
<td>7.52</td>
<td>&lt;0.01**</td>
<td>-1.58</td>
</tr>
<tr>
<td></td>
<td>&lt;0.01**</td>
<td>0.68 (vs. Base Regret Trade)</td>
<td>&lt;0.01** (0.49** - vs. Herding)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.04* - vs. Herding)</td>
<td>(=0.01** - vs. Herding)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Block Information</strong></td>
<td>7.11</td>
<td>6.03</td>
<td>&lt;0.01**</td>
<td>1.08</td>
</tr>
</tbody>
</table>

_P-values are two-tailed T-tests. We report two p-values: (1) Herding and Multiple Reference Points vs. Base; (2) the comparison of trade vs. keep for regret_
Table Three -
Regret Motivates Trading Choices

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Regret</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trade</td>
</tr>
<tr>
<td>Base</td>
<td>0.02*</td>
</tr>
<tr>
<td>Herding</td>
<td>&lt;0.01**</td>
</tr>
<tr>
<td>Base with Focus on Trade</td>
<td>0.13</td>
</tr>
<tr>
<td>Herding with Focus on Keep</td>
<td>0.02*</td>
</tr>
<tr>
<td>Multiple Reference Points</td>
<td>0.03*</td>
</tr>
<tr>
<td>Seek-Information</td>
<td>0.01*</td>
</tr>
<tr>
<td>Block-Information</td>
<td>1</td>
</tr>
</tbody>
</table>

Results logistic regression, p-values for dependent variable trade.

Table Four - Strategic Herding: Seek and Block Information

Table Five

| All p-values are two-tailed Fisher tests. |

Table Five - Strategic Motivation:
Amount by Which Seek or Block Information Reduces Regret over Optimal Choice

<table>
<thead>
<tr>
<th>Regret – Subjects who seek Info (Regret trade with Info – trade without Info)</th>
<th>Regret – Subjects who reject Info (Regret trade with Info – trade without Info)</th>
<th>p-value Impact Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seek Info (25 €-cent for Trading)</td>
<td>-2.26</td>
<td>-1.09</td>
</tr>
<tr>
<td>Block Info (25 €-cent for Keeping)</td>
<td>-1.83</td>
<td>-0.44</td>
</tr>
</tbody>
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References


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Zeelenberg, Marcel and Rik Pieters (2004), Consequences of Regret Aversion in Real Life: The Case of the Dutch Postcode Lottery, Organizational Behavior and Human Decision Process 93, 155-68.
