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# Betting Your Favorite to Win: Costly Reluctance to Hedge Desired Outcomes

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**Abstract.** We examined whether people reduce the impact of negative outcomes through *emotional hedging*—betting against the occurrence of desired outcomes. We found substantial reluctance to bet against the success of preferred U.S. presidential candidates and Major League Baseball, National Football League, National Collegiate Athletic Association (NCAA) basketball, and NCAA hockey teams. This reluctance was not attributable to optimism or a general aversion to hedging. Reluctance to hedge desired outcomes stemmed from identity signaling, a desire to preserve an important aspect of the bettor's identity. Reluctance to hedge occurred when the diagnostic cost of the negative self-signal that hedging would produce outweighed the pecuniary rewards associated with hedging. Participants readily accepted hedges and pure gambles with no diagnostic costs. They also more readily accepted hedges with diagnostic costs when the pecuniary rewards associated with those hedges were greater. Reluctance to hedge identity-relevant outcomes produced two anomalies in decision making, risk seeking and dominance violations. More than 45% of NCAA fans in Studies 5 and 6, for instance, turned down a "free" real $5 bet against their team. The results elucidate anomalous decisions in which people exhibit disloyalty aversion, forgoing personal rewards that would conflict with their loyalties and commitments to others, beliefs, and ideals.

**History:** Accepted by Yuval Rottenstreich, judgment and decision making.

**Keywords:** hedging • self-signaling • risk • identity • emotions

Hedging is a strategy whereby one makes an investment to offset a potential loss in a companion investment (Smith and Stulz 1985). Many consequential financial decisions involve hedging, including the diversification of equity and currency portfolios in financial investments and the purchase of medical, home, auto, and life insurance for oneself and one's family. We examine whether, as with financial losses, people are inclined to hedge the negative emotions that would be induced by uncertain, negative future outcomes that are associated with important aspects of their identity (e.g., a group, person, or position with which they identify). To minimize the emotional disappointment incurred by the loss of her favorite team, for example, a fan could make an emotional hedge. She could bet that her team will *lose* its next game. If the team loses, her disappointment would be reduced by the payout of the gamble. If her team wins, she would lose an amount of money that she might gladly forgo for it to win.

Specifically, we test whether people will seek emotional hedges to offset the potential disappointment of an undesirable future outcome for an identity-relevant target. We believe they will not. In contrast to standard utility models positing that people should enact hedging as a utility-maximizing strategy, we suggest that the identity relevance of desired outcomes introduces a disincentive to hedge. People should be reluctant to hedge desired outcomes because of the motivational conflict hedging would induce. In economic terms, hedging requires a decision maker to trade off the potential gains in utility associated with the payout of the hedge (i.e., outcome utility) against the negative self-signal about her identity that hedging would produce (i.e., its diagnostic cost).

Most accounts of standard expected utility theory suggest that if the utility of gambles and the outcomes determining those gambles are integrated, people should prefer to hedge emotional disappointment. A strategy of betting on desired outcomes increases the variance of possible outcomes. Specifically, it maximizes gains if the desired outcome occurs but also maximizes losses if the desired outcome does not occur. By contrast, a strategy of hedging a desired outcome decreases potential variance. It minimizes gains if the desired outcome occurs but also minimizes losses if the desired outcome does not occur. In the case of car insurance, people readily accept a pure loss (their

insurance payment) to reduce the magnitude of a possible greater financial loss due to an accident (the value of their car and liabilities). Standard utility theories assume a concave utility function (i.e., diminishing marginal utility), which predicts that people will prefer to minimize the risk of potential losses rather than maximize potential gains and should bet against rather than on desired outcomes (e.g., Bernoulli 1954, Fischer et al. 1986, von Neumann and Morgenstern 1944, von Winterfeldt and Edwards 1986).[1]

There are two reasons why people could be reluctant to hedge desired outcomes. One is that people do not like to anticipate undesirable outcomes and may engage in various motivated processes that lead to inflated estimates of the likelihood of desirable outcomes (Baker and Emery 1993, Hoch 1985, Massey et al. 2011, Simmons and Massey 2012; cf. Krizan and Windschitl 2007). Consequently, these motivated processes may inflate the perceived expected value of desired events (e.g., Levitt 2004, Simmons and Nelson 2006). If these motivated processes make desired outcomes appear to be the most likely outcome, people may prefer to bet on desired outcomes because people exhibit a preference for betting on more likely outcomes (e.g., Lichtenstein and Slovic 1973). However, we suggest that even if people are offered a very generous payout that accounts for these biases and preferences, they will be unlikely to bet against a desired outcome. This is because accepting a hedge creates an uncomfortable conflict between identity- and outcome-oriented motives (diagnostic utility and outcome utility, respectively).

From a psychological perspective, hedging creates an interdependence dilemma—a motivational conflict between a short-term monetary gain and the long-term benefits accrued from feelings of identification with and loyalty to a position, person, or group whom the bettor desires to succeed (Hogg et al. 2004, Kelley and Thibaut 1978, Van Lange et al. 1997). From the perspective of balance theory (Heider 1958), psychological conflict arises as a result of an imbalanced triadic relationship in which there is a negative relationship between a desired outcome (e.g., a preferred candidate or team winning) and a reward (e.g., pecuniary benefits of hedging) that are both positively related to the self. The experience of motivational conflict induces considerable negative affect (Heider 1958). Numerous demonstrations of cognitive dissonance illustrate how people change their cognitions, beliefs, and behaviors to avoid internal motivational conflict (Harmon-Jones 2000). Similarly, people exhibit arousal in response to difficult decisions and often defer them to avoid the negative feelings conflict engenders (e.g., Anderson 2003, Krosch et al. 2012, Shafir and LeBoeuf 2004).

Interdependence dilemmas usually occur in reciprocal relationships where commitment is two-sided. In a two-sided interaction, acting in a disloyal way to another party might lead that party to react unfavorably (e.g., retaliate, withdraw from the relationship, express disappointment). We propose that even in one-sided relationships where there is no potential for positive or negative reciprocation (e.g., a candidate or team is unlikely to notice the action of an individual supporter or fan), the desire to avoid motivational conflict will induce a reluctance to hedge identity-relevant outcomes. People will reject gambles that they would otherwise accept if there were no loyalty conflict. Only when the short-term rewards are sufficiently high to outweigh the diagnostic costs will people compromise their feelings of loyalty and commitment (Powell and Van Vugt 2003).

In economic terms, this conflicted decision can be modeled as a trade-off between the outcome utility gained by hedging (e.g., money) and the diagnostic costs it incurs (e.g., disloyalty; Bodner and Prelec 2003). People make inferences about their beliefs and identity from their behavior (e.g., Bem 1972, Goffman 1959). If a person is uncertain about an aspect of her identity, such as the extent to which she values a candidate or team, hedging may signal to her that she is not as committed to that candidate or team as she originally believed. If the diagnostic cost of this self-signal and the resulting identity change are substantial, it may outweigh the outcome utility of hedging, and she may reject even very generous hedges.

Both investments made by private and professional investors and gambles made by National Football League (NFL) fans provide tentative evidence that people are reluctant to hedge identity-relevant outcomes. Private and professional investors exhibit underdiversification in their investment strategies. They overinvest in familiar assets from their own country, geographic region, and company stock, despite considerable evidence suggesting this is a suboptimal strategy (Foad 2010). Displaying an equity home bias, a typical portfolio of American investors in 1987 was predominantly (87.2%) composed of domestic equities despite the United States only commanding 43.1% of world market capitalization (Cooper and Kaplanis 1994). Similar overinvestment in domestic assets is observed in currency holdings. Most troubling is the considerable overinvestment by individual investors in company stock. They risk losing both their job and a large portion of their investments if their company becomes bankrupt. The importance of this problem is illustrated by the case of Enron, whose 21,000 employees' 401(k) plans were primarily (62%) composed of Enron stock when it failed (Benartzi et al. 2007). In addition to greater comparative ignorance regarding unfamiliar assets, these familiarity and equity home biases have been linked to psychological identification with countries and firms (Foad 2010). Reported national pride is positively correlated

with home bias (Morse and Shive 2011). Experiments in minimal group settings show that investors prefer funds linked to their social identity (Fellner and Maciejovsky 2003).

Evidence suggests NFL fans may be similarly reluctant to hedge identity-relevant outcomes. In one study, 76% of fans of underdog teams preferred to bet $50 that their team would win at even odds, despite a consensus of professional bookmakers agreeing that their team would lose (Simmons and Massey 2012). These gambles suggest that reluctance to hedge desired outcomes is not due to a moral aversion to profit from the suffering of others (Inbar et al. 2012). Games, tournaments, and elections are structured so that suffering is inevitable. One side must win and the others must lose. Fans are perfectly willing to bet on the success of their team, which is contingent on the suffering and misfortune of its opponents. We predict that it is only from the suffering and misfortune of their own team that fans will be reluctant to benefit.

As we will show, reluctance to hedge desired outcomes produces two notable anomalies in decision making: risk-seeking behavior and a preference for financially and materially inferior options. Decision makers who are reluctant to hedge exhibit risk-seeking behavior for mixed gambles. They prefer to maximize potential gains and losses by betting on desired outcomes, rather than minimizing potential gains and losses by betting against them. Reluctance to hedge also leads decision makers to violate a basic principle of rationality by preferring dominated alternatives. They may prefer an option guaranteeing them no reward (e.g., $0) to an option rewarding them (e.g., >$0) if an undesired outcome occurs.

### Overview of Studies

We tested whether people are reluctant to bet against desired outcomes among voters participating in U.S. presidential elections (Studies 1 and 2), Major League Baseball (MLB) baseball fans (Study 3), NFL football fans (Study 4), National Collegiate Athletic Association (NCAA) basketball fans (Study 5), and NCAA hockey fans (Study 6). We examined whether people would be reluctant to hedge when we controlled for wishful thinking by equating the expected value of hedging and not hedging using participants' own subjective probability estimates (Study 1), equating the subjective probabilities and payouts of desired and neutral outcomes (Studies 2 and 3), and equating the objective probabilities of desired and neutral outcomes (Study 4). We examined whether people would be reluctant to hedge when hedging dominated its alternative in real choices (Studies 4–6). We also tested whether the reluctance to hedge depended on the type of reward offered (i.e., money or consumer goods; Study 5) or merely reflected a more general aversion to hedging or preference for betting on likely outcomes (Study 2).

We tested our theoretical account of reluctance to hedge in four ways. First, we examined whether people would be more reluctant to hedge desired outcomes with higher diagnostic costs than similar neutral outcomes with lower diagnostic costs (Studies 2–4). Second, we examined whether increasing the outcome utility associated with hedging (i.e., its payout) would reduce the reluctance to hedge (Study 4). Third, we tested whether individual differences in the perceived diagnostic cost of hedging a desired outcome would determine reluctance to hedge it (Study 5). Fourth, we examined whether reducing the diagnostic cost of hedging a desired outcome would reduce the reluctance to hedge that outcome (Study 6).

We report how we determined our sample sizes, all data exclusions (if any), all manipulations, and all measures in the studies we report. All study materials and data can be accessed through the Open Science Framework (https://osf.io/p2gj6).

## Study 1: Hedging Against Expected Value

We first examined hedging behavior by offering MBA students a real bet on the 2000 U.S. presidential election. We calibrated bets to their personal beliefs about which candidate would win by first eliciting individual probability estimates of the election from each participant. We then used these estimates to offer each participant a choice of personalized bets on her preferred candidate or his opponent to win, with equal expected value. This allowed us to account for any optimistic bias in the value of bets. We expected that participants would still be reluctant to bet against their preferred candidate, even though the structure of the bets they were offered controlled for their personal (optimistic) beliefs about the outcome of the election.

### Method

**Participants and Exclusions.** One week before the 2000 U.S. presidential election, 111 MBA students participated in a two-part class exercise on October 30, 2000. Participants first reported their preferred 2000 U.S. presidential candidate of the four listed on our survey: 45.9% preferred George W. Bush, 44.1% preferred Al Gore, 3.6% preferred Ralph Nader, and 0.9% preferred Pat Buchanan, and 5.4% had no preference.

Eleven participants did not indicate a preference for either Bush or Gore and were excluded from all further analyses. One participant did not respond to the loyalty concern questions and was excluded from the mediation analysis. No demographic information was collected.

**Procedure.** In the first part of the class exercise, participants first indicated which of four presidential candidates they preferred in a paper survey: Bush, Gore, Nader, or Buchanan. Next, participants reported the strength of their preference for their preferred candidate on a nine-point scale with endpoints of very weak (1) and very strong (9). To control for wishful thinking, participants then indicated the probability that each candidate (i.e., Bush, Gore, Buchanan, and Nader) would win the election from 0% to 100%.

In the second part of the class exercise, each participant was given a new sheet of paper offering paired gambles for Bush and Gore to win the election, tailored to her probability estimates. To control for optimistic bias, the bets offered for each candidate to win were adjusted so that each had an expected value of \$7.50. For example, if a participant believed Bush had a 75% chance of winning the election and Gore had a 25% chance of winning, her paired gamble would be a choice between the bets (a) earn \$10 if Bush wins and \$0 if Gore wins and (b) earn \$30 if Gore wins and \$0 if Bush wins. Participants were matched from the first part to the second via the last four digits of their student identification numbers.

All participants chose whether to bet on Bush or Gore to win the election, and then they answered six questions about the motives for their choice of bet on seven-point scales with endpoints of disagree strongly (1) and agree strongly (7). The questions were designed to capture a range of plausible motivations under risky choice. Two items measured preferences for probability or payment: "I wanted to choose the option with the highest chances of winning money" and "I wanted to choose the option that paid the most money" ($r = 0.09$, ns). Two insurance motive items measured explicit awareness of a hedging strategy: "I wanted to insure myself against a bad election outcome" and "I wanted to be sure to have something to be happy about—either winning money or having my candidate win" ($r = 0.58$, $p < 0.05$). Most important, two items measured loyalty to the preferred candidate: "I wanted to be loyal" and "I would not enjoy money that I received if the opposing candidate won" ($r = 0.51$, $p < 0.01$). If participants chose Bush, they received payouts after the U.S. Supreme Court determined the outcome of the election.

## Results

**Optimistic Bias.** Participants were slightly optimistic with respect to the perceived probability that their preferred candidate would win. On average, Bush supporters believed that Bush had a 53.5% chance of winning (and Gore a 45.0% chance), whereas Gore supporters believed that Bush had a 50.7% chance (and Gore a 48.6% chance), but these differences were not significant ($p$'s $> 0.08$).

**Hedging and Loyalty.** As predicted, a majority of participants (74%) rejected an opportunity to hedge and bet on their preferred candidate to win, a proportion significantly greater than 50% (binomial $z = 4.70$, $p < 0.001$) (see Table 1). We next used logistic regression to examine betting on the preferred candidate to win as a function of strength of preference for the preferred candidate and the perceived probability of his success (converted to log odds). Not surprisingly, the perceived odds of the candidate winning significantly predicted betting him to win (B = 4.62, SE = 2.08, $\chi^2 = 4.95$, $p < 0.03$). More important, even after controlling for perceived odds, the strength of support for the preferred candidate predicted the likelihood that participants would bet on him to win (B = 0.27, SE = 0.13, $\chi^2 = 3.97$, $p < 0.05$).

**Table 1.** Frequency of Betting Against the Focal Outcome (e.g., Hedging) by Type of Gamble, and Its Expected Value Relative to Betting on the Focal Outcome, in Studies 1–6

| Gamble | EV | Identity-relevant hedge (%) | Pure gamble (%) | Identity-irrelevant hedge (%) |
|---|---|---|---|---|
| Study 1: 2000 U.S. presidential election | = | 26.0 | | |
| Study 2: 2016 U.S. presidential election | | | | |
| All focal outcomes | = | 14.0[a] | 44.6[b] | 39.0[b] |
| Unlikely focal outcomes ($p = 0.40$) | = | 16.0[a] | 70.0[b] | 64.0[b] |
| Likely focal outcomes ($p = 0.60$) | = | 12.0[a] | 19.6[a] | 14.0[a] |
| Study 3: 2015 MLB game | > | 52.0[a] | 66.0[b] | |
| Study 4: 2010 NFL games (means) | | | | |
| Fans | < | 22.3[a] | 42.0[b] | |
| Nonfans | < | 41.7[a] | 46.1[a] | |
| Study 5: 2013 NCAA men's basketball | ∞ > | 53.9 | | |
| Study 6: 2015 NCAA men's hockey | ∞ > | 40.9[a] | | 95.0[b] |

*Notes.* Different superscripts within rows indicate significant differences between conditions ($p < 0.05$) with $\chi^2$ (Studies 2, 3, and 6) or $F$ (Study 4). Expected values for gambles of all types were matched within studies. Expected values of bets against the focal outcome (EV) were equal to those of bets on the focal outcome in Studies 1 and 2, were (on average) greater than those in Studies 3, 5, and 6, and were (on average) less than those in Study 4.

Ratings following the choice suggest that conflicting motives were the source of the reluctance to hedge. Of the 99 participants reporting loyalty concerns, those who rejected a hedge reported having more loyalty concerns for their preferred candidate (M = 5.29, SD = 2.92) than did participants who hedged against him (M = 2.16, SD = 1.15) ($t(97) = 5.22$, $p < 0.001$). To test whether loyalty concerns mediated the influence of preference strength on the reluctance to hedge, we used the PROCESS macro for SPSS (Hayes 2013) to test the indirect pathway from support to loyalty concerns to the betting decision (Model 4 with 5,000 bootstrapped samples) and found a significant indirect path (95% confidence interval (CI) = 0.12, 0.66). To test loyalty against the other two motives, we entered the hedging strategy items, the option to win the most money item, and the option with the highest chance of winning as covariates into the model. The loyalty mediation remained significant (95% CI = 0.10, 0.75). Finally, entering all motives in the model resulted in only loyalty predicting hedging behavior (95% CI = 0.13, 0.79) and not insurance (95% CI = −0.25, 0.03), greatest profit (95% CI = −0.07, 0.18), or greatest chance (95% = −0.06, 0.04).

### Discussion

A majority of participants were reluctant to hedge an identity-relevant outcome. Rather than betting against their preferred candidate, most participants bet on their preferred candidate to win. Thus, participants maximized rather than minimized risk when making incentive-compatible choices between gambles. This was true even though the expected value of the bets accounted for any optimism in their subjective probability estimates. In other words, participants were not simply reluctant to hedge against their preferred candidate because they thought he would win. As evidence that identity signaling underlay their reluctance to hedge, that reluctance increased with their support for the candidate and was only mediated by loyalty concerns. It appears that the greater the diagnostic cost associated with hedging, the less likely participants were to bet their preferred candidate to lose the election.

## Study 2: Hedging Identity-Relevant and Identity-Irrelevant Outcomes

In Study 2, we decoupled identity relevance and hedging to differentiate reluctance to hedge identity-relevant outcomes from a more general reluctance to hedge any outcome. We did so by adding a condition in which participants could hedge an outcome that was not relevant to their identity. All participants indicated their preference between two candidates in the 2016 U.S. presidential election (i.e., Hillary Clinton and Donald Trump), the strength of their preference, and their *cash equivalent* for that candidate to be elected—how much money they would have to receive right then to be as happy as if their candidate won the election. We then asked participants to choose between two hypothetical bets of equal expected value ($100): a bet on a focal outcome or a bet on its alternative.

We manipulated two factors: whether the focal outcome was more ($p = 0.60$) or less ($p = 0.40$) likely than chance, and whether the bets included an identity-relevant hedge, an identity-irrelevant hedge, or only pure gambles. In the *identity-relevant hedging* condition, participants chose between a bet on their preferred candidate to win the election and a bet on his or her opponent to win the election. In an *identity-irrelevant hedging* condition, participants imagined they stood to earn the amount of money they stated as their cash equivalent if a wheel of fortune landed on black instead of white. This procedure equated the emotional benefits in the identity-relevant hedge to its dollar equivalent in the identity-irrelevant hedge. In an additional gamble on that spin, they then chose whether to double down on the first gamble by betting on black or to hedge that first gamble by betting on white. In an *identity-irrelevant pure gamble* condition, participants simply chose whether to bet on black or white in a spin of a wheel of fortune (as in the identity-irrelevant hedging condition, but without the cash-equivalent gamble).

Our theory suggests that reluctance to hedge should be driven by the identity relevance of the outcome rather than a general aversion to hedging. In other words, participants should be more reluctant to accept an identity-relevant hedge than an equivalent identity-irrelevant hedge, whether or not participants were more reluctant to accept an identity-irrelevant hedge than an equivalent pure gamble.

### Method

**Participants and Exclusions.** Three hundred and two residents of the United States (151 women, $M_{age} = 35.84$, SD = 12.44) were recruited from Amazon Mechanical Turk (AMT) on August 4, 2016, to participate in a study on the 2016 U.S. presidential election.

Sample size was set on AMT in advance to 300 participants; 301 completed the experiment. All participants had an AMT approval rating equal to or higher than 95%. One participant who did not complete the experiment was excluded.

**Procedure.** All participants first indicated whether they preferred Hillary Clinton or Donald Trump to be elected president of the United States of America on November 8, 2016. They then indicated the extent to which they preferred that candidate to his or her opponent on a five-point scale with endpoints of no more (1) and very much more (5). Third, participants indicated how much money they would have to earn right then

as a bonus payment to be as happy as they would be on November 8, 2016 if their candidate won the upcoming 2016 election and was elected president of the United States of America. This amount served as their cash equivalent for that outcome.

Participants were then randomly assigned between subjects to consider one of three gambles: an identity-relevant hedge, an identity-irrelevant hedge, or an identity-irrelevant pure gamble (see Table 2 for examples). In the identity-relevant hedge condition, participants imagined that on the morning of the election they believed their candidate had a 60% chance of winning the election (likely condition) or a 40% chance of winning the election (unlikely condition). Perceived likelihood of winning was represented by the shaded region on a pie graph and was randomly assigned between subjects. Participants in the identity-relevant hedging condition then indicated which of two bets they would prefer: a bet for their candidate to win the election or a bet for his or her opponent to win the election. Each option had an expected value of $100 such that in the likely condition, the bets were a 60% chance to earn $167 if a participant's candidate wins (i.e., $\$167 \times 0.60 = \$100$ EV) and a 40% chance to earn $250 if his or her opponent wins (i.e., $\$250 \times 0.40 = \$100$ EV). In the unlikely condition, the bets were a 40% chance to earn $250 if a participant's candidate wins and a 60% chance to earn $167 if his or her opponent wins. Participants were told they would earn $0 if the outcome they chose did not occur. If participants chose to bet on their candidate to win, their response was coded as not hedging (coded as 0; betting on the focal outcome), and if they chose to bet on his or her opponent to win, their response was coded as hedging (coded as 1; betting against the focal outcome).

Participants in the identity-irrelevant hedge condition were shown a black-and-white pie chart representing a wheel of fortune and imagined that they had a 60% chance (or 40% chance) to win the cash equivalent if the spin of an arrow on that wheel of fortune landed on black. For example, if a participant in the unlikely condition said her cash equivalent for her preferred candidate winning the election was $700, she would see, "Imagine you have a 40% chance to win $700 if an arrow on a wheel of fortune randomly lands on BLACK [not white]." These participants then imagined that they were offered an additional, separate bet on the same spin of the wheel of fortune—this being the critical dependent variable that measured identity-irrelevant hedging. In this additional bet, they could choose to bet that the arrow would land on black or white. Each option had an expected value of $100 such that in the likely condition, the bets were a 60% chance to earn $167 if black wins ($\$167 \times 0.60 = \$100$ EV) and

**Table 2.** Example of Bets Offered by Gamble and Likelihood Conditions in Study 2

| | Unlikely condition | Likely condition |
|---|---|---|
| **Identity-relevant hedge** | | |
| | Imagine that on the morning of the election, you believed Hillary Clinton had a 40% chance of winning. | Imagine that on the morning of the election, you believed Hillary Clinton had a 60% chance of winning. |
| *Bet on focal outcome*: Bet preferred candidate to win the election. | • A 40% chance to earn $250 if Clinton wins.<br>• Earn $0 if Clinton loses. | • A 60% chance to earn $167 if Clinton wins.<br>• Earn $0 if Clinton loses. |
| *Bet against focal outcome*: Bet opposing candidate to win the election. | • A 60% chance to earn $167 if Trump wins.<br>• Earn $0 if Trump loses. | • A 40% chance to earn $250 if Trump wins.<br>• Earn $0 if Trump loses. |
| **Identity-irrelevant hedge** | | |
| | Imagine you have a 40% chance to win $500 if the arrow lands on black. | Imagine you have a 60% chance to win $500 if the arrow lands on black. |
| *Bet on focal outcome*: Second bet that the arrow lands on black. | • A 40% chance to earn an additional $250 if black.<br>• Earn $0 if white. | • A 60% chance to earn an additional $167 if black.<br>• Earn $0 if white. |
| *Bet against focal outcome*: Second bet that the arrow lands on white. | • A 60% chance to earn an additional $167 if white.<br>• Earn $0 if black. | • A 40% chance to earn an additional $250 if white.<br>• Earn $0 if black |
| **Identity-irrelevant pure gamble** | | |
| | Imagine you are now offered a bet on the wheel of fortune below. An arrow will spin around it and then randomly land on one of two colors, black (40%) or white (60%). | Imagine you are now offered a bet on the wheel of fortune below. An arrow will spin around it and then randomly land on one of two colors, black (60%) or white (40%). |
| *Bet on focal outcome*: Bet that the arrow lands on black | • A 40% chance to earn $250 if black.<br>• Earn $0 if white. | • A 60% chance to earn $167 if black.<br>• Earn $0 if white. |
| *Bet against focal outcome*: Bet that the arrow lands on white | • A 60% chance to earn $167 if white.<br>• Earn $0 if black. | • A 40% chance to earn $250 if white.<br>• Earn $0 if black |

a 40% chance to earn \$250 if white wins (\$250 × 0.40 = \$100). In the unlikely condition, the bets were a 40% chance to earn \$250 if black wins (\$250 × 0.40 = \$100 EV) and a 60% chance to earn \$167 if white wins (\$167 × 0.60 = \$100). If participants chose to bet on black, their response was coded as not hedging (coded as 0; betting on the focal outcome), and if they chose to bet on white, their response was coded as hedging (coded as 1; betting against the focal outcome).

In the identity-irrelevant pure gamble condition, participants saw a black-and-white pie chart representing a wheel of fortune and were told an arrow would randomly land on one of two colors, black or white. In the likely condition, the payouts and odds were a 60% chance to earn \$167 if black wins and a 40% chance to earn \$250 if white wins. In the unlikely condition, the payouts and odds were a 40% chance to earn \$250 if black wins and a 60% chance to earn \$167 if white wins. To compare betting preferences to the two hedging conditions, if participants chose to bet on black, their response was coded as 0 (betting on the focal outcome), and if they chose to bet on white, their response was coded as 1 (betting against the focal outcome).

For the purposes of clarity, the three conditions and bets offered are summarized in Table 2. At the end of the study, all participants reported their age and gender, and they again reported their preferred candidate as an attention check.

## Results and Discussion

**Candidate Preferences and Cash Equivalents.** Of the 301 participants, 68.1% preferred Clinton and 31.9% preferred Trump to win. Relative to the indifference point (i.e., 1), participants exhibited a significant preference for their preferred candidate to win the election (M = 4.05, SD = 1.33) ($t(301) = 39.77$, $p < 0.001$). Cash equivalents were nonnormally distributed with a positive skew and long tail (mean = \$70,873.17; median = \$20.00; mode = \$5.00; 25th percentile = \$4.50, 75th percentile = \$500.00).

**Betting Behavior.** Frequencies of bets by condition are presented in Table 1. We examined differences in betting behavior on the focal outcome with a logistic regression coded with three dummy variables for likelihood (0 = unlikely, 1 = likely), pure gamble (0 = identity-relevant hedge, 0 = identity-irrelevant hedge, 1 = identity-irrelevant pure gamble), and identity-irrelevant hedge (0 = identity-relevant hedge, 1 = identity-irrelevant hedge, 0 = identity-irrelevant pure gamble). The identity-relevant hedge was the omitted category. We then included two interactions in the second step of the model, pure gamble × likelihood and identity irrelevant × likelihood.

The initial regression model tested only main effects. The model revealed a main effect of probability, where people were less likely to bet against the focal outcome when its probability was high (B = −1.90, SE = 0.30, $\chi^2 = 40.79$, Exp(B) = 0.15, $p < 0.001$), and a main effect of pure gamble (B = 1.87, SE = 0.38, $\chi^2 = 23.91$, Exp(B) = 6.46, $p < 0.001$), indicating that people were less likely to bet against the focal outcome when they made an identity-relevant hedge than when they made a pure gamble. Importantly, there was also a main effect of identity irrelevance (B = 1.57, SE = 0.38, $\chi^2 = 17.11$, Exp(B) = 4.82, $p < 0.001$), indicating that people were less likely to bet against the focal outcome when they made an identity-relevant hedge than when they made an identity-irrelevant hedge.

A second model added two interaction terms, which were both significant: a pure gamble × likelihood interaction (B = −1.92, SE = 0.75, $\chi^2 = 6.64$, Exp(B) = 0.15, $p = 0.010$) and an identity irrelevance × likelihood interaction (B = −2.06, SE = 0.77, $\chi^2 = 7.15$, Exp(B) = 0.13, $p = 0.007$). We thus turned to the simple effects in the output, which reveal how the two dummy variables (pure gamble and identity-irrelevant hedge) compare to the omitted category (identity-relevant hedge) in the *low-probability* condition (Irwin and McClelland 2001). Within the low-probability condition, participants were significantly more likely to bet against the focal outcome in the pure gamble condition than in the identity-relevant hedge condition (B = 2.51, SE = 0.49, $\chi^2 = 25.72$, Exp(B) = 12.25, $p < 0.001$). Importantly, they were also more likely to accept an identity-irrelevant hedge than an identity-relevant hedge (B = 2.23, SE = 0.49, $\chi^2 = 21.17$, Exp(B) = 9.33, $p < 0.001$).

We also reverse-coded the high-probability condition as 0 and examined the simple effects of the hedging conditions when the preferred candidate's probability of winning was high. We found that the identity-relevant condition did not differ significantly from the identity-irrelevant condition (B = 0.18, SE = 0.60, $\chi^2 = 0.09$, $p = 0.77$) or the pure gamble condition (B = 0.58, SE = 0.56, $\chi^2 = 1.08$, $p = 0.30$). These results suggest that when the probability of the focal outcome was high, participants showed a similar level of risk aversion in the identity-relevant hedge condition as in the identity-irrelevant hedge condition and the pure gamble condition.

Additional analyses examining preference strength for the preferred candidate as an individual predictor on hedging in the identity-relevant hedge condition revealed that preference strength for the preferred candidate did predict reluctance to hedge the election (B = −0.813, SE = 0.241, $\chi^2 = 11.374$, Exp(B) = 0.44, $p = 0.001$). Preference strength did not predict hedging against the cash-equivalent gamble or betting against the focal outcome in the pure gamble condition (all B's < −0.07, all $p$'s > 0.67). The results on betting behavior remained the same, controlling for preference strength.

### Discussion

Participants were most reluctant to bet against their preferred presidential candidate—to hedge the identity-relevant outcome. By contrast, participants were just as willing to accept an identity-irrelevant hedge as an equivalent pure gamble. Participants were no less likely to hedge against a gamble paying the cash equivalent of their candidate winning the election as they were to place the equivalent bet in a pure gamble. These results suggest that the reluctance to hedge is unique to identity-relevant outcomes, that people do not have a more general aversion to hedging.

It is important to note, however, that these analyses only found reluctance to hedge identity-relevant outcomes when focal outcomes were unlikely. When focal outcomes were likely, we presume that the preference for betting on likely events (e.g., Levitt 2004, Lichtenstein and Slovic 1973, Simmons and Nelson 2006) made betting on the focal outcome too attractive in all cases, to differentiate betting on likely outcomes from reluctance to hedge identity-relevant outcomes. In Study 3, we tested whether the reluctance to hedge identity-relevant outcomes is true when the focal outcome is likely by making bets on likely focal outcomes less attractive (i.e., reduced their expected value). We then compared the propensity to accept generous identity-relevant hedges and similar pure gambles.

## Study 3: Likely Identity-Relevant vs. Identity-Irrelevant Gambles

In Study 3, we examined whether people are reluctant to hedge likely identity-relevant outcomes. We asked MLB fans outside Fenway Park about the Red Sox's chance of winning their game that day, assuming that most fans would believe their team would win. We then compared their preference for bets on that game and on a nondiagnostic gamble with the same odds and payouts (i.e., the spin of a wheel of fortune). This allowed us to compare identity-relevant hedges and identity-irrelevant gambles on likely events that had the same subjective probabilities and payouts. In addition, we controlled for optimistic bias by eliciting fans' perceived chance of their team winning.

We set the payout for betting against the focal outcome in both gambles to be twice the payout for betting on the focal outcome, so betting against the focal outcome had a higher expected value and would be an attractive gamble. Our theory predicts that the greater diagnostic cost of betting against their team would make fans more reluctant to bet on their team to lose than to choose the equivalent bet on the wheel of fortune.

### Method

**Participants and Exclusions.** One hundred one pedestrians (30 women; $M_{age} = 34.94$, $SD = 14.06$) outside Fenway Park in Boston, Massachusetts, volunteered to complete a short survey before the start of a game on July 25, 2015, between the Boston Red Sox and the Toronto Blue Jays. Before the beginning of the game, research assistants asked pedestrians in Kenmore Square and around Fenway Park if they were willing to complete a survey about the game that evening. Sample size was set to 100 complete surveys.

Data from one additional participant who did not make choices for gambles were collected but not included in this count or analyses because the critical dependent measures were not completed.

**Procedure.** A research assistant handed each participant a pen and a clipboard holding a one-page paper survey. Participants first answered, "To what extent are you a fan of the Boston Red Sox?" on an 11-point Likert scale marked at the end and midpoints with hate the Red Sox (1), neutral (6), and love the Red Sox (11). Next, they drew an *X* through the 1 of 11 circles that best depicted their perceived chance of the Red Sox winning the game that day. The ratio of white to black in each circle corresponded to the subjective probability of the Red Sox losing or winning, as illustrated in Figure 1.

In a counterbalanced order, participants then indicated which (hypothetical) option they would choose that day if offered each of two matched gambles, an identity-relevant gamble on the game and an identity-irrelevant gamble on the spin of a wheel of fortune. For the identity-relevant gamble, participants indicated whether they would choose a bet paying \$10 if the Red Sox lost the game (the hedge) or a bet paying \$5 if the Red Sox won the game.

For the identity-irrelevant gamble, participants first imagined that the circle they selected was a wheel of fortune with an arrow that spun around the wheel until it randomly landed on black or white. They then indicated whether they would choose a bet paying \$10 if the arrow landed on white or a bet paying \$5 if the

**Figure 1.** Diagram Used to Elicit Subjective Probability of the Boston Red Sox Winning in Study 3 (Represented by Shaded Region)

arrow landed on black. Finally, participants reported their age and gender.

### Results

**Descriptive Statistics.** The majority of participants indicated being fans of the Boston Red Sox (75.2%; M = 8.50, SD = 2.12), as indicated by selecting a value higher than the midpoint (6) of the scale. Despite the Red Sox having lost more games than they won at that point in their 2015 season (43 wins–54 losses), participants were on average more likely to believe that the Red Sox would win than lose the game ($M_{P(win)}$ = 54.05%, SD = 23.44). Perceived likelihood of a win was positively correlated with the degree to which participants self-identified as fans ($r(98) = 0.40$, $p < 0.001$).

**Hedging Behavior.** Exhibiting a greater reluctance to hedge in the identity-relevant than identity-irrelevant gamble, participants were significantly less likely to bet on the Red Sox to lose (M = 52.0%) than to bet on white (66.0%) (McNemar's $\chi^2(N = 100) = 4.69$, $p = 0.03$) (see Table 1). Restricting the sample to the participants who believed that the Red Sox were more likely to win than lose the game (i.e., gave subjective probability estimates greater than 60%), fewer participants were willing to bet on the Red Sox to lose (28.3%) than bet on white (52.2%) (McNemar's $\chi^2(N = 46) = 5.88$, $p = 0.015$). The effect of question order on betting behavior was examined on the full sample in a 2 (gamble: identity-relevant, identity-irrelevant) × 2 (first bet: identity-relevant, identity-irrelevant) analysis of variance (ANOVA) with repeated measures on the first factor (as suggested by Rosenthal and Rosnow 1991 for binary outcomes with $n > 40$). The greater reluctance to bet on the Red Sox to lose than to choose the equivalent bet on white in the spin of the wheel of fortune ($F(1, 98) = 5.82$, $p = 0.018$) was not moderated by order. There was no main effect of order or interaction (all $F$'s$(1, 98) < 2.11$, all $p$'s $> 0.15$).

In exploratory analyses, we found that self-identification as a fan was negatively correlated with betting on the Red Sox to lose the game ($r(98) = -0.28$, $p = 0.005$). It was not negatively correlated with betting on white in the nondiagnostic gamble ($r(98) = -0.12$, $p = 0.22$). Subjective probability estimates were negatively correlated both with the likelihood of betting on the Red Sox to lose the game ($r(98) = -0.43$, $p < 0.001$) and with betting on white in the nondiagnostic gamble ($r(98) = -0.20$, $p = 0.045$). The evidentiary value of these analyses is tempered by the positive correlation between self-identification and subjective probability assessments, suggesting that identification with the team and the perceived likelihood of it winning are related. Indeed, when controlling for subjective probability, we found that there were no significant differences between the correlations between identification and the two bets, nor were there significant differences between the correlations for subjective probability and the two bets (all $Z$'s $< 1.62$, $p$'s $> 0.10$).

### Discussion

In many cases, optimism is likely to make betting one's team to win an unrealistically attractive gamble (e.g., Simmons and Massey 2012). Even when controlling for optimistic bias and accounting for the preference to bet on likely outcomes (Levitt 2004, Lichtenstein and Slovic 1973, Simmons and Nelson 2006), we find that people are reluctant to hedge likely identity-relevant desired outcomes. Fans were more reluctant to accept an identity-relevant hedge than an equivalent identity-irrelevant pure gamble when we explicitly matched their odds and payouts, even when restricting the sample to those who believed it was most likely that their team would win.

Considered with the findings in the previous studies, optimistic bias does not seem to be solely responsible for reluctance to hedge desired outcomes. Partisans were reluctant to hedge the loss of their presidential candidate when the expected value of the hedge accounted for their optimistic biases in Study 1, and they were still reluctant to hedge the election when their candidate was more likely to lose than win the election in Study 2. Similarly, MLB fans were more reluctant to hedge the loss of their team than accept a similar pure gamble in Study 3.

By contrast, identity relevance appeared to play an important role in the reluctance to hedge desired outcomes in each of these studies. Preferences for presidential candidates predicted the propensity to bet on them to win in Studies 1 and 2. Partisans were more reluctant to accept an identity-relevant hedge against their preferred presidential candidate than identity-irrelevant hedge or pure gamble on a wheel of fortune in Study 2. Similarly, MLB fans were more reluctant to hedge the loss of their team than accept a comparable identity-irrelevant pure gamble in Study 3.

## Study 4: Objectively Matched Desired and Neutral Outcomes

Our fourth study compared bets on more similar kinds of identity-relevant and identity-irrelevant gambles, and further examined the role of diagnostic and outcome utility in reluctance to hedge. We compared the gambles preferred by Pittsburgh Steelers fans in an identity-relevant NFL game involving the Steelers to the gambles they preferred in an identity-irrelevant NFL game involving the Philadelphia Eagles. Both teams were given the same odds of winning their games, which were played on the same day.[2] Because bets on the Steelers game should have more diagnostic utility than bets on the Eagles game, we predicted Steelers fans would be less likely to bet against the Steelers than the Eagles. By contrast, for participants who were not fans

of the Steelers, the bets in both games should have no diagnostic utility, so they should not be more or less likely to bet against either team.

To manipulate outcome utility, each participant indicated whether they would bet on the focal team or its opponent to win across 41 different pairs of payouts for both games. Our theory predicts that nonfans should exhibit similar sensitivity to payouts in both games (i.e., only exhibit a main effect of payout), because only outcome utility should influence their choice of gambles. By contrast, Steelers fans should be more sensitive to payouts when choosing gambles for the Eagles game than for the Steelers game (i.e., exhibit a payout × game interaction). In the Eagles game, fans should only consider outcome utility when choosing gambles. By contrast, in the Steelers game, fans should have to trade off the outcome utility of gambles against their diagnostic utility, diluting the influence of outcome utility on their choice of gambles.

## Method

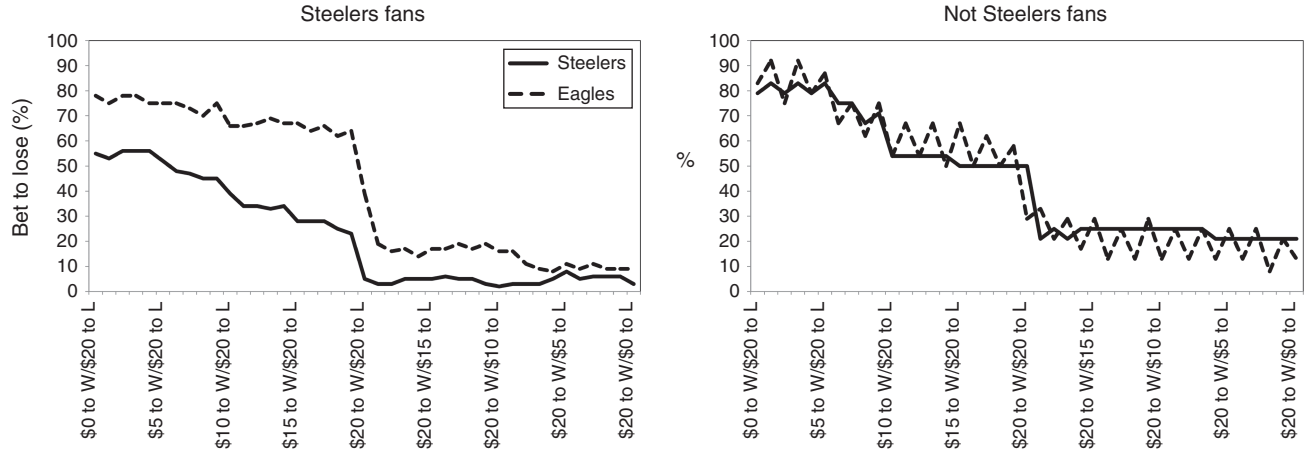
**Participants and Exclusions.** On July 14, 2010, one hundred pedestrians (65 women; $M_{age}$ = 37.65, SD = 16.55) were recruited at the intersection of Forbes Avenue and Murray Avenue in Pittsburgh, Pennsylvania, by a team of research assistants. The study took place in a mobile laboratory, a large truck with eight private computer terminals in its rear. Participants received $5 for compensation. Data collection began when the laboratory was opened to participants at 10:19 A.M. and was arbitrarily ended when 100 responses had been collected at 4:43 P.M. There were no participant exclusions.

**Procedure.** Each participant was seated at a private cubicle in a mobile laboratory and completed the experiment on a laptop computer. In the experiment, participants made hypothetical bets on two NFL games that took place on Sunday, September 12, 2010; these were the first games for each participating team in the 2010 regular season. Both games had at the time been assigned the same average point spread by VegasInsider.com: the Pittsburgh Steelers (−1 against the spread) versus the Atlanta Falcons, and the Philadelphia Eagles (−1 against the spread) versus the Green Bay Packers. The order in which games were considered was counterbalanced.

Participants first reported the extent to which they were fans of each team playing in one game (e.g., the Steelers and Falcons) on two five-point scales with endpoints of not at all (1) and a lifelong fan (5), and the number of regular season games that they watched the previous season. Participants then made hypothetical bets on that game by picking which team they would bet to win in each of 41 choice pairs. In each pair, the payout for one team to win was $20. The payout for its opponent increased in $1 increments from $0 to $20 ($0 if the Pittsburgh Steelers win or $20 if the Atlanta Falcons win, $1 if the Pittsburgh Steelers win or $20 if the Atlanta Falcons win, etc.). Thus, for each team there was always a choice pair in which choosing that team meant preferring to earn $0 than having a chance to earn $20. These dominance violations were the critical tests of whether participants would refuse to hedge a desired outcome (the endpoints of the *x* axis in Figure 2).

After making choices for the first game, participants reported the extent to which they were fans of the teams in the other game (e.g., the Eagles and the Packers) on two five-point scales and the number of regular season games that they watched the previous season. Participants then picked which of those two teams they would bet to win in that game for each of 41 identical choice pairs. Finally, participants reported their age and gender.

**Figure 2.** Bets on Focal Team by Team, Bet Payouts, and Fan Status




*Notes.* Pittsburgh Steelers fans were significantly more reluctant to bet against the Steelers than against a team given the same odds of winning that day (i.e., Philadelphia Eagles) for all outcomes in which the payout for the focal team was less than 2.5 times the payout for its opponent. By contrast, participants who did not identify as Steelers fans were indifferent in their betting behavior for both games. L, lose; W, win.

## Results

**Team Preferences.** Seventy-six participants exhibited a greater preference for one team: the Pittsburgh Steelers (64%), Philadelphia Eagles (6%), Green Bay Packers (6%), and Atlanta Falcons (0%). Some participants did not prefer one team to all other teams (24%). For Steelers fans and nonfans, their bets were coded into choices for and against the Steelers and the team's matched control (i.e., the Eagles). Team preferences appeared to be corroborated by behavioral reports. Reported fandom for all four teams ($M_{Steelers} = 2.92$, $SD = 1.52$; $M_{Falcons} = 1.18$, $SD = 0.66$; $M_{Eagles} = 1.41$, $SD = 0.89$; $M_{Packers} = 1.50$, $SD = 1.06$) was positively correlated with the number of games that team played that participants reported having watched during the 2009 NFL season ($M_{Steelers} = 5.98$, $SD = 5.89$; $M_{Falcons} = 0.64$, $SD = 2.44$; $M_{Eagles} = 1.28$, $SD = 3.08$; $M_{Packers} = 1.50$, $SD = 3.66$) (all $r's(98) > 0.77$, all $p's < 0.001$).

**Steelers Fans.** We first examined whether Steelers fans ($N = 64$) would be more likely to exhibit a dominance violation by refusing to bet against the Steelers in the choice pair in which they would receive nothing ($0) if the Steelers won and $20 if their opponent won than the corresponding bet against the Eagles. Indeed, whereas 78% of Steelers fans preferred a bet paying them $20 if the Packers won rather than a bet paying them $0 if the Eagles won, only 55% of Steeler fans were willing to accept the equivalent hedge paying them $20 if the Falcons won rather than a bet paying them $0 if the Steelers won ($t(63) = 4.05$, $p < 0.001$) (see the left panel of Figure 2). This resulted in a "loyalty premium" of $4.70. Specifically, if the teams picked by fans in this critical choice pair won, Steelers fans stood to earn significantly less on average in the diagnostic game involving the Steelers ($M = \$10.93$; $SD = 10.03$) than in the nondiagnostic game involving the Eagles ($M = \$15.63$; $SD = 8.33$) ($t(63) = 4.05$, $p < 0.001$, r=0.46).

All bets were then analyzed in a 2 (focal team: Steelers, Eagles) × 41 (payout) repeated-measures ANOVA. Across all choice pairs, fans were less likely to bet against the Steelers ($M = 22.3\%$, $SE = 2.7$) than the Eagles ($M = 42.0\%$, $SE = 2.9$) ($F(1, 63) = 31.23$, $p < 0.001$, $\eta_p^2 = 0.33$) (see Table 1). As the payout for both focal teams increased, so too did the percentage of fans who bet on them to win( $F(1, 63) = 49.53$, $p < 0.001$, $\eta_p^2 = 0.44$), as illustrated by the trends for bets on both focal teams in Figure 2 (left panel). These main effects were qualified by the predicted significant interaction.

Steelers fans were more reluctant to accept a bet against the Steelers than the Eagles, although they were increasingly willing to accept a bet against the Steelers as the financial benefits of hedging increased in magnitude, as reflected by a significant focal team × payment interaction ($F(1, 63) = 7.91$, $p = 0.007$, $\eta_p^2 = 0.11$) (left panel of Figure 2). Simple effects tests found that Steelers fans were more likely to reject a bet against the Steelers than the Eagles for all cases in which the payout for the opposing team was equal or greater (all $t's(63) \geq 3.00$, all $p's \leq 0.004$) (left panel of Figure 2). Only in choice pairs in which the payout for the focal team was $12 higher than the payout for its opponent (e.g., $20 if the Steelers won, $8 if the Falcons won) were participants equally likely to bet on the Steelers and the Eagles (all $t's(63) \leq 1.93$, all $p's \geq 0.06$). In short, it appears that Steelers fans were more sensitive to the outcome utility of gambles for the game in which the Eagles were the focal team than in the game in which the Steelers were the focal team.

**Not Steelers Fans.** Whereas Steelers fans were more reluctant to accept a gamble against the Steelers than the Eagles, nonfans ($N = 36$) did not prefer either focal team and appeared to base their choice of gambles purely on outcome utility. For these participants, the same 2 (team) × 41 (payout) repeated-measures ANOVA revealed only a significant main effect of payout. Participants bet the team whose win would pay more ($F(1, 35) = 24.83$, $p < 0.001$, $\eta_p^2 = 0.42$) (right panel of Figure 2). No main effect of focal team or interaction was found, as participants were as likely to bet against the Steelers ($M = 41.7\%$; $SE = 3.9$) as they were to bet against the Eagles ($M = 46.1\%$, $SE = 4.2$) ($F < 1$ and $F(1, 35) = 1.07$, $p = 0.31$, respectively) (see Table 1). Nonfans were not willing to pay a loyalty premium. They stood to earn a similar amount of money in the critical choice pair in the games between the Steelers and Falcons ($M = \$15.56$, $SD = 8.43$) and the Eagles and Packers ($M = \$16.11$, $SD = 8.03$) ($t < 1$).

## Discussion

These results illustrate the trade-off between diagnostic and outcome utility inherent in hedging identity-relevant outcomes. NFL fans exhibited sensitivity to diagnostic utility in their betting behavior. Fans were more likely to bet on a focal team with which they identified (i.e., Steelers) to win than a comparably favored team with which they did not identify (i.e., Eagles), particularly when betting on the opponent to win was more profitable. Only when the payout for betting on both focal teams to win was at least 2.5 times more profitable than betting on their opponents to win were fans equally likely to bet on both focal teams to win. Suggesting that diagnostic costs drove this betting behavior rather than idiosyncratic differences in the games, participants who were not fans of either team were equally likely to bet on both focal teams to win at every level of payout.

Both fans and nonfans exhibited sensitivity to the outcome utility of gambles. Participants who were not fans were only sensitive to outcome utility in their betting behavior. Their bets on teams were determined only by how much money they stood to earn if each

team won. NFL fans were sensitive to outcome utility in their choice of gambles, but were less sensitive to outcome utility in the identity-relevant Steelers–Falcons game than in the identity-irrelevant Eagles–Packers game. In the identity-relevant game, even when the pure outcome utility of betting against the focal team outweighed the outcome utility of betting on the focal team to win (as indicated by bets in the Eagles–Packers game), the diagnostic costs involved in hedging led many fans to still bet on the Steelers to win.

## Study 5: Riskless Hedges

In Study 5, we tested whether people would reject a very favorable, real, riskless single monetary or nonmonetary hedge against the failure of a valued social target. We recruited NCCA basketball fans outside an arena before a game and offered all participants one real "free" incentive-compatible hedge: $5 or a good of comparable value if their team lost. There was no option to bet on their team to win; rejecting the hedge guaranteed that participants would earn nothing. This further addressed the issue of individual variations in subjective probability estimates, as participants could accept the hedge and have a nonzero chance to earn a prize or reject the hedge and have zero chance to earn a prize. We included nonmonetary hedges in this experiment to address the possibility that reluctance to hedge was due to a sacred value or resistance to put a dollar value on a social relationship (e.g., Heyman and Ariely 2004, Tetlock 2003). We predicted that a significant proportion of fans would exhibit reluctance to hedge and reject these "free," riskless hedges. In addition, we directly measured whether participants cited relational or superstitious motives regarding their decision to hedge.

### Method

**Participants and Exclusions.** On February 18, 2013, one hundred two pedestrians (48 women; $M_{age} = 28.28$, $SD = 15.26$) in Pittsburgh received a beverage and snack for participating in a study about University of Pittsburgh men's basketball before entering an arena to watch an NCAA basketball game between the University of Pittsburgh and Notre Dame. Sample size was set at the number of participants recruited by an experimenter and two research assistants between the start of data collection at 4:15 P.M. and the beginning of the game at 7:15 P.M. Of these 102 participants, 83.3% were students or alumni and 100% supported Pittsburgh.

One additional volunteer who reported supporting Notre Dame was not included in the study. No other participants were excluded.

### Procedure

Each participant completed the study on a computer in one of eight private cubicles in the rear of the mobile laboratory used in Study 4. The mobile laboratory was parked on De Soto Street approximately one city block from the arena in which the game was played, the Petersen Events Center at the University of Pittsburgh.

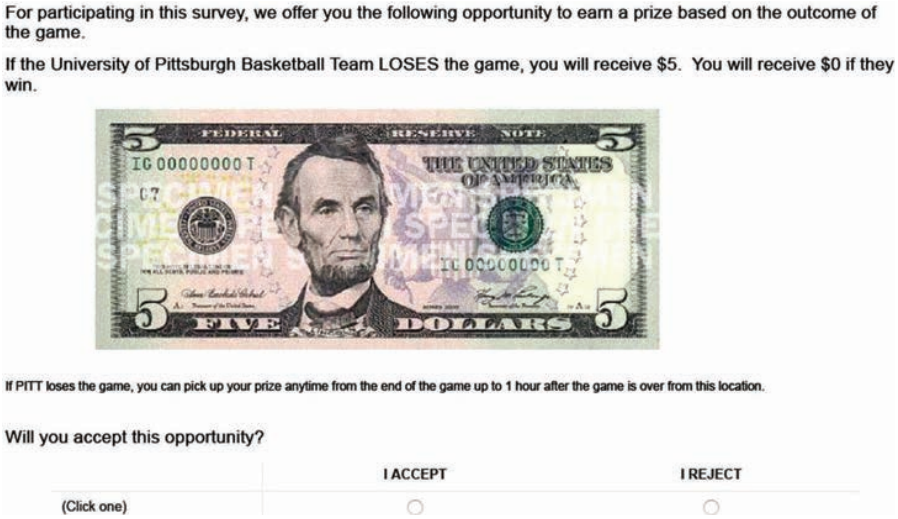
Participants first estimated the probability that Pittsburgh would win the game on an analog scale with endpoints at 0% and 100%. Next, participants indicated whether they supported Pittsburgh or Notre Dame in the game in a binary measure. On separate scales, they reported the extent to which they liked, valued, and felt connected to Pittsburgh's basketball team on five-point scales with endpoints of not at all (1) and extremely (5); Cronbach's $\alpha = 0.90$.

In a between-subjects design, participants were then randomly assigned the opportunity to accept one of three hedges: In a *monetary hedge* condition, participants accepting the hedge would receive $5 if Pittsburgh lost the game and $0 if Pittsburgh won (see Figure 3 for a screenshot). In one of two *nonmonetary hedge* conditions, participants accepting the hedge would receive a plain shot glass if Pittsburgh lost and nothing if the team won. In a second nonmonetary hedge condition, participants accepting the hedge would receive a University of Pittsburgh shot glass if Pittsburgh lost and nothing if Pittsburgh won. (Participants were not offered a chance to win anything if they rejected the hedge.) Participants then accepted or rejected the hedge to which they were randomly assigned.

After accepting or rejecting the hedge, on a separate page, participants reported the influence of relational and superstitious motives in their betting decision. To measure the former motive, participants indicated how accepting and rejecting the hedge would affect the team and their relationship with it on two seven-point scales with endpoints of would definitely affect it negatively (1) and would definitely affect it positively (7). To measure the latter motive, participants reported the extent to which accepting and rejecting the hedge would influence whether Pittsburgh won or lost the game on two seven-point scales with endpoints of it would make Pitt much more likely to lose (1) and it would make Pitt much more likely to win (7). Finally, participants reported their gender, age, and affiliation status with regard to the University of Pittsburgh (i.e., currently enrolled student, alumnus, prospective student, faculty or staff, fan, none of the above).

At the end of the survey, a two-letter code appeared on each participant's computer monitor indicating their choice, which they showed to the experimenter. The experimenter then handed the participant a raffle-style ticket with one of four codes discretely printed on the ticket that indicated whether they had accepted one of the three hedges or had rejected a hedge. After the game, which Pittsburgh lost, participants who accepted a hedge had one hour to return to the laboratory to redeem their payout with their ticket.

**Figure 3.** (Color online) Screenshot of Monetary Hedge Offered to Participants in Study 5




## Results

As in Study 3, a majority of fans believed their team was more likely to win than lose the game (M = 73.93%; SD = 13.98), one-sample $t(101) = 17.29$, $p < 0.001$.

Most important, exhibiting a preference for a dominated alternative, nearly half of participants (46.1%) rejected a riskless, real opportunity to hedge against their team (see Table 1). Reluctance to hedge was not unique to monetary payoffs; rejection rates were similar whether the incentive was $5 (40.0%), an unmarked good (48.6%), or university merchandise (50.0%) ($\chi^2(2, N = 102) = 0.81$, $p = 0.67$).

Suggesting again that hedging was not due to differences in optimistic bias, participants who rejected the hedge were no more likely to believe that Pittsburgh would win the game (M = 74.66%, SD = 15.64) than participants who accepted the hedge (M = 73.31%, SD = 12.50) ($t < 1$). Unexpectedly, participants who accepted and rejected the hedges did not differ in their self-reported identification with their team ($M_{reject} = 3.97$, SD = 0.89; $M_{accept} = 3.77$, SD = 1.01) ($t(100) = 1.06$, $p = 0.29$). This null result may have been due to a ceiling effect. The sample consisted of fans attending a game on a cold evening in the middle of February.

We next compared the influence of self-reported relational and superstitious motives in reluctance to hedge. First, we reverse-coded responses for how accepting hedges would influence the relationship and outcome, and we then separately averaged those measures with the correlated corresponding reports of how rejecting a hedge would influence participants' relationship with their team ($r(100) = -0.63$, $p < 0.001$) and its likelihood to win the game ($r(100) = -0.74$, $p < 0.001$). We then entered both measures of relational and superstitious influence into a logistic regression to see whether either predicted a reluctance to hedge. We found that participants who believed that hedging would affect their relationship with the team were more reluctant to hedge than were participants who did not (B = −0.58, SE = 0.24, $\chi^2 = 5.72$, Exp(B) = 0.56, $p = 0.017$). By contrast, participants who believed that hedging would affect their team's likelihood of winning the game were no more reluctant to hedge than were participants who did not (B = −0.91, SE = 1.03, $\chi^2 = 0.77$, Exp(B) = 0.40, $p = 0.38$). Similar results are obtained when including in the regression participants' perceived chance of their team winning and the strength of their attachment to the team: relational motive (B = −0.57, SE = 0.25, $\chi^2 = 5.27$, Exp(B) = 0.57, $p = 0.02$) and superstitious motive (B = −0.91, SE = 1.06, $\chi^2 = 0.75$, Exp(B) = 0.40, $p = 0.39$).

## Discussion

A substantial proportion of fans were reluctant to accept a real, generous hedge against their team that offered them "free" money or goods of similar value. The dominance violation exhibited in this study and Study 4 does not appear to be due to cheap talk. There was no difference between rejection rates for monetary and nonmonetary hedges, so the reluctance to hedge does not appear to be due to an aversion to placing a monetary value on a social relationship (e.g., Heyman and Ariely 2004, Tetlock 2003). Supporting the role of self-signaling in the reluctance to hedge, fans that rejected the hedge expressed more concern that hedging might affect their relationship with the team.

We did not find an effect of superstitious beliefs on hedging in Study 5. An additional ancillary study provides more evidence that attributions of reluctance to hedge to superstition may be more a justification than cause of the behavior (see the appendix). NFL fans were given the option to accept a hedge or were assigned a hedge against their team, either before or after estimating its likelihood of winning the corresponding game. If fans (superstitiously) believed that

hedging would reduce their team's chance of winning, probability estimates following a choice or assignment to hedge should be lower than probability estimates preceding a choice or assignment to hedge. There was no order effect on probability estimates, which were the same whether they preceded or followed hedging, suggesting that hedging does not change the perceived probability of the desired outcome. We further discuss the potential role of superstition in the general discussion.

## Study 6: Diagnostic Utility and Hedging

As a final test of the role of self-signaling in the reluctance to hedge, we varied the diagnostic cost of the same identity-relevant hedge in Study 6. Boston University's NCAA men's hockey fans were offered a $5 hedge if Boston University (BU) lost a game against its rival. We predicted that BU fans would be more likely to reject the hedge if the $5 payout was paid to them than if it was donated to charity. Whereas the former self-interested hedge would incur negative diagnostic costs because of the self-signal it entailed, the latter "charitable" hedge should incur lower diagnostic costs. It might even provide positive diagnostic utility, if accepting the charitable hedge created an altruistic self-signal.

### Method

**Participants and Exclusions.** On January 12, 2015, a link to a "science experiment" was posted on a Boston University hockey blog, four days before a men's game against Boston College. Forty-four readers completed the experiment between that time and the start of the game on Friday, January 16, 2015 (40 men; $M_{age} = 40.98$, SD = 15.57). Most participants were Boston University students or alumni (75.6%); some were faculty or staff members (19.5%). No participants were excluded.

**Procedure.** All participants first indicated the percent chance that Boston University would win the game on an analog scale with endpoints at 0% and 100% and the team they preferred (Boston University, neither team, or Boston College). As measures of identity-relevance, they then indicated the extent to which they liked, valued, and felt connected to the Boston University men's hockey team on five-point scales with endpoints of not at all (1) and extremely (5).

Most important, in a between-subjects design, participants were then offered one of two hedges. In the *self-benefit* condition, participants were offered a hedge that would pay them $5 if Boston University lost the game and $0 if Boston University won. In the *other-benefit* condition, participants were offered a hedge in which the experimenter would donate $5 to Doctors Without Borders if Boston University lost the game and would donate $0 if Boston University won. All participants then indicated whether they accepted or rejected the hedge, reported their gender, age, and university affiliation, and provided their mailing address in the case they accepted the self-interested hedge. Boston University did lose the game. Checks were sent out one week after to participants and Doctors Without Borders.

### Results

**Manipulation Checks.** All participants reported supporting the Boston University men's hockey team in its game against Boston College. Participants believed that it was likely that Boston University would win the game (M = 73.18%, SD = 11.51), with all estimates ranging from 50% to 100% (i.e., no participants believed their team was more likely to lose than win the game). Their average identification score with Boston University was 4.42 (SD = 0.60; $\alpha = 0.76$).

**Hedges.** Most important, a significant difference was found in the reluctance to hedge between the two conditions. Whereas the majority (59.1%) of participants in the self-benefit conduction rejected a free hedge paying them $5 if Boston University lost the game, only one participant (5%) in the other-benefit condition rejected a free hedge that would donate $5 to charity if Boston University lost the game ($\chi^2(1, N = 44) = 13.79$, $p < 0.001$) (self-interested and other-interested hedges are referred to in Table 1 as the identity-relevant and identity-irrelevant hedges, respectively).

In additional exploratory analyses, we examined the relationship between identification with Boston University and hedging in the self-benefit and other-benefit conditions with logistic regression. Whereas there was a marginally significant relationship in the self-benefit condition, such that participants who were more likely to identify with Boston University were less likely to accept the hedge (B = −1.29, SE = 0.77, $\chi^2 = 2.78$, Exp(B) = 0.28, $p = 0.096$), there was no relationship between identification with Boston University and hedging in the other-benefit condition (B = −0.47, SE = 2.46, $\chi^2 = 0.036$, Exp(B) = 0.63, $p = 0.85$). Obviously, the low statistical power of the regression analyses limits the inferences that can be drawn, but tentative support for a connection between hedging and team identification was present only in the self-benefit condition. There was no evidence for any connection between hedging and team identification in the other-benefit condition.

### Discussion

The results support a self-signaling account of reluctance to hedge. Fans were reluctant to accept a lucrative identity-relevant hedge that might incur a negative self-signal regarding their identification with their university's team. By contrast, fans readily accepted an equivalent hedge paid to charity that might provide

a positive altruistic self-signal. These results also constitute a dominance violation. If identity signaling was not a factor, the $5 hedge should have had a greater utility to participants in the self-benefit condition because they could have used the money any way that they liked, including donating it to Doctors Without Borders or a charity of greater personal importance.

## General Discussion

People seem reluctant to hedge desired outcomes that are relevant to their identity. A majority of participants preferred to increase potential gains and losses by betting on their candidate or team to win rather than reduce potential losses and gains by betting on their candidate or team to lose. Participants exhibited reluctance to hedge even when their optimism was controlled for statistically (Study 1) or procedurally (Studies 2 and 3), and when refusing a hedge meant having no chance to receive a reward rather than having a riskless, "free" chance to earn real money or other goods (Studies 4–6).

Although we examined hedging in relatively low-stakes contexts, people may be reluctant to hedge desired outcomes even when stakes are high. For instance, Auburn fan Mark Skiba refused to hedge a 500 to 1 bet he fortuitously placed on Auburn to win the 2014 BCS National Championship that would have paid $50,000 if Auburn won. By hedging, he would have been guaranteed to win thousands of dollars more than the initial $100 he paid for the bet on Auburn, whether it won or lost the game. Despite these high stakes, Skiba ultimately decided not to hedge because "he felt weird about betting against his team" (Rovell 2014).

The one-sided nature of the relationships between participants and their candidates and teams meant that their reluctance to hedge was not due to fear of sanctions or reprisals for hedging (e.g., Fehr and Fischbacher 2004). Instead, our findings suggest that the reluctance to hedge was due to the diagnostic costs of hedging identity-relevant outcomes. In Study 1, preference strength for a presidential candidate predicted reluctance to hedge his loss. Only loyalty concerns—a proxy for the cost of the negative self-signal incurred by hedging—mediated the relationship between preference strength for the candidate and reluctance to hedge. In Study 2, participants were more reluctant to hedge an identity-relevant outcome than a similar identity-irrelevant outcome or pure gamble. Indeed, no differences in betting behavior between identity-irrelevant hedges and pure gambles were observed. In Studies 3 and 4, participants were significantly less likely to accept a diagnostic hedge against their MLB or NFL team than to accept a non-diagnostic matched gamble or bet against a team with which they did not identify. In Study 5, NCAA basketball fans were less likely to accept a real, riskless hedge if they perceived that doing so would influence their relationship with their team. In Study 6, a majority of NCAA hockey fans rejected a hedge with diagnostic costs (i.e., winnings paid to them), whereas all but one participant accepted a hedge with no diagnostic costs (i.e., winnings paid to charity). When considering whether to hedge, participants appeared to trade off the diagnostic costs and outcome utility associated with hedging. In Study 4, NFL fans became less reluctant to hedge against their team as the potential payout for hedging became greater.

The reluctance to hedge was not driven by an aversion to gambling. Participants were willing to bet that their candidate or team would win. Participants were also willing to accept gambles against candidates and teams to which they were indifferent (Studies 1–4). The results of Study 5 suggest that a reluctance to hedge is not due to the act of violating a social norm by placing a monetary value on a relationship (e.g., Heyman and Ariely 2004). Nor did the participants' reluctance to hedge appear to be attributable to the framing of gambles. Participants were reluctant to hedge whether hedging was framed as a bet that one's candidate or team would lose (Studies 3, 5, and 6) or that the opponent would win (Studies 1, 2, and 4). The comparison of betting on similar identity-relevant and identity-irrelevant events in Studies 2–4 suggests that reluctance to hedge is not due to a failure to comprehend the elicitation procedure.

We did not find any evidence that superstitious beliefs or moral aversion to profiting from suffering explained the reluctance to hedge identity-relevant outcomes. In our ancillary study (see the appendix), fans' perceived probability of their team winning was not affected by whether they had or had yet to hedge the outcome (via choice or condition assignment). Nor did we find a relationship between superstitious thinking and hedging behavior in Study 5, in which superstitious beliefs were directly measured. Regarding moral aversion, fans in Study 4 were sensitive to the outcome utility associated with betting against their team, suggesting that they were weighing the costs of hedging against its pecuniary benefits. Indeed, it is possible that, offered enough money, all of these fans would bet on their team to lose.

It is possible, however, that superstitious beliefs and moral aversion do play a role in more general forms of reluctance to hedge desired outcomes. Insurance is perceived to decrease the likelihood of the insured event, which might encourage hedging because it would thus increase the chance of the desired outcome (Tykocinski 2008). On the other hand, hedging might increase the salience or ease of representing the negative outcome and influence betting in ways that are orthogonal to

signaling motives (e.g., Morewedge and Kahneman 2010, Risen and Gilovich 2008, Simmons and Nelson 2006). Fans were clearly not averse to gambling on the suffering of the opposing team in our studies (e.g., Inbar et al. 2012), but a substantial portion of fans rejected costless profitable hedges when betting their team to win had $0 expected value. It is possible that fans that identify highly with their candidate or team consider hedging to be so strong a negative self-signal that it would be a moral transgression to bet against their team. We suggest that future research would be well directed toward further exploring the role of these intriguing mechanisms in hedging.

The motivational conflict we explore in this paper—an aversion to put oneself into conflict between the opportunity to receive personal rewards and a negative outcome befalling important social targets—has similar features to some economic games and to insurance. In the ultimatum and dictator games, players trade off self-interest and concern for a social preference—pecuniary rewards for fairness (e.g., Camerer 2003, Morewedge et al. 2014). In these games people also appear to become more self-interested as the stakes increase (Slonim and Roth 1998). Hedging and insurance both serve to mitigate loss. However, most insurance decisions differ from those studied here because the payment that is received after a loss is designed to materially redress the loss (a damaged car is repaired or replaced) and has no identity consequence. In these situations, people are not reluctant to "hedge" bad outcomes for their automobiles, homes, etc.

Interestingly, previous research has found that people are more likely to insure and claim insurance for a good to which they feel great affection to receive "consolation" for its loss (Hsee and Kunreuther 2000), such as a favorite, expensive painting. We believe that affection increasing the desirability of insurance could also be consistent with self-signaling. In the absence of the ability to signal concern for and attachment to a good by paying for a good thing to happen to it (e.g., to protect it from harm with extra security or safety measures), purchasing insurance serves as a signal to the owner that the good is or was highly valued.

We speculate that buying insurance is not an attempt to buffer the negative emotions incurred by the loss of the insured good. In two ancillary surveys, we found that framing hedges as insurance did not increase their uptake. NFL fans were no more likely to pay $15 to receive $30 if their team lost if the hedge was framed as a "bet" (37%) than as "fan insurance" (39%) ($\chi^2(1, N = 100) = 0.03$, $p = 0.88$). Nor were participants in a different sample more likely to pay $15 to receive $300 if their car was vandalized in the next three years if the hedge was framed as a "bet" (40%) than as "insurance" (51%) ($\chi^2(1, N = 101) = 1.31$, $p = 0.25$).

The reluctance to hedge against negative outcomes for important social targets also resembles decisions made in interpersonal relationships with reciprocal commitment, for which people willingly engage in self-sacrifice (Van Lange et al. 1997). In extreme cases, this may include sacrificing their own and lives and the lives of others for their ingroup (e.g., Swann et al. 2010). The present research extends these findings by showing that even one-sided loyalties and commitments elicit sacrifice when there is no opportunity for benefits from future interactions. The identity-signaling mechanism we identify also implies that people should be paradoxically more reluctant to hedge the failure of a close other than their own failure. A professor should be more willing to bet that her own paper will be rejected than to bet that her colleague's paper will be rejected, and a father should be more willing to bet on the loss of his own softball team than on the loss of his daughter's team. We find that people do place other-interest before self-interest in such cases, because betting against the self creates a weaker negative self-signal than does betting against another person (Tang et al. 2016).

A reluctance to hedge against undesired outcomes leads to two important anomalies in decision making. First, it leads decision makers to violate a basic principle of standard expected utility theory by choosing a dominated alternative: preferring to receive nothing than a chance to profit from an undesired outcome. Second, it leads to risk-seeking behavior for mixed gambles. By betting on the success of their favorite team or candidate, bettors put "all of their eggs in one basket." They opt for a riskier higher-variance alternative than a less risky lower-variance alternative (i.e., hedging). von Winterfeldt and Edwards (1986) discussed multiattribute risk proneness conceptually, but to our knowledge, it has been rarely observed in the academic literature.

Previous demonstrations have focused on choices among pure losses, where the convexity of the prospect theory value function in losses produces risk-seeking behavior (Fischer et al. 1986, Payne et al. 1984). Our demonstrations of risk proneness include combinations of positive and negative outcomes that are not explained by a basic reference dependence account. They are consistent with von Winterfeldt and Edwards' (1986) conception of a negative interaction between attributes—the diagnostic disutility of disloyalty decreases the value of money earned from the loss of a favorite team or candidate.

Our results have implications for a broad set of behaviors. Optimistic betting in sports wagers and electoral predictions (e.g., Cantril 1938, Hayes 1936, Levitt 2004, Simmons and Massey 2012, Simmons and Nelson 2006) may reflect not just distorted views of the probabilities of outcomes but also the value of loyalty and

commitment. Commitment motives to bet on or "pick" one's team or candidate may outweigh substantial economic incentives or an accuracy motive. Our results may also help to explain the lack of appropriate diversification exhibited by professional investors including the equity home bias and familiarity biases (Cooper and Kaplanis 1994, Fellner and Maciejovsky 2003, Foad 2010, Strong and Xu 2003). Personal investors who receive stock in their own companies as compensation tend to ignore advice not to hold too much company stock and are thus exposed to undue risk—to lose both their jobs and their retirement accounts if their company fails (Benartzi et al. 2007, Meulbroek 2005). Their reluctance to sell or short company stock may be due to its psychological cost—feeling disloyal or threating an important facet of their identity. More generally, the results may help to elucidate a variety of anomalous decisions in which people forgo personal rewards that would conflict with their loyalty and commitment to others, their beliefs, or ideals.

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## Appendix. Ancillary Study

### Method

**Participants, Sampling, and Exclusions.** Four hundred hits were requested from AMT to complete a survey about NFL games on Qualtrics on Tuesday, September 13, 2013. All participants had an AMT approval rating equal to or higher than 95%. Four hundred twenty-two participants took the survey and received 25¢ as compensation. Of the four hundred six participants who completed the survey, four hundred two passed the attention check (indicating the same favorite team twice) and were included in the analyses. No participants who completed the survey and passed the manipulation check were excluded.

**Procedure.** All participants first indicated their favorite NFL team from all 32 teams, the extent to which they preferred that team to all other teams (M = 2.33, SD = 0.86) on a seven-point scale with points marked as much less than other teams (−3), no more or less than other teams (0), and much more than other teams (3), and the team it was playing in the game that week (week 2 of the 2013 NFL season).

All participants were offered a hedge, a 5¢ bonus if their team lost its game in week 2. Participants in a *choice* condition had the option to accept or reject the hedge, and participants in a *no choice* condition were simply told they would receive the bonus if their team lost its game in week 2. Participants randomly assigned to a *hedge first* condition were first offered the 5¢ hedge against their team and then estimated the percent chance on an analog slider scale (0%–100%) that it would win its next game. Participants randomly assigned to a *hedge last* condition made the probability estimation and were offered the hedge in the reverse order. All participants again reported their preferred team as an attention check and report demographic information. Participants were paid bonuses if their team lost its game.

### Results

Most important, a 2 (judgment order: hedge first, probability first) × 2 (hedge: choice, no choice) ANOVA revealed that of the participants who chose to or were assigned to hedge against their team, there was no significant effect of judgment order. In other words, participants were just as likely to perceive that their team would win before they had accepted or were assigned to hedge against their team (M = 64.29%, SD = 21.06) as they were after they had chosen to accept or were assigned to hedge against their team (M = 63.41%, SD = 21.34) ($F(1,356) < 1$, $p = 0.77$). Additionally, there was no main effect of choosing or being assigned to the hedge and no significant interaction (choosing: $F(1,356) = 2.02$, $p = 0.16$; being assigned: $F(1,356) < 1$, $p = 0.44$). Including all participants in the choice condition in the 2 × 2 ANOVA does not change the outcome of any of the main effects or interaction (all $F$'s$(1,398) < 1$, all $p$'s $\geq 0.37$).

## Endnotes

[1] The value function in prospect theory (Kahneman and Tversky 1979) yields a more complicated pattern of risk preference: risk aversion for choices involving gains (due to concavity caused by diminishing sensitivity), extreme risk aversion among mixed outcomes (due to loss aversion), and risk seeking for choices involving all losses (due to convexity caused by diminishing sensitivity). We assume that people view desired outcomes and gambling wins to be gains.

[2] NFL spreads set by bookmakers are not precise reflections of the outcome of games (spreads tend to be designed to exploit biases to bet on visiting teams and favorites), but bookmakers set spreads within a few percentage points, so each outcome is similarly likely (Levitt 2004).

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