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It's a Sure Win!
Experimental evidence on overconfidence in betting behavior

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University of Naples Federico II   **University of Salerno**   **Bocconi University, Milan**

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Abstract

We conduct an experiment with regular sports bettors in Tanzania to investigate how they value their bets and form expectations about winning probabilities. By comparing a sports bet to a neutral urn-and-balls lottery with identical odds, we find that subjects under the sports framing assign higher subjective values (certainty equivalents) to their bets and are significantly more optimistic about their chances of winning, even though, in fact, they are not more likely to win. This is consistent with bettors being overconfident in their ability to predict sports outcomes. Coupled with data on betting frequency and motives, our results suggest that, by leveraging gamblers' overconfidence, sports betting magnifies their financial losses.

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1 Introduction

Sports betting is a large and rapidly growing industry with a global turnover of more than 70 billion USD in 2021 (Polaris, 2022). In the United States alone an estimated 60 million people bet regularly on sports (FSGA, 2022), and the phenomenon is growing rapidly among the poorest in society, both in developed economies (e.g., The Guardian, 2021) and in developing countries (e.g., DW, 2017). Like in any other form of gambling, the average sports bettor loses money but may nonetheless derive positive utility from gambling if s/he is risk-loving (Ali, 1977), or s/he is risk-averse but enjoys the act of gambling (Conlisk, 1993; Le Menestrel, 2001; Clotfelter and Cook, 1991), has a preference for return skewness (Garrett and Sobel, 1999; Grossman and Eckel, 2015), or bets on the chance of life-changing winnings (Friedman and Savage, 1948). Another potential explanation for sports betting is that agents may wrongly believe the likelihood of certain lottery outcomes to be higher than it actually is. Existing studies, for instance, demonstrate that gamblers tend to overestimate small lottery probabilities (Snowberg and Wolfers, 2010; Barberis, 2013).

This channel may be particularly important in the context of sports betting, where gamblers rely on their *perceived* ability to predict the outcomes of sports events. Agents may therefore be over-confident – a behavioral bias that has been established across a range of other contexts (Malmendier and Tate, 2015; Daniel and Hirshleifer, 2015; Grubb, 2015) – and thus overly optimistic about their chances of winning. As a result, they may over-bet and incur financial losses. As the sports betting industry grows and aggressively targets consumers across the world, lobbies lawmakers and regulators, and pursues sweeping promotion deals (e.g., The New York Times, 2022), this hypothesis bears important implications but has received little rigorous scrutiny.

We fill this knowledge gap through a lab-in-the-field experiment that allows us to investigate sports bettors' subjective expectations and their resulting betting behavior. Participants in our experiment are regular sports bettors in urban Tanzania, an African country akin to many other low-income settings with a rapidly growing urban population

and an increasing penetration of sports gambling. In the experiment, subjects receive an endowment and are randomly offered either the possibility to bet it on a football match from the UK Premier League or to participate in a neutrally-framed (urn and balls) lottery with identical odds. The odds we offer for the Premier League matches used in the experiment are based on publicly available odds posted by major betting companies. The odds in the urn-and-balls lotteries are set to replicate the probability distributions associated with the games' outcomes. In addition to eliciting bettors' subjective probabilities of winning, we elicit certainty equivalents for the bets. Before the outcome of the bet is revealed, we offer subjects the possibility to exchange the bet for a fixed amount of money and we elicit the lowest possible amount for which they would sell the lottery. This certainty equivalent provides us with the subjective value that each bettor attaches to the bet. Comparing bettors' behavior under the two randomized framings allows us to isolate the specific role that a sports betting framing plays in shaping subjects' expectations and preferences towards risky lotteries, for given lottery fundamentals and risk preferences. Within this setting, we can therefore test whether the widespread phenomenon of sports betting can be, at least in part, ascribed to potential misperceptions of winning probabilities due to agents' over-confidence in their own abilities to predict the outcomes of sports events.

Additionally, we offer a randomized treatment to a subset of participants assigned to the sports betting treatment, who are also given a more detailed explanation of how to translate odds into probabilities. This is an application to the sports-betting setting of information requirements recently adopted by policymakers in a number of countries for standard lotteries, which make it mandatory to inform consumers about odds or winning probabilities. Our results, therefore, speak to the efficacy of such policies in reducing excessive gambling. Finally, we collect detailed information on participants' actual betting patterns and we paint a rich picture of betting behavior.

Two main results emerge from our experiment. First, bettors' certainty equivalents are significantly higher when the bets are framed as sports bets compared to neutral lotteries with identical odds. This implies that bettors attach a higher subjective value to

sports bets compared to equivalent neutral bets. Second, and consistent with this, we find that when bets are framed as sports bets, participants report a higher subjective probability of winning their bets compared to the neutral lottery even though, in fact, bettors in the sports framing are not more likely to win than those under the neutral framing. This result dispels the possibility that bettors' confidence may be due to their superior predictive abilities. It highlights, on the contrary, that bettors are over-confident in their ability to predict the outcome of football matches.[1] We also rule out that bettors may report a high probability of winning as a form of ex-post rationalization of their choice. We do so by assigning a subset of participants to a pre-fixed bet where they cannot choose the outcome to bet on and are passive recipients of the winnings if the pre-fixed outcome is realised. We find that, consistent with overconfidence, those subjects over-predict the probability of winning by as much as those who could choose which outcome to bet on.

We complement this analysis with novel stylised facts on the behavior of regular sports bettors. The rich dataset we collected highlights that most bettors are from low-income backgrounds, they bet frequently and are primarily motivated by need as opposed to enjoyment. This further underscores the importance of our findings since misperceiving the likelihood of winning is both more detrimental for poorer subjects and more difficult to overcome given an often lower educational background. Finally, our randomized information treatment shows that explaining how to translate odds into probabilities does not change significantly bettors' perceptions and behavior. This casts doubts on the efficacy of such a policy, at least in the context of sports betting.

This study makes important contributions to our understanding of betting behavior, a growing phenomenon of global interest, which raises particular concerns due to its prevalence among the most disadvantaged in society. An existing literature focuses on bettors' background and on the link between financial resources and betting habits (Kearney, 2005; Clotfelter and Cook, 1991). We contribute to this body of knowledge by

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[1]This is also consistent with the fact that the high profits of real betting companies, whose odds we use in the experiment, are in large part driven by their comparative advantage in predicting the outcome of sports events relative to the average bettor, in addition to the profit margin they may make by setting skewed odds exploiting bettors' biases (Levitt, 2004) or 'unfair' odds that imply negative expected winnings).

showing that gamblers are primarily driven by need, as they perceive gambling as a way of generating income despite the fact that they lose money on average. This is consistent with recent work by Herskowitz (2021), who finds that relaxing financial constraints reduces sports betting in Uganda.

Most importantly, we shed light on the key issue of distorted beliefs among gamblers and their formation. We elicit subjective probabilities and we find that bettors have incorrect perceptions of the probability to win in line with previous findings (Williams and Connolly, 2006; Zenker et al., 2016; Abel et al., 2020). Crucially, we show that a sports framing *triggers* overconfidence in own predictive abilities and excessively optimistic expectations. Interestingly, these expectations exist despite participants being habitual, frequent sports bettors who are exposed to the fact that, on average, they are unable to beat the odds, as our experiment shows. Descriptively, they report positive average winnings from their bets over the two weeks prior to the experiment, hinting at selective recall (Benabou and Tirole, 2002) whereby individuals overweight positive events over negative ones (Möbius et al., 2022; Eil and Rao, 2011).[2]

Our work also speaks to a growing literature documenting overconfidence in a range of contexts. Previous studies have investigated the role of overconfidence in households' and traders' financial investment decisions and the creation of speculative bubbles (Barber and Odean, 2001; Menkhoff et al., 2013; Daniel and Hirshleifer, 2015; Michailova and Schmidt, 2016), entrepreneurship and managerial decisions such as market entry and corporate investment (Camerer and Lovallo, 1999; Cain et al., 2015; Malmendier and Tate, 2015), poor consumer choices (Grubb, 2015), including gym memberships driven by overconfidence in future self-control (Della Vigna and Malmendier, 2006) and under-insurance (Sandroni and Squintani, 2013). In developing countries, previous work has focused on the role of overconfidence in driving the riskiness of farmers' crop portfolios (Barsbai et al., 2022) and risk-taking among micro-entrepreneurs (Seither, 2021).

More broadly, we contribute to a growing body of work documenting misalignment between agents' expectations and market outcomes. This finding recurs in a range

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[2]Blumenstock and Olckers (2021) find, in contrast, that mobile phone sports-bettors in Kenya are as likely to adjust their betting behavior following good and bad news.

of contexts, including workers' beliefs about their employment prospects (Banerjee and Sequeira, 2020; Abebe et al., 2022; Bandiera et al., 2021), firm managers' expectations about their workers (Caria and Falco, 2022; Abebe et al., 2022), and parents' beliefs about returns to education (Jensen, 2010). Much less is known, however, about this issue in the context of sports betting, where misaligned probabilities are highly detrimental as they lead to immediate financial losses.

## 2   Setting the Scene: Betting Habits in a Low-Income Context

To set the scene, we use the data we collected to provide some novel stylised facts on betting behavior in a low-income context. The subjects of our study are regular bettors from Dar es Salaam, the capital city of Tanzania, a low-income urban setting akin to many other growing cities both in the developing world and in advanced economies. We sampled our participants outside betting shops, as detailed below.

After making participants do their betting choices, we asked them a series of questions about their betting habits and previous experiences. Answers to some of these questions are summarized in Figure 1.

The first remarkable fact we document is that 60% of participants in our study report to bet on sports on a daily basis, and another 33% of them do so several times a week. Only 6% of participants place one sports bet per week or less. Additionally, 57% of individuals feel that they bet more than they should.

The second important fact is that, when asked about the reasons for betting, almost 90% of participants indicate that they aim 'to make money' as one of the reasons, while only 15% (also) refer to it as a form of leisure (i.e., they answer either 'for fun', 'to watch the game', or both). Rather than a pure recreational activity, therefore, sports betting is approached as an income-generating activity by most participants. Indeed, in line with this, 61% of participants consider (at least to some extent) sports betting to be a reliable source of income. Only 1 in 4 participants states that sports betting cannot

6

Figure 1: Betting Habits
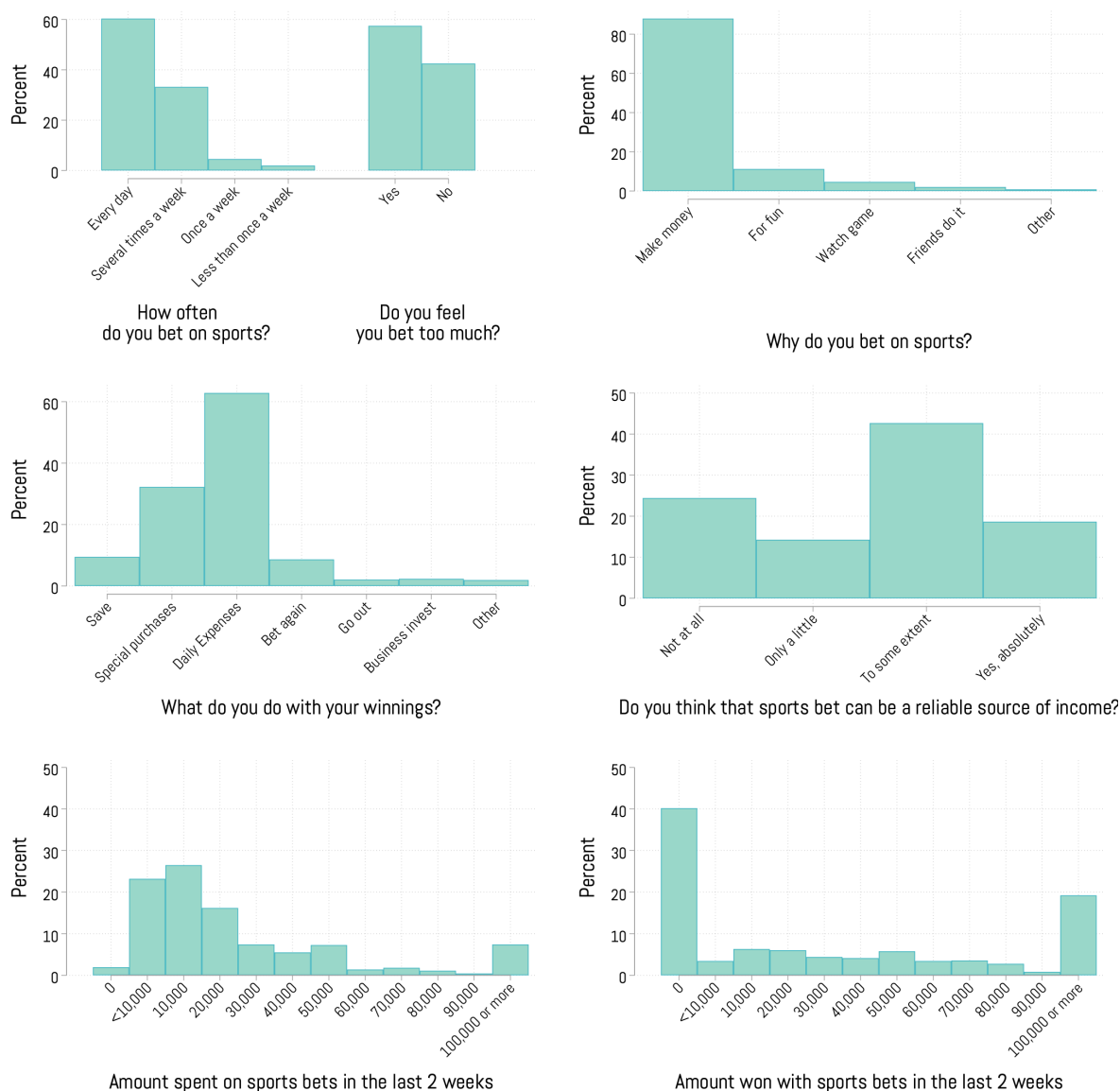
NOTES. This figure depicts participants' answers to the questions on betting habits they answered at the end of the experiment. Sample size: 729 individuals.

be a reliable source of income. When asked what they do with winnings from sports bets, the vast majority of participants report to use the money to cover daily expenses or make special purchases. This is consistent with work by Herskowitz (2021) in neighboring Uganda, showing that gambling is a tool to finance lumpy investment. Only about 9% of our respondents save the money from winnings, and a similar share use the money for a new bet.

Third, we find that gambling absorbs a sizeable share of gamblers' earnings and

that, for many, it results in financial losses. Nearly one half of subjects in our sample spent at least 20,000 Tanzanian Shillings (TSh) on sports betting in the two weeks prior to the experiment, equivalent to over 15% of median monthly earnings in Dar es Salaam (and to an even larger fraction of median earnings in our sample, see below). Median net winnings (the amount won minus the amount bet) are zero, and one half of the sample experienced a net loss over the past two weeks.[3]

Looking at the socio-demographic characteristics of the subjects in our sample adds important elements to the picture (Table 1). Our subjects are almost exclusively male, and three quarters would describe themselves as football experts. They are on average 32 years old (with range 18-68) and their average education level is relatively low: 45% have completed at most primary school and 88% have completed at most 4 years of secondary education ("O-levels"). Only 12% of subjects have completed six years of secondary school ("A-levels") with some continuing to tertiary education. The majority of subjects are self-employed (60%), while 26% are employees, and 14% are unemployed. Among monthly earners, 74% earn less than 300,000 TSh (approx. 128.8 USD) per month. Among daily earners, 43% earn less than 10,000 TSh per day (approx. 4.3 USD). Overall, median earnings in our sample are below the median in Dar es Salaam (about 280,000 TSh per month), according to the Tanzania National Panel Survey (TNPS) data of 2019-20 (World Bank, 2022). Sample characteristics are balanced across experimental groups (see Appendix Table A1).

To sum up, three key facts emerge from our survey of regular bettors: (i) sports bettors tend to spend considerable amounts on betting, they place bets very frequently, and often acknowledge that betting may be an addiction (i.e., they say they bet "more than they should"); (ii) the majority of bettors considers betting a way to generate an income and cover daily expenses, despite clear evidence that average winnings are negative; (iii) the vast majority of bettors are men without tertiary education, who represent the majority of men above 18 in Dar es Salaam, where only 8% have tertiary education (World Bank, 2022).

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[3]Furthermore, 40% of gamblers experienced gross winnings of zero, meaning that any amount they bet was fully lost (Figure 1, bottom right panel).

Table 1: Sample characteristics

	N	Mean	Sd	Min	Max
Male	729	0.99	0.10	0	1
Age	729	32.09	8.70	18	68
Self-assessed football expert	729	0.75	0.43	0	1
Education: None	728	0.03	0.18	0	1
Education: Primary	728	0.42	0.49	0	1
Education: Secondary (4 yrs)	728	0.43	0.49	0	1
Education: Secondary (6 yrs) or univ.	728	0.12	0.33	0	1
Lives with 4+ family members	729	0.55	0.50	0	1
Monthly family income <50k TSh	729	0.27	0.44	0	1
Monthly family income 50k-200k TSh	729	0.43	0.50	0	1
Monthly family income 200k-500k TSh	729	0.22	0.42	0	1
Monthly family income >500k TSh	729	0.08	0.27	0	1
Self-employed	729	0.60	0.49	0	1
Employed (worker)	729	0.26	0.44	0	1
Unemployed	729	0.14	0.35	0	1
Wage frequency daily	588	0.70	0.46	0	1
Daily wage >10k TSh	412	0.57	0.50	0	1
Monthly wage >150k TSh	176	0.65	0.48	0	1
Monthly wage >300k TSh	176	0.26	0.44	0	1
Sector: Agriculture, forestry, fishing	625	0.07	0.25	0	1
Sector: Manuf., motor, constr., transp.	625	0.30	0.46	0	1
Sector: Retail, wholes., accomm., food	625	0.28	0.45	0	1
Sector: White collar	625	0.07	0.26	0	1
Sector: Other	625	0.28	0.45	0	1

These stylised facts are an interesting point of departure for our experimental analysis, which aims to assess whether excessive betting may be due to misperceptions of winning probabilities.[4]

3 Experimental Design and Sampling

3.1 Baseline Experiment

The experiment is centered around the comparison of subjects' choices under two types of lottery framings. At the beginning of the experiment, all participants received an endowment of 10,000 TSh (approx. 4.30 USD or a day's median wage among daily

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[4]Further information about the betting habits of participants can be found in Appendix Table A2.

workers in our sample) and were randomly assigned to one of two lottery types. Under the first type, they were asked to bet their endowment on one of the possible outcomes of an English Premier League game to be played the same evening ('sports betting'). Under the second type, they were asked to bet on the outcome of a neutral urn-and-balls lottery (choosing the color of a ball to be drawn from an urn at the end of the session, 'neutral lottery'). In both cases, participants had to bet the full endowment and could not choose not to bet. The bets presented in the sports betting arm were akin to the simplest bets bettors are used to place in a betting shop. They had three possible outcomes: Team A wins, Team B wins, Draw. The experiment was conducted over 7 non-consecutive days between December 18, 2021 and February 19, 2022. We used 7 Premier League matches in total (one on each day of the experiment).[5] The odds associated with each outcome were taken from the websites of major online betting companies on the day of the experiment. We translated these odds into corresponding proportions of differently colored balls in the neutral urn-and-balls lottery framing. The urn contained 100 balls of three different colors (matching the three possible outcomes of the football match) and each color was associated with a different prize, inversely proportional to the share of balls of that color in the urn. At the end of the experiment, respondents assigned to the neutral lottery were asked to draw one ball from the urn (a black bag) and found out what their winnings were. Like the participants in the sports bet arm, however, they did not receive the winnings until that same evening.[6] The experiment was conducted on tablets handed to participants by members of the research team, who were available to provide explanations throughout the session.[7] We collected phone numbers and explained that we would transfer the winnings via mobile money (a very common payment method in

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[5]The full list of matches we used is the following: Leeds vs. Arsenal, Tottenham vs. Liverpool, Manchester City vs. Chelsea, Liverpool vs. Brentford, Manchester United vs. West Ham, Crystal Palace vs. Liverpool, and Manchester City vs. Tottenham.

[6]For full comparability, we considered running the random draw in the evening and communicating the result to the respondents then. This would not have made a difference for their decisions while it would have posed additional concerns about the extent to which respondents would have trusted the outcome of a lottery they could not witness (in contrast to the outcome of a football game that is public information). For this reason, we opted for simplicity and revealed the outcome immediately after the experiment, while the payment was postponed.

[7]After obtaining informed consent, we explained to participants that the exercise was conducted for research purposes and that bets were placed with the research team, not with a real betting company.

10

Tanzania) at the end of the day. We also asked participants to complete a short survey. At the end of the experiment, all respondents received a 5,000 TSh participation fee, which was independent of the outcome of the bet.

For a subgroup of subjects, we played a modified version of the experiment, whereby we *fixed the outcome* of the bet and gave subjects the resulting ticket. In other words, participants in this arm ('No Choice') could not choose which outcome (team or ball color) to bet on and were passive recipients of the winnings if the outcome of the bet was realised. This helps us to address the endogeneity of the chosen outcome when analysing misperceptions.[8]

3.2 Information treatment to explain the odds

We also introduced an additional information treatment that was randomized within groups A and B. In addition to the game odds normally provided by betting companies, half of the subjects in those groups were shown the *probabilities* of each outcome implied by those odds (groups A1, B1). The other half only received the odds as in the baseline setup (groups A2, B2). The objective was to replicate and test the effectiveness of an approach used by gambling authorities to facilitate a correct assessment of winning probabilities among bettors.[9]

To sum up, on each day of the experiment our experimental setup randomly assigned participants to one of six groups (as summarized in Table 2). Each of the six groups comprises approximately one-sixth of the subjects in the sample.[10]

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[8]Specifically, by giving participants in this arm a pre-determined bet on a given outcome, we can disentangle the effect of the sports framing on the *choices* made by participants (i.e., the outcome they choose to bet on) from the effect on the *valuations* of the bets (i.e., the difference in the value assigned to the same lottery when framed as a sports bet rather than a neutral lottery).

[9]Gambling authorities in the United Kingdom, Italy, and France, for example, have mandated providers of lottery tickets and/or scratch-card betting to provide customers with information on winning probabilities before betting (e.g., UK Gambling Commission (2020)). In practice, this is implemented by stating on the back of scratch-cards one in how many cards will win for each of two to three prize brackets (Italy, Agenzia delle Accise, Dogane e Monopoli (2022)), or one in how many will win any prize (United Kingdom), or by listing the total number of printed tickets and the total number of winning tickets for each possible prize (France). We constructed this experimental arm with the aim to apply this type of information treatment to sports betting.

[10]See Table A1 for the exact figures.

Table 2: Summary of Experimental Groups

	Sports-betting		Neutral lottery
	Info treatment	No info treatment	
Choice	***Group A1***: Subjects shown odds of a Premier League game and asked to place a bet (Team 1 wins, Draw, Team 2 wins). They receive the information treatment.	***Group A2***: Subjects shown odds of a Premier League game and asked to place a bet (Team 1 wins, Draw, Team 2 wins).	***Group C***: Subjects asked to bet on outcome of a neutral lottery (Color 1, Color 2, or Color 3) after being shown the proportions of colors in the urn and the corresponding winnings.
No-choice	***Group B1***: Subjects shown odds of a Premier League game and given a ticket for an already-placed bet (Team 1 wins, Draw, Team 2 wins). They receive the information treatment.	***Group B2***: Subjects shown odds of a Premier League game and given a ticket for an already-placed bet (Team 1 wins, Draw, Team 2 wins).	***Group D***: Subjects shown the proportions of colors and the corresponding winnings in a neutral lottery and given a ticket for an already-placed bet (Color 1, Color 2, Color 3).

3.3 Eliciting subjective probabilities and certainty equivalents

After participants placed their bets but before the outcome was revealed, we elicited their subjective probabilities that each of the three lottery outcomes would occur (further details are provided when we discuss the results below). We did this by means of visual aids in order to ensure clarity and minimise the cognitive load.[11] We also elicited subjects'

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[11]The expectation questions were not incentivized to avoid complicating the design excessively and in light of recent literature that has successfully used unincentivized expectation questions, including in contexts similar to our own (Caria and Falco, 2022). In any case, this is unlikely to be an important concern for our analysis since we concentrate on the *difference* in expectations between the neutrally-framed lottery and the sports bet and we have no reason to believe that incentivizing the expectation question would have had different impacts between the two versions.

certainty equivalents for the bets. To this end, we showed subjects in all groups a list of prices. For each price, we asked them to choose whether they would prefer to sell the bet or neutral-lottery ticket and receive that price with certainty, or keep the ticket and await the outcome of the match or urn draw. This question was incentivized: we explained to participants that after making their choices, a random buy-back price from the list would be drawn and implemented.[12]. It was made clear that this amount would be paid at the end of the day (the same as any winnings from the sports bet or neutral lottery) to avoid issues of present bias affecting the choice to sell.

3.4   Sampling Strategy

We conducted the experiment with a sample of 729 bettors who visited selected betting shops in Dar es Salaam. The experiment took place outside the shops and participants were recruited among the shop customers. The selected locations were betting shops belonging to mainstream companies that were willing to work with the experimenters (Throne-bet, GAL Sport Betting, Meridian-bet, Play-Master bet and Premier-bet). Specifically, we selected betting shops from different areas within three out of the five districts of Dar es Salaam (Ilala, Kinondoni, and Ubungo). The choice of areas was informed by the objective to attain diversity in economic activity (residential vs. commercial area) and income levels (low, middle, high). This strategy delivered interesting heterogeneity, but it was not meant to attain representativeness of the general population.

The research team arrived at the betting shops three to four hours before the start of the selected Premier League game of the day. That was the best time to find a large number of bettors in the shops. Research assistants went into the shop with the permission of the owners and recruited subjects for the experiment among the customers. The experiment was conducted outside the shop in a quiet nearby location where subjects were given tablets and the research assistants were available to provide explanations.[13]   Randomization into different treatment arms was conducted by the survey

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[12]That is, if they chose "sell" for this amount, they would receive the amount and not participate anymore in the sports bet / lottery; if they chose "keep" for this amount, they would keep their ticket and participate in the sports bet / lottery

[13]The subjects were distanced and could not discuss with one another during the experiment. Also,

software (Qualtrics) at the start of the experiment.

4 Results

This section presents our experimental results, drawing on the comparison between the sports bet and the neutral bet. We show that a sports framing triggers higher subjective valuations (certainty equivalents) of the bets and higher subjective probabilities of winning – despite an equal probability of actually winning – compared to the neutral bet. This is consistent with sports betting triggering subjects' overconfidence in their predictive abilities.

## 4.1 Sports betting induces higher certainty equivalents

The first finding from the experiment is that the average certainty equivalent in the sports bet is higher than the average certainty equivalent in the urn lottery despite the two having identical underlying odds (Figure 2). This is evident in both the choice and the no-choice arm, that is, both when subjects can choose the team / color on which they want to bet and when they are given a pre-made bet.

To probe this result further, we run a series of regressions where we estimate the effect of the sports framing on the certainty equivalent controlling for day fixed effects and participants' characteristics, and taking into account with a Tobit model that the certainty equivalent is capped at 20,000 TSh. The results, reported in Table 3, confirm that the sports framing induces significantly larger certainty equivalents relative to a neutral lottery with identical odds. The difference is similar in the choice arm (Col. 1, 1,742 TSh) and the no-choice arm (Col 3, 2,754 TSh), and it grows once we account for the truncated nature of the data (3,135 TSh in Col. 2 and 5,202 TSh in Col. 4, in the choice and no-choice arm respectively).[14] These are large magnitudes, as evidenced by the fact that the lowest estimated coefficient of 1,742 corresponds to about 17% of the

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we prevented players from participating more than once in the experiment.

[14]That is because the share of participants who are not willing to sell the lottery ticket even when offered the largest possible safe amount (20,000 TSh) is larger in the sports-bet group than in the urn-lottery group.

Figure 2: Certainty Equivalents

(a) Choice arm   **(b)** No-Choice arm
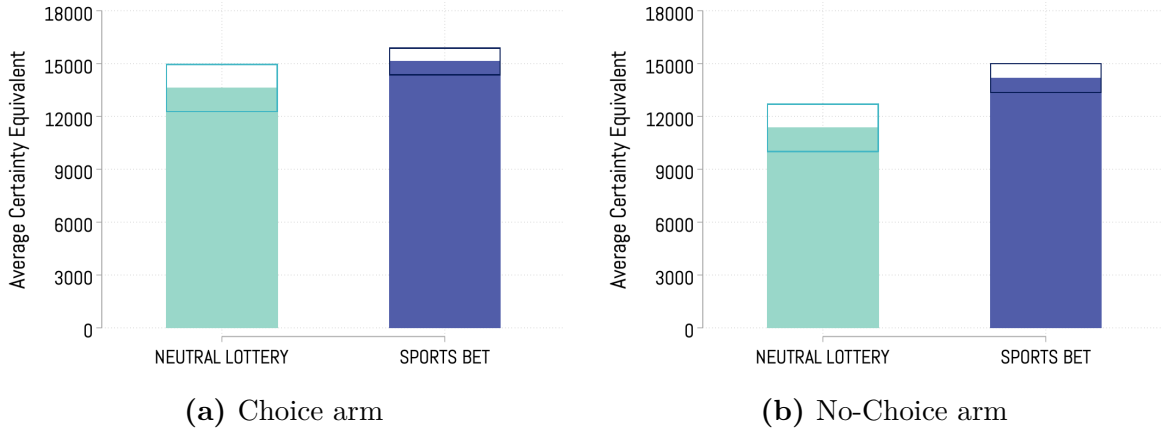
NOTES. This figure depicts the average certainty equivalent for participants in the Choice (left) and No-Choice (right) arms. In each panel, the certainty equivalent is presented separately for those who receive the neutral and sports-bet lottery. The certainty equivalent is defined as the amount at which an individual starts preferring to sell the sports bet (or the neutral lottery ticket) and receiving that amount with certainty rather than keeping the ticket.

initial endowment (10,000 TSh) and to about 13% of the average certainty equivalent in the neutral lottery.[15]

We also go a step further to allow for a more accurate comparison between the choice and the no-choice arm. To this end, we start from the reflection that the effect of the sports betting framing in the choice arm is the result of two distinct effects. First, the sports betting framing may induce participants to *choose different outcomes* to bet on. For instance, it may induce them to choose more often the lowest-paying, safest, team. Second, *conditional on choosing an outcome (team)*, the sports framing may increase the value that participants attach to the bet (i.e., their expected likelihood that the outcome will occur). In the no-choice arm, the second effect is the only one at play.

To isolate the second effect in the choice arm, in Col. 5 of Table 3 we add *day×outcome* fixed effects to the empirical model, where an *outcome* is one of the three possible results of a match (Team A wins, Draw, Team B wins) or one of the three corresponding colors in the urn. By doing this, we now estimate the coefficient of interest by comparing the certainty equivalents of players who choose a given outcome under

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[15]In the baseline specification, we control for participants' age, gender, education, income, and self-assessed football knowledge. The *Sports Bet* coefficient is unchanged when we do not include these controls, albeit more imprecisely estimated (and not significant in Column 1 and 2).

Table 3: Sports betting induces higher certainty equivalents

	Choice		No choice		Choice condit.
	(1) OLS	(2) Tobit	(3) OLS	(4) Tobit	(5) OLS
Sports Bet	1741.61*	3134.59*	2753.51***	5201.57***	2844.83***
	(965.11)	(1877.37)	(984.75)	(1726.62)	(1079.83)
Day-by-outcome FE	No	No	No	No	Yes
Mean dep. var (Neutral Lottery)	13557.69	13557.69	11352.94	11352.94	13557.69
Std. dev. dep. var	8402.30	8402.30	8282.93	8282.93	8402.30
Observations	334	334	330	330	334
R-squared	0.060		0.070		0.107

NOTES.: This table reports the estimated effect of the sports-bet framing on the certainty equivalent. In all columns, the dependent variable is defined as the amount at which an individual starts preferring to sell the sports bet (or the lottery ticket) and receiving that amount with certainty rather than keeping the ticket. *Sports Bet* is a dummy variable that equals one if an individual receives the sports bet and 0 if s/he receives the neutral lottery. All columns include controls for participants' age, education, income, and self-assessed football knowledge; Column 1, 2, 3, and 4 also include day fixed effects, while Column 5 includes day×outcome fixed effects. Column 1, 2, and 5 consider only participants in the choice arm, who can choose the outcome to bet on. Column 3 and 4 consider participants in the no-choice arm, who were given a ticket for an already-placed bet. Coefficients in all columns except 2 and 4 are estimated by OLS, while the ones in Column 2 and 4 are obtained from a Tobit model, which accounts for the upper limit on the safe amount offered to participants (20,000 TSh). Robust standard errors in parentheses. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$.

the sports framing *only with players who choose the corresponding outcome under the neutral framing* (e.g., players who choose the lowest paying outcome under the sports framing are compared to those who choose the lowest paying outcome under the neutral framing). Upon doing this, the estimated coefficient becomes larger and more statistically significant. As expected, it is even closer to the coefficient from the OLS regression in the no-choice arm (Col. 3) where the first of the two effects outlined above is shut down by design.

4.2 Sports betting induces higher expectations of winning

The second finding from the experiment is that sports bettors overestimate their probability of winning. To measure participants' expectations, we asked them to indicate on a 0-100 scale how likely they thought each lottery outcome was. The expected probability of winning is the one associated with the outcome they bet on.[16]

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[16]We divide the three stated probabilities by their sum. This rescaling was necessary because we did not want to force the answers to sum to 100, as this may have primed subjects. We also asked a more direct but less refined question: "How likely do you think it is that you will win your bet on a scale from 0 to 100?". As expected, the results are similar but less precise if we measure subjective winning

Figure 3: Perceived probability of winning

(a) Choice arm **(b)** No-choice arm
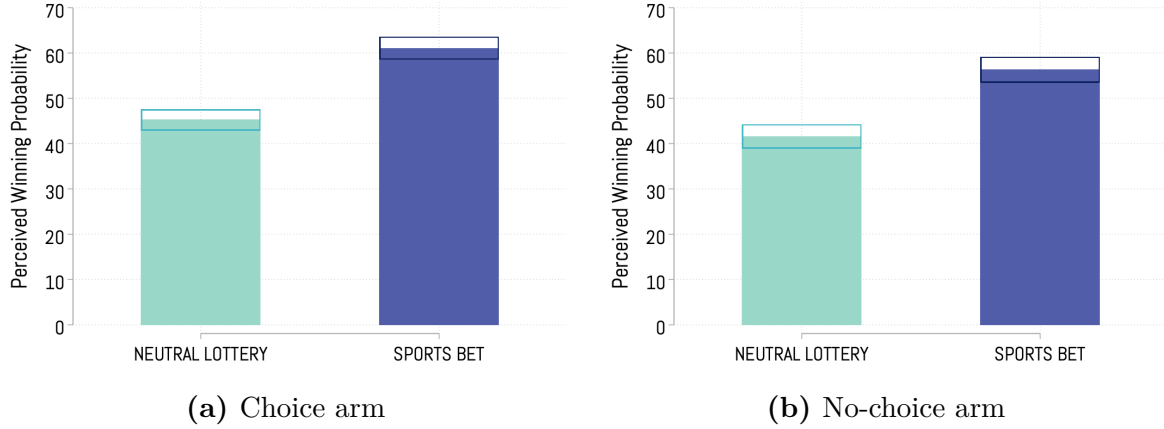
NOTES. This figure depicts the average perceived probability of winning among participants in the Choice (left) and No-Choice (right) arms. In each panel, the perceived probability of winning is the answer to the question "What do you think are the chances (in percentages) that each of the following events will happen?", where events are either the colors of the ball or the outcomes of the football match (1, X, or 2), for the event they bet on. As participants' possible answers are not constrained to sum to 100, the answers are re-scaled by the sum of the three likelihoods stated. The average perceived probabilities are presented separately for those who receive the neutral and the sports-bet lottery.

Figure 3 shows the average subjective probability of winning by type of framing (the lighter bars capture the neutral lottery, the darker bars capture the sports framing), splitting the sample into the choice arm (Panel a) and the no-choice arm (Panel b). The figure shows a consistent picture across the two arms: under the sports framing, subjective probabilities of winning are significantly higher.

As in the previous section, we probe the raw results further by estimating a series of regressions that control for individual characteristics and day fixed effects (Table 4). We find that with the sports framing subjective expectations of winning are approximately 16 percentage points higher in the Choice arm (Col. 1) and 14 percentage points higher in the No Choice arm (Col. 2). The conclusions are unchanged when we control for $day \times outcome$ fixed effects in Column 3. As in the previous section, this is done with the objective of comparing participants who bet on equivalent outcomes under both framings.

We conclude that a sports framing increases subjects' perceived likelihood of winning, which is consistent with the hypothesis that it triggers overconfidence in their own predictive abilities. The result is also consistent with the evidence on certainty

probabilities using the answers to this question.

Table 4: Sports betting induces higher expectations of winning

	(1) Choice	(2) No choice	(3) Choice condit.
Sports Bet	16.13***	14.12***	11.33***
	(2.17)	(2.35)	(2.59)
Day-by-outcome FE	No	No	Yes
Mean dep. var (Neutral Lottery)	78.14	75.37	78.14
Std. dev. dep. var	21.21	24.69	21.21
Observations	361	367	361
R-squared	0.175	0.164	0.236

NOTES.: This table reports the estimated effect of the sports bet framing on participants' perceived probability of winning. This is defined as the answer to the question "What do you think are the chances (in percentages) that each of the following events will happen?", where events are either the color of the ball or the outcome of the football match (1, X or 2). As participants' possible answers are not constrained to sum to 100, these are re-scaled by the sum of the three likelihoods stated. In all columns, Sports Bet is a dummy variable that equals one if an individual receives the sports bet and 0 if s/he receives the neutral lottery. All columns include controls for participants' age, education, income, and self-assessed football knowledge; Column 1 and 2 also include day fixed effects, while Column 3 includes day×outcome fixed effects. Column 1 and 3 consider only participants in the Choice arm, who can choose the outcome to bet on. Column 2 considers participants in the no-choice arm, who were given a ticket for an already-placed bet. Coefficients in all columns are estimated through OLS. Robust Robust standard errors in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.

equivalents presented above and it complements it in important ways. Crucially, since a higher certainty equivalent for the sports bet may be partly driven by preferences (e.g., betting on football and awaiting the outcome of the game may generate enjoyment), showing that the sports framing increases underlying subjective expectations allows us to pin down the mechanism more precisely.

4.3 Explaining the odds of a bet to gamblers has little impact

One possible explanation for bettors' incorrect expectations is that they may not understand the odds as an expression of the likelihood of winning the bet but rather as an indication of their potential winnings (i.e., they only see the odds as the factor by which their stakes are multiplied in case of success). The idea that gamblers may be unaware of winning probabilities has driven gambling authorities in countries such as the United Kingdom, Italy and France to require lottery operators to provide such information explicitly.

In order to shed light on the efficacy of such a policy tool and, more generally, to test the role of gamblers' limited understanding of betting odds, we randomized an information treatment among participants in the sports lottery arm. Half of the participants in this group were given only the standard odds of each game outcome; the other half were also shown the probability of each event implied by the odds. Appendix Table A5 presents the effects of this treatment (pooling together the choice and no-choice arms). The effect of the additional information on the certainty equivalent of the lottery (Column 1 and 2) and on the perceived probability of winning (Column 3) is statistically insignificant and close to zero. This suggests that lack of ability to understand the odds plays little role in explaining our results. This conclusion is in line with the fact that the effect of the sports framing documented above is not heterogeneous in participants' numeracy or education (we present this additional result in Appendix Table A4). In sum, we conclude that providing information on the underlying probabilities has a limited impact on gamblers' choices.[17] While a fully-fledged policy evaluation is beyond the scope of this article, this can inform regulators' future attempts to improve bettors' understanding of their gambles.

5 Discussion and Additional Results

In this section, we present additional results to bolster our conclusions and shed light on the mechanisms at play. First, we test for the possibility that a sports framing may trigger greater optimism (i.e., a generally more positive outlook on uncertain events) as opposed to overconfidence in one's own predictive abilities. Second, we test whether bettors' seemingly excessive confidence in their decisions (i.e., their high certainty equivalents and subjective probabilities of winning) may in fact be justified by higher chances of winning in the sports bet arm compared to the neutral bet arm (e.g., because what appears to be overconfidence is in fact the result of actually superior predictive abilities).

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[17]This is in line with findings by Zenker et al. (2016) that informing Thai households of the winning probabilities of a Government Lottery did not reduce willingness to pay for lottery tickets.

5.1 Overconfidence *vs.* Optimism

Our evidence so far points to the conclusion that bettors are over-confident about their chances of winning sports bets relative to equivalent neutrally-framed lotteries. We interpret this as evidence of bettors' overconfidence in their predictive abilities with regard to sports events. An alternative explanation for overly positive predictions is that sports events may trigger greater optimism, which could be viewed as a generally more positive outlook on the chances that uncertain events will turn in one's favor. Since betting on sports is part of a broader experience revolving around the enjoyment of watching games, it is not far-fetched to think that such enjoyment may trigger a more positive assessment and greater faith in one's luck.[18]

To test this hypothesis, we compare once again the choice and no-choice arm of the experiment. At first glance, the fact that both in the choice and in the no-choice arm subjects were overly optimistic about their bets seems to point to the conclusion that general optimism as opposed to overconfidence may be at play. A more careful scrutiny of the data, however, rejects this conclusion. Crucially, one should note that in the no-choice arm the pre-fixed bet we offered was typically placed on the most likely outcome (i.e., the top team).[19] This was *also the team that most respondents picked in the choice arm.* We show this in Figure 4, where we plot the betting choices of the participants on each day of the experiment. In light of this, it is not surprising nor inconsistent with overconfidence that, on average, the certainty equivalent of the sports bet is similar in the choice and the no-choice arms, since participants in the choice arm systematically bet on the same (top) team that we give them in the no-choice arm. In other words, had they had the option, most participants in the no-choice arm would have placed the same bet we gave them. This implies that the value subjects assign to the sports bet – and, implicitly, their (over)confidence in the bet – is similar in the two arms, on average.

This average, however, masks useful heterogeneity that we can use to probe

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[18]For instance, in a lab experiment Ifcher and Zarghamee (2014) induced positive affect ("a good mood") in their subjects and found this to increase overconfidence in male subjects.

[19]This was done both for budgetary reasons (as riskier bets may have triggered large payouts albeit with a low probability) and to offer a safer bet to participants.

our hypothesis further. Specifically, Figure 4 shows that, although typically high, the share of participants in the choice arm who bet on the same outcome as the one assigned in the no-choice arm (i.e., the top team winning, colored in light blue) varies across days. On days 2 and 7, for instance, about 80% of participants in the choice arm bet on the team chosen for the no-choice arm (low disagreement). Instead, on day 3, fewer than 50% of participants did so (high disagreement). If overconfidence (and not general optimism) is the mechanism at play, the value assigned to sports bets should be higher in the choice arm, relative to the no-choice arm, on days with high disagreement, when a lower proportion of subjects in the choice arm chose the outcome we selected for the no-choice arm. If instead, results are driven by some form of excess optimism triggered by the sports betting framing, the value of the lottery in the choice arm relative to the no-choice arm should be similar across days.[20] The analysis supports the first hypothesis and corroborates our conclusions on overconfidence. As shown in Appendix Table A6, bettors' certainty equivalents in the choice arm are higher – although the p-value of the estimated difference (0.11) is just above conventional significance thresholds – relative to the no-choice arm on days with higher disagreement, when a lower share of participants in the choice arm chose the same outcome as the one selected by the experimenters in the no-choice arm.[21] In other words, by looking at cases in which subjects choose outcomes that differ from the pre-fixed choice of the no-choice arm, we detect higher certainty equivalents that cannot be ascribed to general optimism since that should apply equally regardless of whether the bet is made by participants or is pre-determined.

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[20]Put differently, on days when a lower share of subjects in the choice arm bet on the same team as in the pre-fixed no-choice bet (high-disagreement days), there is a larger share of participants in the no-choice arm who, had they had the option, would have picked a different outcome. On these days, one should observe a more pronounced difference in the certainty equivalent of the sports bet between the choice and the no-choice arm.

[21]Due to the limited number of game days available, it is not surprising that statistical significance is reduced in this estimation. Despite this, when we subject the results to even stricter testing by adding controls and running the same Tobit model used in previous sections, the conclusions remain qualitatively unchanged. The additional results are available upon request.

Figure 4: Participants' betting choices
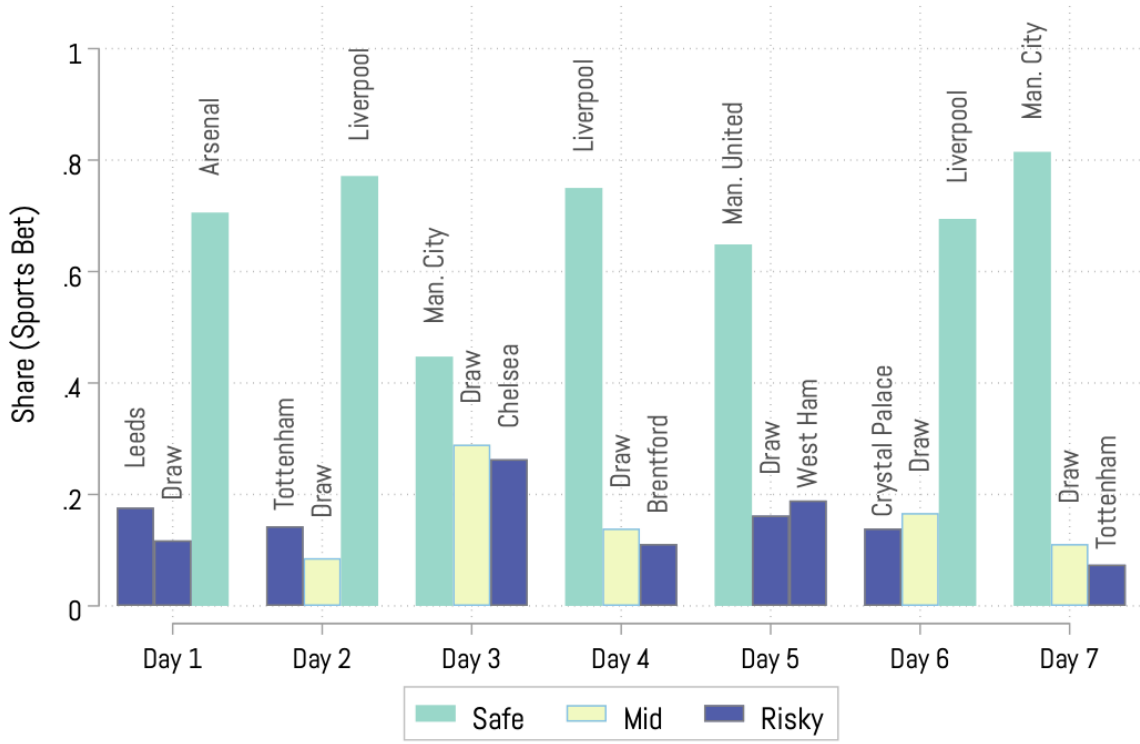
NOTES. This figure depicts, for each day of the experiment, the share of participants in the choice arm of the sports bet group who chose to bet on each of the possible game outcomes. The most likely (safest) outcome according to the odds is colored in light blue. The second most likely outcome is colored in yellow. The least likely outcome (riskiest) is coloured in dark blue. In the no-choice arm, the pre-fixed bet is always on the most likely (safest) outcome.

5.2 Sports betting does not yield larger winnings than the neutral lottery

The apparent overconfidence we have documented may in fact be fully rational if subjects did in fact have superior knowledge of the game and predictive abilities that allowed them to systematically 'beat the odds'. In other words, what appears to be an overestimation of the winning probabilities implied by the odds may in fact be the result of a superior assessment relative to the information carried by those odds. This is a testable hypothesis. The key implication is that under the sports framing subjects should win the bet more frequently than in the neutral framing.

This hypothesis is strongly rejected by the data. Focusing on the choice arm,

participants under the sports framing lose, on average, 588 TSh.[22] This is close to the average loss under the neutral framing, which is equal to 504 TSh. We conclude, therefore, that despite their apparent confidence, as signaled by their higher certainty equivalents, sports bettors do not win more often than participants in the neutral lottery. As in the real world, our experimental subjects are unable to beat the odds set by betting companies, which are the ones we use in the experiment. This lends credibility to our experimental setup and it is highly consistent with the very foundations of the industry's business model. Crucially, this is also in line with our overall conclusion that gamblers are overconfident and have overly optimistic expectations.

6 Conclusions

The rapid spread of sports betting especially among the most disadvantaged in society is a growing cause of concern globally. This is the first study that experimentally investigates how sports betting induces overly optimistic expectations and over-betting by leveraging overconfidence.

We find that the certainty equivalent of a bet is, on average, higher when the bet is framed as a sports bet compared to a neutral urn-and-balls lottery with identical underlying odds. We also find that sports bets trigger a higher subjective probability of winning compared to a neutral lottery. In reality, bettors under the sports framing are no more likely to win. We also offer unique evidence on betting habits, which makes the experimental findings all the more compelling and disconcerting. Bettors bet frequently, they allocate a significant share of their income to this activity, and they view betting as an income generating activity (akin to a job) as opposed to a game, despite clear evidence that their average gains are negative.

In light of our conclusions, policymakers should dedicate close attention to the industry. Gambling is often justified on the grounds that risk-loving individuals should be free to make a choice that gives them positive utility. Our conclusions show that such

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[22]We compute this value as the difference between participants' average winnings and the initial endowment of 10,000 TSh.

an argument is at best partial given that the expectations on which bettors' assessments are based may be incorrect independently of their risk preferences. We also show that standard policy instruments such as the provision of more detailed information on the odds of a bet may not improve the bettors' assessment nor reduce their financial losses. Further work is necessary to devise better strategies to ensure that bettors become aware of their misperceptions.

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Online Appendix

Table A1: Balance

	(1) Group A mean/sd	(2) Group B mean/sd	(3) Group C mean/sd	(4) Group D mean/sd	(5) (2)-(1) b/t	(6) (4)-(3) b/t	(7) (3)-(1) b/t	(8) (4)-(2) b/t
Age	31.82	31.44	33.14	32.88	0.26	0.38	1.45	1.32
	(8.41)	(8.47)	(9.28)	(9.09)	(0.22)	(0.50)	(1.50)	(1.36)
Self-assessed football expert	0.78	0.72	0.72	0.79	-0.07	0.06	0.08	-0.06
	(0.42)	(0.45)	(0.45)	(0.41)	(-1.28)	(1.58)	(1.60)	(-1.15)
Education: None	0.04	0.02	0.05	0.02	0.03	0.01	0.00	0.01
	(0.19)	(0.15)	(0.22)	(0.16)	(1.06)	(0.81)	(0.02)	(0.62)
Education: Primary	0.37	0.44	0.47	0.42	0.05	-0.07	-0.02	0.10
	(0.48)	(0.50)	(0.50)	(0.50)	(0.82)	(-1.64)	(-0.39)	(1.90)
Education: Secondary (4 yrs)	0.43	0.42	0.41	0.45	-0.05	0.01	0.04	-0.02
	(0.50)	(0.49)	(0.49)	(0.50)	(-0.74)	(0.21)	(0.65)	(-0.38)
Education: Secondary (6 yrs) or univ.	0.16	0.11	0.07	0.10	-0.03	0.05	-0.01	-0.10*
	(0.37)	(0.32)	(0.25)	(0.30)	(-0.87)	(1.62)	(-0.42)	(-2.56)
Lives with 4+ family members	0.57	0.57	0.50	0.54	-0.04	0.00	-0.03	-0.07
	(0.50)	(0.50)	(0.50)	(0.50)	(-0.64)	(0.06)	(-0.50)	(-1.29)
Monthly family income <50k TSh	0.26	0.27	0.34	0.21	0.13*	-0.02	-0.07	0.08
	(0.44)	(0.45)	(0.47)	(0.41)	(2.27)	(-0.43)	(-1.37)	(1.61)
Monthly family income 50k-200k TSh	0.40	0.40	0.47	0.50	-0.03	0.00	0.10	0.07
	(0.49)	(0.49)	(0.50)	(0.50)	(-0.52)	(0.02)	(1.85)	(1.22)
Monthly family income 200k-500k TSh	0.26	0.23	0.15	0.21	-0.06	0.02	-0.02	-0.10*
	(0.44)	(0.42)	(0.36)	(0.41)	(-1.27)	(0.60)	(-0.36)	(-2.25)
Monthly family income >500k TSh	0.09	0.09	0.04	0.07	-0.03	-0.01	-0.02	-0.04
	(0.28)	(0.29)	(0.20)	(0.26)	(-1.07)	(-0.27)	(-0.61)	(-1.54)
Self-employed	0.61	0.58	0.62	0.58	0.04	0.03	-0.00	0.01
	(0.49)	(0.49)	(0.49)	(0.50)	(0.68)	(0.62)	(-0.05)	(0.23)
Employed (worker)	0.24	0.28	0.27	0.26	0.01	-0.04	-0.02	0.03
	(0.43)	(0.45)	(0.45)	(0.44)	(0.22)	(-1.05)	(-0.49)	(0.62)
Unemployed	0.15	0.14	0.11	0.17	-0.06	0.01	0.03	-0.04
	(0.36)	(0.35)	(0.31)	(0.37)	(-1.26)	(0.44)	(0.69)	(-1.11)
Wage frequency daily	0.74	0.65	0.71	0.72	-0.00	0.09	0.07	-0.03
	(0.44)	(0.48)	(0.46)	(0.45)	(-0.07)	(1.94)	(1.12)	(-0.52)
Daily wage >10k TSh	0.52	0.57	0.58	0.63	-0.05	-0.05	0.06	0.06
	(0.50)	(0.50)	(0.50)	(0.49)	(-0.63)	(-0.75)	(0.86)	(0.76)
Monthly wage >150k TSh	0.69	0.61	0.57	0.74	-0.17	0.07	0.13	-0.11
	(0.47)	(0.49)	(0.50)	(0.45)	(-1.32)	(0.81)	(1.17)	(-1.01)
Monthly wage >300k TSh	0.25	0.27	0.25	0.22	0.03	-0.02	-0.05	-0.00
	(0.44)	(0.45)	(0.44)	(0.42)	(0.24)	(-0.20)	(-0.49)	(-0.05)
Sector: Agriculture, forestry, fishing	0.07	0.06	0.08	0.07	0.02	0.02	0.01	0.01
	(0.26)	(0.23)	(0.28)	(0.26)	(0.42)	(0.67)	(0.44)	(0.38)
Sector: Manuf., motor, constr., transp.	0.27	0.31	0.38	0.30	0.08	-0.04	-0.01	0.11*
	(0.44)	(0.46)	(0.49)	(0.46)	(1.22)	(-0.89)	(-0.17)	(2.01)
Sector: Retail, wholes., accomm., food	0.27	0.29	0.21	0.34	-0.13*	-0.02	0.05	-0.06
	(0.44)	(0.45)	(0.41)	(0.47)	(-2.10)	(-0.47)	(0.88)	(-1.15)
Sector: White collar	0.09	0.06	0.08	0.07	0.02	0.03	0.01	-0.00
	(0.28)	(0.23)	(0.28)	(0.26)	(0.42)	(1.22)	(0.44)	(-0.07)
Sector: Other	0.31	0.29	0.25	0.23	0.02	0.01	-0.06	-0.06
	(0.46)	(0.46)	(0.43)	(0.42)	(0.30)	(0.30)	(-1.20)	(-1.12)
Observations	243	246	119	121	240	489	367	362

NOTES.: This table shows balance tests for a range of participant characteristics across the four experimental groups. Group A is "Sports-betting, choice", Group B is "Sports-betting, no-choice", Group C is "Lottery, choice", and Group D is "Lottery, no-choice".

Table A2: Summary statistics on betting behavior

	mean	sd	min	max
Bets on sports every day; dummy=0 if less frequently	0.60	0.49	0.00	1.00
Bets on sports every day or several times a week	0.94	0.25	0.00	1.00
Avg single bet above 1k Tsh	0.54	0.50	0.00	1.00
Amount spent on SB last 2 wks (in 1000 Tsh)	40.27	160.16	0.00	4000.00
Number of SB last 2 wks	7.19	3.19	0.00	10.00
Spent less than usual past 2 wks	1.00	0.00	1.00	1.00
Amount won with SB last 2 wks (gross) (in 1000 Tsh)	108.21	762.68	0.00	20000.00
Amount won with SB last 2 wks (gross, noout) (in 1000 Tsh)	80.89	193.56	0.00	3000.00
Net amount won with SB last 2 wks (in 1000 Tsh)	67.95	774.35	-3974.00	19900.00
Net amount won with SB last 2 wks (noout) (in 1000 Tsh)	40.70	242.28	-3974.00	2700.00
Lost money with SB last 2 wks	0.49	0.50	0.00	1.00
Won 50k or more with SB last 2 wks	0.25	0.43	0.00	1.00
Feels sometimes bets more than should	0.57	0.49	0.00	1.00
Largest amount won above 250k Tsh	0.41	0.49	0.00	1.00
Largest amount heard of above 5mio Tsh	0.50	0.50	0.00	1.00
Reason bets: make money	0.88	0.33	0.00	1.00
Reason bets: for fun	0.11	0.32	0.00	1.00
Reason bets: watch game	0.05	0.21	0.00	1.00
Reason bets: friends do it	0.02	0.14	0.00	1.00
Reason bets: other	0.01	0.09	0.00	1.00
SB reliable income source==Not at all	0.24	0.43	0.00	1.00
SB reliable income source==Only a little	0.14	0.35	0.00	1.00
SB reliable income source==To some extent	0.43	0.49	0.00	1.00
SB reliable income source==Yes, absolutely	0.19	0.39	0.00	1.00
SB reliable income source (some ext,absol)	0.61	0.49	0.00	1.00
Use of winnings: save	0.09	0.29	0.00	1.00
Use of winnings: special purchases	0.32	0.47	0.00	1.00
Use of winnings: daily expenses	0.63	0.48	0.00	1.00
Use of winnings: bet again	0.09	0.28	0.00	1.00
Use of winnings: go out	0.02	0.14	0.00	1.00
Use of winnings: business invest	0.02	0.15	0.00	1.00
Use of winnings: other	0.02	0.14	0.00	1.00
Observations	729			

Table A3: Alternative measure of perceived probability of winning

	(1) Choice	(2) No choice	(3) Choice condit.
Sports Bet	6.68***	7.21***	4.93*
	(2.39)	(2.70)	(2.90)
Day-by-outcome FE	No	No	Yes
Mean dep. var (Neutral Lottery)	78.14	75.37	78.14
Std. dev. dep. var	21.21	24.69	21.21
Observations	361	367	361
R-squared	0.062	0.063	0.124

NOTES.: This table reports the estimated effect of the sports bet framing on an alternative measure of the participants' perceived probability of winning. This is defined as the answer to the question "How likely do you think it is you will win your bet on a scale from 0 to 100?". In all columns, Sports Bet is a dummy variable that equals one if an individual receives the sports bet and 0 if s/he receives the neutral lottery. All columns include controls for participants' age, education, income, and self-assessed football knowledge; Column 1 and 2 also include day fixed effects, while Column 3 includes day×outcome fixed effects. Column 1 and 3 consider only participants in the choice arm, who can choose the outcome to bet on. Column 2 considers participants in the no-choice arm, who were given a ticket for an already-placed bet. Coefficients in all columns are estimated through OLS. Robust standard errors in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.

Table A4: Heterogeneous Impacts

	Choice		No choice	
	(1) CE	(2) Prob. win	(3) CE	(4) Prob. win
Sports Bet	-222.24 (3712.26)	36.56*** (9.00)	4360.93 (3504.12)	12.07 (8.17)
Age	-11.94 (91.38)	0.10 (0.20)	-48.10 (81.03)	-0.06 (0.15)
Sports Bet × Age	51.91 (108.79)	-0.65** (0.26)	-51.99 (104.78)	0.08 (0.24)
Sports Bet	2038.17 (1265.09)	21.46*** (3.00)	3237.34** (1460.47)	15.21*** (3.80)
≥ median income	-818.02 (1660.68)	-0.52 (2.86)	-1010.67 (1635.11)	4.01 (3.30)
Sports Bet × ≥ median income	-813.99 (1892.36)	-9.70** (4.22)	-742.11 (1948.17)	-1.35 (4.80)
Sports Bet	2839.98** (1366.62)	14.46*** (2.70)	1528.92 (1532.77)	16.43*** (3.31)
Secondary educ. or higher	2014.78 (1613.60)	2.01 (2.93)	-915.81 (1669.68)	3.10 (3.26)
Sports Bet × Secondary educ. or higher	-2727.55 (1871.93)	1.95 (4.20)	2224.85 (1988.54)	-3.17 (4.55)
Sports Bet	531.46 (1002.92)	14.92*** (2.13)	2869.00*** (1055.27)	15.57*** (2.46)
Numeracy	-6246.87** (2497.51)	-2.84 (6.36)	-2703.10 (2100.72)	6.89 (5.09)
Sports Bet × Numeracy	6768.05** (2704.90)	5.69 (7.23)	-536.99 (2472.62)	-4.99 (6.63)
Sports Bet	2646.94 (1844.21)	18.69*** (3.84)	2511.65 (2431.24)	14.64*** (5.20)
Football expert	2130.55 (1838.44)	2.49 (2.77)	-109.39 (2386.37)	-4.01 (4.35)
Sports Bet × Football expert	-1697.66 (2150.99)	-3.82 (4.63)	381.75 (2650.17)	-0.40 (5.81)
Sports Bet	2639.75* (1517.21)	16.52*** (3.36)	5148.42*** (1544.08)	12.07*** (3.81)
Bets every day	2801.97* (1682.26)	-0.99 (3.09)	2588.20 (1669.91)	-2.66 (3.44)
Sports Bet × Bets every day	-1951.90 (1933.72)	-1.31 (4.31)	-3855.92** (1956.99)	4.15 (4.80)
Sports Bet	1775.69 (1086.36)	14.86*** (2.38)	2987.53*** (1127.56)	14.94*** (2.61)
Won 50K or more last two weeks	1526.66 (1962.38)	-0.99 (3.24)	-616.72 (1851.77)	-4.28 (3.58)
Sports Bet × Won 50K or more last two weeks	-1314.43 (2243.42)	4.09 (4.67)	-740.08 (2216.53)	-1.24 (5.60)

NOTES.: This table shows impact heterogeneity for the sports framing treatment along a set of participants' characteristics and indicators of betting habits. The individual characteristics considered are age (in years), an indicator equal to one if the income is higher than the sample median, an indicator equal to one for secondary education or higher, an indicator equal to one if a participant answers correctly the two questions measuring numeracy. The variables capturing betting habits are a set of binary indicators equal to one if a participant defines himself/herself as a football expert, if s/he bets every day, and if s/he won more than 50,000 TSh in the two weeks before the experiment. In Column 1 and 3 the dependent variable is the certainty equivalent, defined as the amount at which an individual starts preferring to sell the sports bet (or the lottery ticket) and receive that amount with certainty rather than keeping the ticket. In Columns 2 and 4, the dependent variable is the answer to the question "What do you think are the chances (in percentages) that each of the following events will happen?", where events are either the colors of the balls or the outcomes of the football match (1, X or 2), re-scaled by the sum of the three likelihoods stated. In Columns 1 and 2 the sample considers only participants in the choice arm, while in Columns 3 and 4 it considers participants in the no-choice arm. All columns include day fixed effects. Coefficients in all columns are estimated through OLS. Robust standard errors in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.

Table A5: Information treatment

	Certainty Equivalent		Perceived probability
	(1)	(2)	(3)
	OLS	Tobit	OLS
Info	-225.41	-665.44	-3.61
	(706.09)	(1441.96)	(2.28)
Mean dep. var (No info)	14786.32	14786.32	60.14
Std. dev. dep. var	7271.35	7271.35	25.03
Observations	458	458	489
R-squared	0.051		0.086

NOTES.: This table reports the estimated effect of the information treatment on the certainty equivalent and participants' perceived probability of winning. In Column 1 and 2, the dependent variable is defined as the amount at which an individual starts preferring to sell the sports bet (or the lottery ticket) and receive that amount with certainty rather than keeping the ticket. In Column 3, it is the answer to the question "What do you think are the chances (in percentages) that each of the following events will happen?", where events are either the colors of the balls or the outcomes of the football match (1, X, or 2), re-scaled by the sum of the three likelihoods stated. Info is a dummy variable that equals one if an individual receives the information treatment, and 0 otherwise. In all columns, the sample pools together participants in the choice and no-choice arm. All columns include an indicator that equals one if an individual is in the choice arm, day fixed effects, and controls for participants' age, education, income, and self-assessed football knowledge. Coefficients in Column 1 and 3 are estimated by OLS, while the ones in Column 2 are obtained from a Tobit model that accounts for the upper limit on the certain amount offered to participants (20,000 TSh). Robust standard errors in parentheses. *p $<$ 0.10; **p $<$ 0.05; ***p $<$ 0.01.

Table A6: Heterogeneous impacts by difference in bets b/n choice and no-choice arm

	(1) OLS	(2) OLS
Choice arm	-2138.7	-2122.2
	(2076.0)	(2071.9)
Choice arm $\times$ Disagreement	9724.1	9688.6
	(6090.3)	(6088.6)
Day FE	No	Yes
Mean dep. var (No choice)	14184.21	14184.21
Std. dev. dep. var	7700.41	7700.41
Observations	458	458
R-squared	0.009	0.030

NOTES: This table reports heterogeneous impacts of the sports framing on certainty equivalents by the difference (degree of disagreement) between the bets made by subjects in the choice arm and those pre-fixed in the no-choice arm. In all columns, the dependent variable is the certainty equivalent of the bet, defined as the amount at which an individual starts preferring to sell the sports bet (or the lottery ticket) and receiving that amount with certainty rather than keeping the ticket. The sample considers only participants in the sports bet group. *Choice arm* is a dummy variable that equals one if the participant is in the choice arm of the experiment (i.e., has the possibility to choose the outcome to bet on). *Disagreement* is the share of participants in the choice arm who choose to bet on an outcome that *differs* from the one we choose for the pre-fixed bet in the no-choice arm. This share ranges from a minimum of 21% (day 7) to a maximum of 56% (day 3). Coefficients in both column 1 and 2 are estimated by OLS. Robust standard errors in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.