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CAN GAMBLING ADS AFFECT CUSTOMER RISK BEHAVIOR? A SIMULATION STUDY TO THE "888" CASE

David Lopez-Lopez

ESADE Business School
Universitat Ramon Llull
Sant Cugat del Vallès, 08172, SPAIN

Giovanni Giusti

Tecnocampus
Universitat Pompeu Fabra
Mataró, 08302, SPAIN

Angel A. Juan

Dept. of Applied Statistics and Operations Research
Universitat Politècnica de València
Alcoy, 03801, SPAIN

Canan Gunes Corlu

Metropolitan College
Boston University
Boston, MA 02215, USA

ABSTRACT

The aim of this research paper is to investigate the connection between advertising and consumer behavior in the gambling industry, which heavily relies on advertising. Specifically, it examines the impact of advertising on risky behavior among consumers, using the well-known Spanish gambling brand "888 Poker" as a case study. The experimental design entails a simulated asset market approach with 92 participants. The collected data is analyzed to draw conclusions about the relationship between advertising and risk behavior within the gambling industry context. The findings demonstrate that exposure to a gambling advertisement prior to engaging in an asset market leads to an almost twofold increase in the trading price of the asset.

1 INTRODUCTION

Gambling constitutes a significant economic endeavor in the countries where it is permitted (Chóliz 2023). Specifically, according to Chóliz et al. 2021, the expenditure on gambling in Italy, Finland, and Spain exceeds 3% of the gross domestic product (GDP). Numerous studies conducted in the fields of psychology and marketing have demonstrated that advertising can influence customer behavior in various ways. The information-processing model of advertising suggests that advertising affects people's behavior by influencing their attention, perception, and memory of the product or service being advertised. Moreover, advertising can create a need or desire for a product or service by appealing to people's emotions, values, and social identity (Aaker and Keller 1990; Oliveira et al. 2022), and can also impact people's attitudes toward the product or service (Petty et al. 1986; Wu and Overton 2022) and buying behavior by altering their perception of the product's value, price, and quality (Keller 1993; Halkiopoulos, Antonopoulou, Gkintoni, and Aroutzidis 2022).

However, the impact of advertising on people's behavior may vary depending on individual differences such as age, gender, personality, and culture (Shavitt et al. 1998; Hudders and De Jans 2022) and external factors such as the advertising context, message, and media channel. Sales play a crucial role in the financial health and success of a company, and various studies have highlighted their importance. Sales data can also provide valuable information on customer preferences and behavior that can inform marketing strategies and product development, allowing companies to track trends, measure the effectiveness of advertising and promotions, and identify areas for improvement in sales and marketing efforts.

Advertising can influence both short-term and long-term sales, brand loyalty, and customer lifetime value, which could explain why companies across all sectors widely use advertising. In-store promotions, such as in-store displays, endcaps, and coupons, have been shown to significantly increase sales, particularly for popular products. Television advertising, especially for consumer packaged goods, has been demonstrated to increase both short-term and long-term sales and have a positive impact on brand loyalty and customer lifetime value (Pauwels et al. 2002). Digital advertising, such as search and social media advertising, has also been found to have a significant impact on sales, particularly for products purchased online, as well as brand awareness and customer engagement (Clemons 2008; Martínez-López et al. 2020).

In controversial industries such as tobacco, alcohol, and gambling, companies tend to use persuasive advertising to promote their products and services (Hoek et al. 2016). These types of advertisements can be effective in increasing sales and revenue for companies in these industries. However, they have also been criticized for their potential to promote unhealthy behaviors and addictions. For example, tobacco companies often use advertising that promotes the lifestyle associated with smoking rather than the product itself, and alcohol companies use advertisements that promote socializing, friendship, and relaxation rather than the product's taste or quality (Jernigan 2009). In the gambling industry, advertisements often focus on the excitement of winning and the social aspects of gambling rather than the financial risks and negative consequences associated with excessive gambling (Nelson et al. 2008). As such, policymakers and public health officials need to regulate advertising practices in these industries carefully to protect consumers from potential harm.

2 THE GAMBLING SECTOR

Some researchers have extensively studied the growth of the gambling industry, with the increased availability and accessibility of online gambling platforms being one of the main factors behind its expansion (Griffiths and Auer 2013). The use of mobile devices and the internet has made it easier for individuals to engage in gambling activities from their own homes or on-the-go (Martínez-López et al. 2021). Moreover, aggressive marketing and advertising strategies employed by gambling companies, which often target vulnerable populations, have contributed significantly to the industry's growth (Hing et al. 2016). These strategies may include free bets, VIP schemes, and exclusive bonuses, all of which make gambling more attractive to individuals at risk of addiction. The deregulation of the gambling industry in many countries has also played a part in its growth, as it has allowed companies to expand their operations and profits.

Individuals' risk profiles can play a significant role in their gambling behavior, with research suggesting that impulsivity and sensation seeking are associated with increased gambling behavior and problem gambling (Blaszczynski and Nower 2002; Leeman and Potenza 2012). Additionally, individuals with a history of substance abuse and mental health disorders may also be at higher risk for problem gambling (Grant et al. 2004). The use of gambling platforms can also have negative financial consequences, particularly for individuals with high levels of debt or low income (Wardle et al. 2011). Gambling advertising may also influence individuals to engage in risky behavior, as it often promotes unrealistic expectations of winning and downplays the potential negative consequences of gambling (Lopez-Gonzalez and Griffiths 2018).

3 THE "888" CASE

In the "888" case (Figure 1), the 888 company, which includes popular gambling platforms such as 888poker, 888casino, and 888sport, has been criticized for using aggressive advertising strategies that normalize gambling and promote its products through celebrity endorsements. The Spanish organization Autocontrol has sanctioned and forced the company to withdraw its ads deemed aggressive and harmful to consumers. The ads depicted repetitive gambling situations and a compulsive attitude towards gambling, with imperative verbs encouraging continuous repetition of the game and bet, thus conveying a message of lack of control.

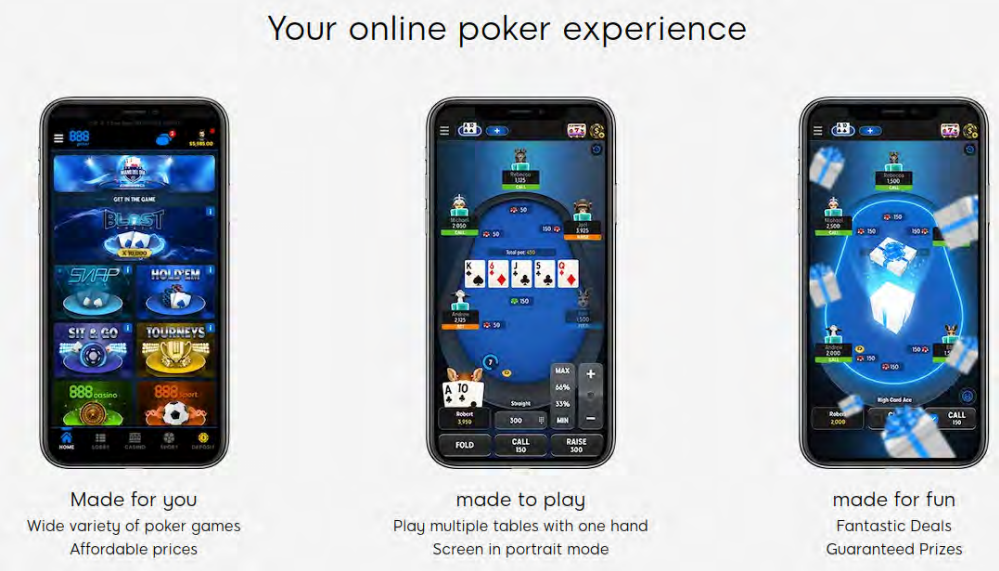


Figure 1: The "888" website.

The aim of this study is to investigate the relationship between gambling advertising and behavior. Specifically, the study aims to determine whether individuals engage in riskier behavior when exposed to gambling advertisements. A financial asset market refers to a market where assets consisting of financial obligations and rights are bought and sold. The study uses a laboratory experiment, where a financial asset market is simulated with two different treatments, one without ads (the control group) and the other with exposure to the 888 advertisement for 120 seconds before participating in the simulated financial market. The study tests the hypotheses that exposure to the advertisement increases the average traded price of an asset, induces participants to invest more in riskier assets, and has a positive effect on individual risk preferences. Additionally, the study examines the heterogeneous effects of the stimulus on individuals and whether risk-loving participants are more likely to invest in riskier assets.

4 METHODOLOGY

Figure 2 summarizes the main steps in our approach. Simulation methods offer several advantages over traditional experimental methods for studying customer behavior related to advertising. These methods are cost-effective and efficient, providing a safe and controlled environment to test advertising hypotheses. They also provide a more flexible and realistic approach, offering insights into the complex and dynamic processes that underlie user response to advertising. Moreover, simulations enable researchers to test the impact of new technologies, platforms, and formats on customer behavior, which is particularly relevant in today's digital advertising landscape. Hence, a simulated financial market was utilized to test the proposed hypotheses, and a controlled laboratory experiment was conducted at Tecnocampus, a university campus affiliated with the Pompeu Fabra University in Barcelona. The study included 92 participants, consisting of undergraduate students in Business Administration with an average age of 20, of which 42 were male and 50 were female. Subjects were randomly recruited from the campus student population via email.

In each session during the experiment, participants were required to trade three distinct assets for 12 periods (a period is defined as the time unit during which the group of participants places their purchasing bets), with each subject initially endowed with a specific number of units of each asset and a set amount of fictitious money (called Eurux). This money can be used to purchase units of the different assets. In order to motivate the participants, the conversion rate is set at 250 Eurux = 1€. Therefore, the expected average payment for subjet was 11€. These assets could be traded in the market in any period, with available cash

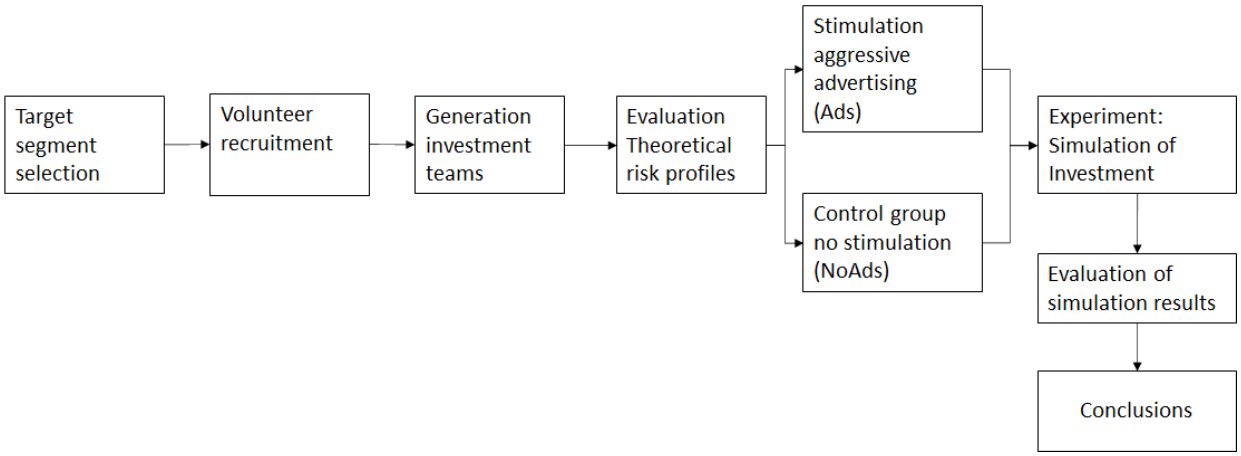


Figure 2: Visual representation of the methodology employed in our study.

being used to purchase new assets. Each unit paid a dividend only in the last period of the market. The dividends paid differed between the three assets as follows:

- UNITS of A (safe asset): Each unit pays 20 Eurux for sure.
- UNITS of B (Low Risk): For each unit, a subject could receive either 10 Eurux or 30 Eurux with a 50% probability.
- Units of C (High Risk): For each unit, a subject could receive either 200 Eurux with 5% probability, 100 Eurux with 5% probability, 50 Eurux with 10% probability, or nothing with 80% probability.

Thus, the fundamental value (FV), which is the expected payment at the end of the market of the three assets, remained constant across the horizon in each session and was equal to 20 Eurux. The simulated market was developed using the program Z-tree (Fischbacher 2007) and divided into six blocks displayed on the computer screen. The top three blocks corresponded to the three separate markets for assets A, B, and C, where participants could buy and sell units of these assets, respectively. If a participant wanted to buy units of A, they would submit a buy order that indicated the number of units they would like to buy and the highest price they would be willing to pay for each unit in the current period. Similarly, if they would like to sell units of A, they would submit a sell order indicating the number of units they would like to sell and the lowest price they would be willing to accept for each unit during that trading period. The computer then organized the buy and sell orders and used them to determine the market price at which assets A, B, and C were bought and sold in the period. Those who submitted buy orders at prices above the market price made a purchase, and those who submitted sell orders at prices below the market price made a sale. At the end of the experiment, participants were paid according to their performance in the financial market, which included the outcome of the lottery on assets B and C. The final cash balance was converted into Euros at a pre-specified conversion rate.

We employed a technique from psychology known as “Priming” to encourage participants to take more risks. Priming involves exposing a person to a stimulus to increase the availability of certain information in the subconscious and activate memory associations before making a decision or performing a task. This technique has been widely used in various fields, including marketing, finance, and economics (Cohn and Maréchal 2016). To prime participants, we used the criticized advertisement of 888, which had been heavily broadcasted during prime time on one of the main Spanish TV channels in 2019. The video lasted for 120 seconds and was displayed on the participants’ screens before starting the simulated financial market.

Accordingly, we measured individual risk preferences of participants in both treatments, using two different methods commonly used in the literature, which consisted of different types of incentivized lotteries. The first method was developed by (Holt and Laury 2002), and the second by (Eckel and Grossman 2008).

5 ANALYSIS OF RESULTS

Two measures have been employed utilizing the laboratory-collected data to assess the trading behavior within each session and estimate the deviation of asset prices from their fundamental value (FV). These measures, namely the Relative Absolute Deviation (RAD) and the Relative Deviation (RD), were initially introduced by Stöckl et al. 2010. The RAD quantifies the average degree of mispricing in relation to the average FV of the market, whereas the RD quantifies the magnitude of overvaluation or undervaluation. Mathematically, these measures can be expressed as follows:

- Relative Absolute Deviation: $RAD = \frac{1}{N}\sum_{p=1}^{N}\left|\frac{\bar{P}_p - FV}{\bar{FV}}\right|$
- Relative Deviation: $RD = \frac{1}{N}\sum_{p=1}^{N}\frac{(\bar{P}_p - FV)}{|\bar{FV}|}$

where, the variable p represents the period, N represents the total number of periods, $\bar{P}_p$ represents the average price in period p, FV represents the fundamental value, and $\bar{FV}$ represents the average fundamental value of the market (which is equal to 20).

Table 1 presents the average Relative Absolute Deviation (RAD) and Relative Deviation (RD) for each treatment. It is noteworthy that both measures nearly align, indicating that the mispricing consistently leaned towards positive values in relation to the fundamental value.

Table 1: RAD and RD by treatment.

		RAD			RD		
	Obs.	Mean	SD	Min-Max	Mean	SD	Min-Max
NoAds	7	1.13	0.53	[0.40, 1.77]	1.09	0.57	[0.40, 1.77]
Ads	7	2.43	0.55	[1.92, 3.54]	2.43	0.56	[1.92, 3.54]

Table 2 provides an overview of the mean values for each treatment, specifically the t-statistic that measures the difference in means between the treatment groups and the corresponding p-value. The first hypothesis states that, due to a greater inclination for risk taking, we anticipate seeing higher prices and a more pronounced overvaluation in the market. Therefore, we hypothesize that exposure to a major risk-increasing factor, such as the 888poker announcement, will directly influence RAD and RD levels.

Table 2: Summary statistics for RAD and RD per treatment.

	N	RAD	RD
NoAds	7	1.13	1.09
Ads	7	2.43	2.43
t		-4.42	-4.37
p-value		< 0.01	< 0.01

The p-values in the last row of table 2 show that the difference in means of the RAD measure for the NoAds treatment and the Ads treatment is significant at the 1% level ($p\text{-value}_{RAD} < 0.01$). Additionally, the difference in means of the RD measure for both treatments is significant at the 1% level ($p - value_{RD} < 0.01$). As reported in Tables 2 there is a statistically significant difference between the RAD and the RD of the NoAds and the Ads treatment. This result indicates that on average, asset prices deviate substantially more from the FV when the simulation market is anticipated by the exposure to the gambling video.

Figure 3 illustrates the average price of three assets calculated for each period and for both treatments. The NoAds treatment is represented by a continuous line, while the Ads treatment is represented by a dashed line. The line at the bottom represents the fundamental value of the three assets, which is equal to 20 all over the experimental session. Both lines exhibit an increase in price during the first 7 or 8

periods, followed by a strong decrease when approaching the end of the market, which is referred to as a "bubble-crash" pattern, commonly observed in similar settings. Compared to the NoAds treatment, the Ads treatment is characterized by much higher prices in each period, with a more pronounced slope during both upward and downward trends.

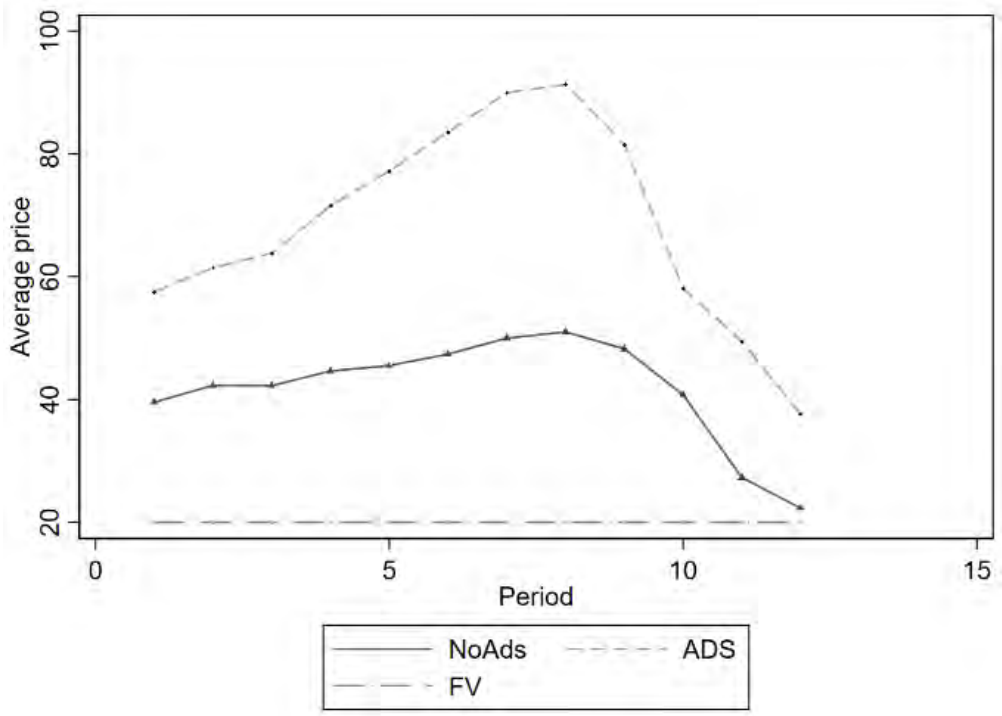


Figure 3: Average price per treatment.

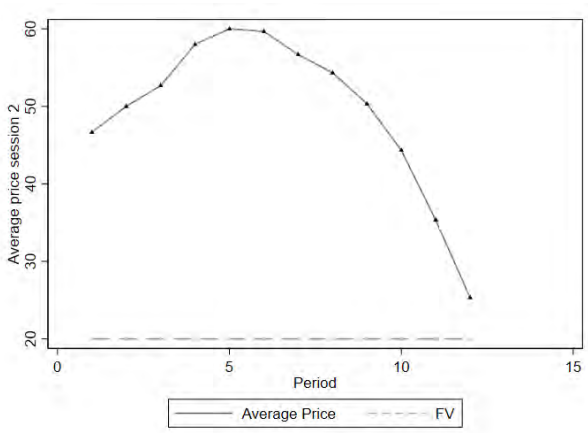
Figures 4 and 5 present an example of the four first sessionsof the simulated trading environment for the NoAds and Ads treatments, respectively. The prices remain above the fundamental value for more than half of the market in most sessions, except for the final periods when they collapse to the fundamental value.

Two measures have been used to estimate the deviation of asset prices from their FV, namely, the Relative Absolute Deviation (RAD) and the Relative Deviation (RD). Both measures almost coincide, indicating that the mispricing was almost always positive compared to the fundamental value. A t-test was also conducted on both measures. The p-values show that the difference in means of the RAD and RD measures between the NoAds and Ads treatments is significant.

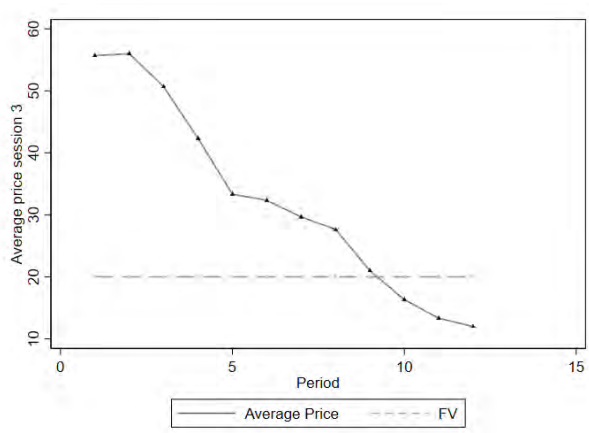
These results validate our first hypothesis, which suggests that exposure to the advertisement of 888poker will have a direct impact on the level of RAD and RD. Our second hypothesis suggests that players will invest more in a riskier asset following the video. However, this hypothesis is not supported by the available information.

6 CONCLUSION

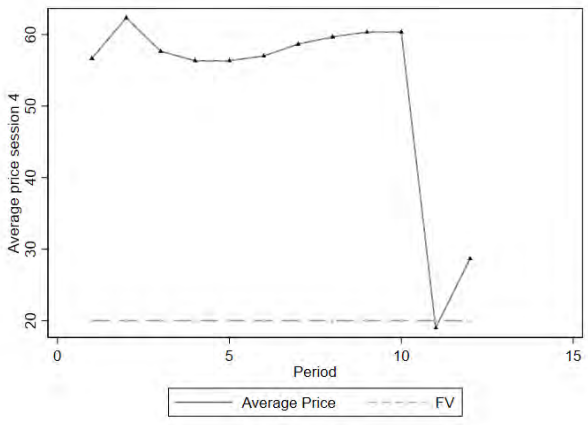
In this study, our main objective was to investigate the influence of a banned TV advertisement of a gambling company on the investment decisions of participants in a simulated financial market. Furthermore, we aimed to contribute to the ongoing ethical debate on the need for stricter control of advertisements for companies operating in controversial sectors. To achieve our goal, we conducted a controlled laboratory experiment in which we simulated a financial asset market and randomly assigned 92 participants into two



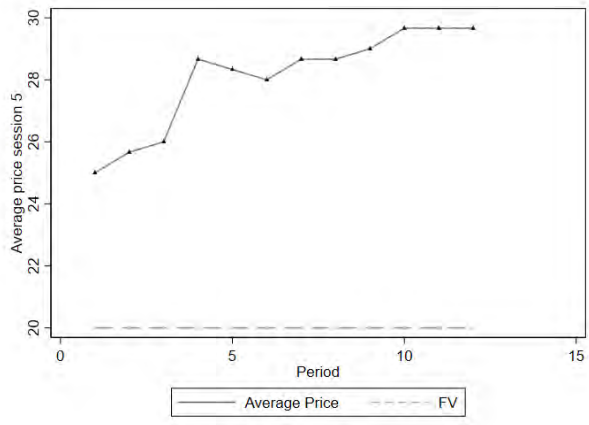
(a) Average price session 2



(b) Average price session 3

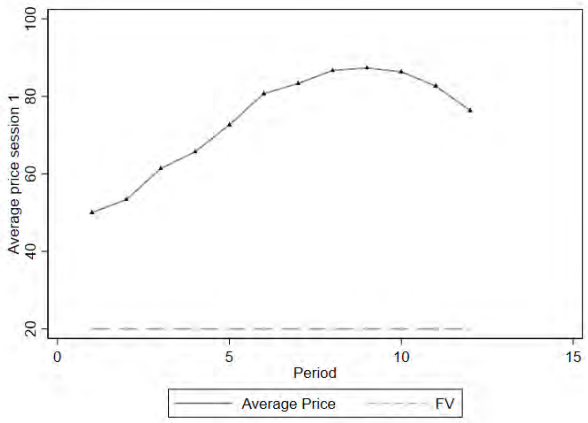


(c) Average price session 4

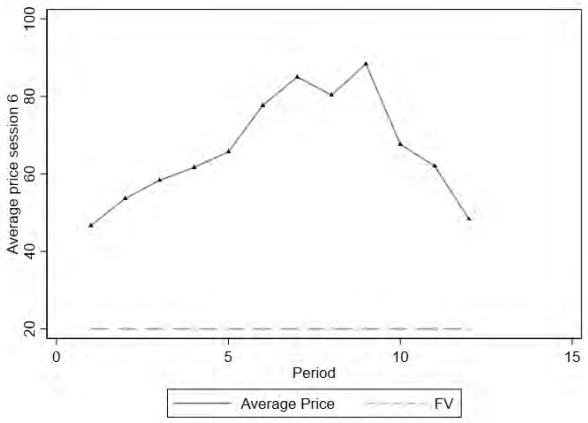


(d) Average price session 5

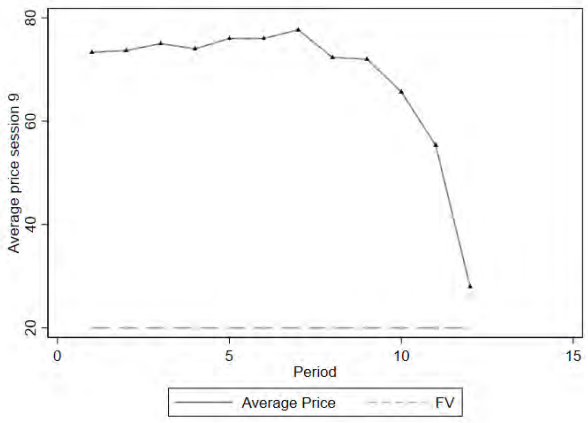
Figure 4: Average price per simulated market for the NoAds treatment. Example for Sessions 2,3,4 and 5.



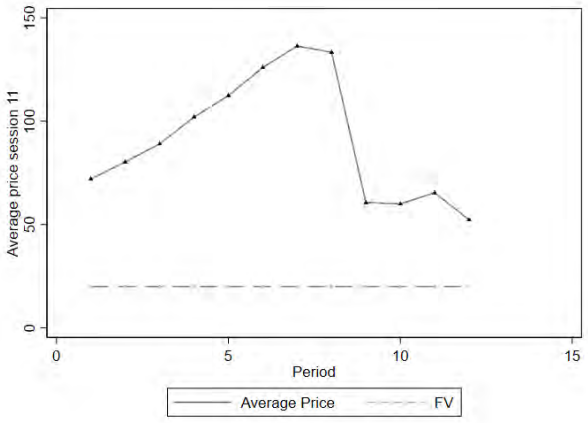
(a) Average price session 1



(b) Average price session 6



(c) Average price session 9



(d) Average price session 11

Figure 5: Average price per simulated market for the Ads treatment. Example for Sessions 1,6,9 and 11.

groups. One group was exposed to the banned video of 888 while the other group was not. We found that the asset markets of the group exposed to the advertisement were characterized by a significantly higher traded price. Additionally, our study showed that exposure to the advertisement led to an increase in risk-taking behavior, as demonstrated by a higher probability of choosing riskier options in the asset market.

The most significant contribution of our research is that our methodology guarantees a causal relationship between exposure to the advertisement and the observed effects, providing robust evidence to inform policy decisions. Our results emphasize the importance of carefully controlling advertisements, especially for companies operating in controversial sectors such as gambling. Finally, we highlight the significance of simulation in our study. By creating a controlled environment, we were able to isolate the effect of the advertisement on investment decisions and risk preferences. Overall, our findings suggest the need for stricter regulatory control of communication campaigns for companies operating in controversial sectors to mitigate the potential negative impact of advertisements on consumer behavior.

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REFERENCES

Aaker, D. A., and K. L. Keller. 1990. "Consumer Evaluations of Brand Extensions". *Journal of Marketing* 54(1):27–41.

Blaszczynski, A., and L. Nower. 2002. "A Pathways Model of Problem and Pathological Gambling". *Addiction* 97(5):487–499.

Chóliz, M. 2023. "Crisis, What Crisis? The Effect of Economic Crises on Spending on Online and Offline Gambling in Spain: Implications for Preventing Gambling Disorder". *International Journal of Environmental Research and Public Health* 20(4):2909.

Chóliz, M., M. Marcos, and J. Lázaro-Mateo. 2021. "The Risk of Online Gambling: A Study of Gambling Disorder Prevalence Rates in Spain". *International Journal of Mental Health and Addiction* 19:404–417.

Clemons, E. K. 2008. "How Information Changes Consumer Behavior and How Consumer Behavior Determines Corporate Strategy". *Journal of Management Information systems* 25(2):13–40.

Cohn, A., and M. A. Maréchal. 2016. "Priming in Economics". *Current Opinion in Psychology* 12:17–21.

Eckel, C. C., and P. J. Grossman. 2008. "Forecasting Risk Attitudes: An Experimental Study using Actual and Forecast Gamble Choices". *Journal of Economic Behavior & Organization* 68(1):1–17.

Fischbacher, U. 2007. "Z-Tree: Zurich Toolbox for Ready-Made Economic Experiments". *Experimental Economics* 10(2):171–178.

Grant, J. E., S. W. Kim, and M. Kuskowski. 2004. "Retrospective Review of Treatment Retention in Pathological Gambling". *Comprehensive Psychiatry* 45(2):83–87.

Griffiths, M., and M. Auer. 2013. "The Irrelevancy of Game-Type in the Acquisition, Development, and Maintenance of Problem Gambling". *Frontiers in Psychology* 3:621.

Halkiopoulos, C., H. Antonopoulou, E. Gkintoni, and A. Aroutzidis. 2022. "Neuromarketing as an Indicator of Cognitive Consumer Behavior in Decision-Making Process of Tourism destination—An Overview". In *Transcending Borders in Tourism Through Innovation and Cultural Heritage: 8th International Conference, IACuDiT, Hydra, Greece, 2021*, 679–697. Springer.

Hing, N., A. M. Russell, P. Vitartas, and M. Lamont. 2016. "Demographic, Behavioural and Normative Risk Factors for Gambling Problems Amongst Sports Bettors". *Journal of Gambling Studies* 32:625–641.

Hoek, J., P. Gendall, C. Eckert, and J. Louviere. 2016. "Dissuasive Cigarette Sticks: The Next Step in Standardised ('Plain') Packaging?". *Tobacco Control* 25(6):699–705.

Holt, C. A., and S. K. Laury. 2002. "Risk Aversion and Incentive Effects". *American Economic Review* 92(5):1644–1655.

Hudders, L., and S. De Jans. 2022. "Gender Effects in Influencer Marketing: An Experimental Study on the Efficacy of Endorsements by Same-vs. Other-Gender Social Media Influencers on Instagram". *International Journal of Advertising* 41(1):128–149.

Jernigan, D. H. 2009. "The Global Alcohol Industry: An Overview". *Addiction* 104:6–12.

Keller, K. L. 1993. "Conceptualizing, Measuring, and Managing Customer-based Brand Equity". *Journal of Marketing* 57(1):1–22.

Leeman, R. F., and M. N. Potenza. 2012. "Similarities and Differences Between Pathological Gambling and Substance use Disorders: A Focus on Impulsivity and Compulsivity". *Psychopharmacology* 219:469–490.

Lopez-Gonzalez, H., and M. D. Griffiths. 2018. "Understanding the Convergence of Markets in Online Sports Betting". *International Review for the Sociology of Sport* 53(7):807–823.

Martínez-López, F. J., R. Anaya-Sánchez, M. Fernández Giordano, and D. Lopez-Lopez. 2020. "Behind Influencer Marketing: Key Marketing Decisions and their Effects on Followers' Responses". *Journal of Marketing Management* 36(7-8):579–607.

Martínez-López, F. J., Y. Li, C. Feng, and D. López-López. 2021. "Buying Through Social Platforms: Perceived Risks and Trust". *Journal of Organizational and End User Computing* 33(4):70–93.

Nelson, S. E., D. A. LaPlante, A. J. Peller, A. Schumann, R. A. LaBrie, and H. J. Shaffer. 2008. "Real Limits in the Virtual World: Self-Limiting Behavior of Internet Gamblers". *Journal of Gambling Studies* 24:463–477.

Oliveira, P. M., J. Guerreiro, and P. Rita. 2022. "Neuroscience Research in Consumer Behavior: A Review and Future Research Agenda". *International Journal of Consumer Studies* 46(5):2041–2067.

Pauwels, K., D. M. Hanssens, and S. Siddarth. 2002. "The Long-Term Effects of Price Promotions on Category Incidence, Brand Choice, and Purchase Quantity". *Journal of Marketing Research* 39(4):421–439.

Petty, R. E., J. T. Cacioppo, R. E. Petty, and J. T. Cacioppo. 1986. *The Elaboration Likelihood Model of Persuasion*. Springer.

Shavitt, S., P. Lowrey, and J. Haefner. 1998. "Public Attitudes Toward Advertising: More Favorable than you Might Think". *Journal of Advertising Research* 38(4):7–22.

Stöckl, T., J. Huber, and M. Kirchler. 2010. "Bubble Measures in Experimental Asset Markets". *Experimental Economics* 13(3):284–298.

Wardle, H., A. Moody, M. Griffiths, J. Orford, and R. Volberg. 2011. "Defining the Online Gambler and Patterns of Behaviour Integration: Evidence from the British Gambling Prevalence Survey 2010". *International Gambling Studies* 11(3):339–356.

Wu, L., and H. Overton. 2022. "Examining Native CSR Advertising as a Post-Crisis Response Strategy". *International Journal of Advertising* 41(2):354–381.

AUTHOR BIOGRAPHIES

DAVID LOPEZ is a Senior Lecturer at ESADE (Ramon Llull University) in the Marketing Department. He is also a visiting professor at Universidad de Chile. Professor López holds a Ph.D. in Digital Strategy and has published more than 20 manuscripts, 2 edited books and 2 book chapters. He is also an entrepreneur, investor, and advisor to companies, among which FHIOS stands out, which employs almost 250 people. His email address is david.lopez1@esade.edu

GIOVANNI GIUSTI is a professor of economics and entrepreneurship at Tecnocampus (Pompeu Fabra University). He holds a Ph.D. in economics, finance, and Management (decision-making), and his research is mainly focused on the interaction between finance and psychology. His email address is ggiusti@tecnocampus.cat

ANGEL A. JUAN is a Full Professor in the Dept. of Applied Statistics and Operations Research at the Universitat Politècnica de València, as well as an Invited Professor at University College Dublin and Euncet Business School. Dr. Juan holds a Ph.D. in Industrial Engineering and an M.Sc. in Mathematics. He completed a predoctoral internship at Harvard University and postdoctoral internships at the Massachusetts Institute of Technology and the Georgia Institute of Technology. His main research interests include applications of simheuristics and learnheuristics in computational logistics and finance. He has published over 150 articles in JCR-indexed journals and more than 335 papers indexed in Scopus. His website address is https://ajuanp.upv.es and his email address is ajuanp@upv.es.

CANAN GUNES CORLU is an Associate Professor in the Administrative Sciences Department of Metropolitan College at Boston University. Her primary research interest is in the area of design and analysis of stochastic simulations under input uncertainty, and applications of data analytics and simulation-based optimization in operations management and supply chain management. Her email address is canan@bu.edu.