Tax Design, Pass-Through, and Incidence in Sports Betting
DO NOT CIRCULATE OR CITE WITHOUT AUTHORS' PERMISSION

Matthew Brown and Jeffrey Ohl*

March 26, 2026

Abstract

The predominant tax on sports betting does not pass through to betting prices. Betting prices are uniform across states despite tax rates on sportsbook revenues that vary from 6.75% to 51%. Instead, firms respond to revenue taxes by reducing promotional sign-up offers and TV advertising in high-tax states. To understand how these reductions affect demand, we measure the causal effect of advertising on sports betting deposits using a border design. Our estimates imply that a policy that reduces local TV advertising by sportsbooks by 10% for one month would reduce industry-wide sports betting deposits in that month by 1.81%.

JEL Codes: H22, L83, H21, H23, M37

*We are grateful to Matt Notowidigdo, Eric Budish, Dan Sacks, Bradley Shapiro, and seminar participants at the University of Chicago for thoughtful feedback. Ohl acknowledges funding from National Science Foundation Graduate Research Fellowship under Grant No. 2140001. Researcher(s)' own analyses calculated (or derived) based in part on data from The Nielsen Company (US), LLC and marketing databases provided through the Nielsen Datasets at the Kilts Center for Marketing Data Center at The University of Chicago Booth School of Business. The conclusions drawn from the Nielsen data are those of the researcher(s) and do not reflect the views of Nielsen. Nielsen is not responsible for, had no role in, and was not involved in analyzing and preparing the results reported herein. Researcher(s)' own analyses calculated (or derived) based in part on data from Consumer Edge and provided by the Kilts Center for Marketing at The University of Chicago Booth School of Business. The conclusions drawn from the Consumer Edge data are those of the researcher(s) and do not reflect the views of Consumer Edge. Consumer Edge is not responsible for and had no role in analyzing or preparing the results reported herein.

1 Introduction

Policymakers across the United States are grappling with how to regulate sports betting. The Supreme Court's 2018 decision in *Murphy v. NCAA* struck down a federal sports betting ban. As of 2024, 39 states had legalized sports betting and Americans wagered more on sports than on state-run lotteries.[1] This growth has spurred interest in policies to address gambling addiction, financial distress, and other social harms associated with sports betting [U.S. Senator Richard Blumenthal, 2025, Office of Governor Kathy Hochul, 2024].

One of the most prominent policies is the state-level tax on sportsbooks' revenues (dollars wagered minus payouts to bettors). The industry term for this tax is the gross gaming revenue (GGR) tax. GGR taxes vary widely across states, from Iowa's 6.75% rate to New York's 51% rate. Large states have also raised their GGR tax rates in recent years.[2] The stated goal of high GGR taxes is typically to increase state revenues. To the extent that sports betting causes negative externalities or internalities, taxes could also have corrective benefits by reducing overconsumption [Brown et al., 2025].

This paper studies how taxes affect the sports betting market, focusing on implications for policy design. We show that GGR taxes do not affect the price of betting, but they do reduce sportsbook marketing expenditures. This finding implies that the incidence and efficiency of GGR taxes differ sharply from those of specific taxes, which do pass through to prices. In particular, the effects of GGR taxes depend critically on the effects of sportsbook marketing. Therefore, we analyze the effects of sportsbooks' local TV advertisements using a border county design, finding that sportsbook TV ads increase sportsbook deposits in the short term. Throughout, we discuss implications for the design of taxes and other regulations.

Our first set of results studies how taxes influence prices and marketing expenditures. Despite the dispersion in GGR tax rates across states, sportsbooks set odds uniformly across the U.S. We then test two more subtle ways sportsbooks could react to taxes: by changing the product mix offered across states, and raising the national price after entering a high-tax state. In both cases, we reject that sportsbooks react to taxes. This lack of pass-through distinguishes GGR taxes from sin taxes in other industries, where firms respond to taxes by increasing prices [Butters et al., 2023]. It is also unique to sports betting taxes on *revenue*. When Illinois introduced a per-wager specific tax in 2025, many sportsbooks responded by introducing per-wager fees for Illinois consumers. The Illinois case study confirms that sportsbooks have the infrastructure to respond to local taxes by raising local prices. But with GGR taxes, they choose not to.

These results are consistent with the public finance literature, which has long highlighted that revenue (ad valorem) taxes should have lower pass-through to prices than specific taxes [Delipalla and Keen, 1992]. Pass-through of a revenue tax should be especially low when per-unit markups are large, which is plausible in the context of digital goods like sports betting where marginal costs are low. In the limiting case of zero marginal costs, a revenue tax approximates a pure profit tax, which does not distort the optimal price. Instead, firms may respond to high taxes along different margins, such as entry [Besley, 1989], or product

[1] Americans wagered $149.6 billion on legal sportsbooks in 2024 [Gustafson, 2025], exceeding traditional lottery sales of $101 billion [North American Association of State and Provincial Lotteries, 2024].

[2] Illinois raised its tax on the largest sportsbooks from a 15% rate to a progressive rate reaching 40% in 2024, and New Jersey raised its rate from 14.25% to 19.75%.

quality [Cremer and Thisse, 1994, Keen, 1998].

In our context, marketing is an important margin of adjustment. Sportsbooks advertise heavily. In 2024, DraftKings spent 22% of revenue on advertising, roughly nine times what the average large firm spends on paid media [Gartner, 2025].[3] We find narrative and quantitative evidence that sportsbooks reduce marketing expenditures in response to high GGR taxes. First, we document that several sportsbook CEOs explicitly make this claim in earnings calls. Second, we find that promotional offers and TV advertising are lower in high-tax states.

These facts motivate our next set of analyses, on the impacts of marketing expenditure on sports betting demand. Following Shapiro [2018], we exploit plausibly exogenous variation in exposure to sportsbook TV advertisements created by TV market borders. We find that local TV advertising increases sportsbook deposits, and the magnitudes are similar to other advertising effects. Our estimates imply that a policy that reduces local TV advertising by sportsbooks by 10% for one month would reduce industry-wide sports betting deposits in that month by 1.81%. This finding suggests that GGR taxes could modestly reduce betting activity by reducing advertising.

In addition to the magnitude of advertising's effects, we find two results on mechanisms. First, sportsbook advertisements work primarily by getting people to deposit at all (extensive margin), not by getting them to deposit more per transaction (intensive margin). Second, we do not find evidence that new depositors marginal to advertising are higher-volume gamblers than the average new depositor. This finding suggests a reduction in sports betting advertising would not be well-targeted at reducing activity by high-volume gamblers.

Our findings relate to the literature comparing ad valorem and specific taxes. This literature shows that specific taxes pass through at higher rates than ad valorem taxes, so a planner with revenue-raising motives will prefer ad valorem taxes because they create smaller quantity distortions [Suits and Musgrave, 1955, Delipalla and Keen, 1992]. For a planner with Pigouvian motives, the preference for ad valorem taxes may reverse. If the externality they seek to correct is large enough, they may prefer specific taxes because they pass through to prices at higher rates [Pirttilä, 2002]. We find that specific and ad valorem taxes affect sports betting demand through different channels, raising prices and lowering marketing, respectively. Abi-Rafeh et al. [2025] study how taxes on sugar-sweetened beverages influence the incentive to advertise in a dynamic equilibrium framework.

We also make several contributions to the empirical literature on sports betting. This literature has found that legalizing sports betting has had a negative impact on household balance sheets [Hollenbeck et al., 2025, Baker et al., 2024]. Other work has documented that demand for sports betting may be driven by cognitive biases, such as overoptimism and self-control problems [Brown et al., 2025, Chegere et al., 2025, Donkor et al., 2025, Potenza et al., 2019]. Motivated by these findings, Brown et al. [2025] propose corrective taxes on sports betting. We show that the most common type of sports betting tax has no effect on price, so any effects of the taxes must occur through non-price channels. We offer the first causal estimates of the effect of advertising on gambling decisions.[4] These results are relevant

[3] Sample: 402 CMOs of companies with $1B or greater revenue. This survey finds the average firm spends 2.4% of revenue on paid media.

[4] Past work includes correlational evidence that ad exposure is associated with betting consumption [McGrane et al., 2023] and lab experiments showing that promotional inducements increase betting participation

to proposed advertising restrictions like the SAFE Bet Act, which would ban sportsbook marketing during live sporting events and restrict promotional credit advertising [Tonko, 2025]. We also make two key data contributions: we are the first to use sports betting odds data to study tax incidence, and we collect novel data on sportsbooks' promotional sign-up offers.

Sections 2 and 3 provide institutional context and describe our data. Section 4 presents results on how firms respond to taxes. Section 5 studies how marketing influences demand. Section 6 concludes.

2 Institutional Details

2.1 Sports betting in the United States

The sports betting market is dominated by a small number of national firms. As of August 2025, 65% of dollars were wagered at two firms: FanDuel and DraftKings, as Table A1 shows. 97% of dollars were wagered at one of eight firms.

Many policy debates center around whether the benefits of sports betting (entertainment value, tax revenues, and producer surplus) are worth the costs (negative externalities from betting and harms from problem gambling). Recent empirical work has documented harms from sports betting. Baker et al. [2024] find that legalizing sports betting leads to a reduction in savings of residents of legalizing states. Hollenbeck et al. [2025], also using state-level legalization events, find legalizing sports betting causes declines in credit scores and increases in bankruptcy rates. Brown et al. [2025] offer evidence that these negative impacts on household balance sheets stem from behavioral biases. Other work has documented a link between legal sports betting and intimate partner violence [Matsuzawa and Arnesen, 2024, Card and Dahl, 2011].[5]

States have passed regulations to mitigate these harms. In Ohio, firms cannot use the phrase "free" or "risk-free" in their advertisements [Ingles, 2023]. Seven states have banned credit card deposits to sports betting apps—a particularly frictionless way to make a deposit. One goal of this paper is to provide guidance about whether and how regulators can use taxes to mitigate harms from sports betting.

2.2 Sports betting pricing

Sportsbooks do not offer actuarially fair odds. Instead, sportsbooks set odds so that a bettor wagering a dollar on each side of a bet is guaranteed to lose money—around 4 percent for simpler bets and upwards of 10 percent for more complicated bets. We think of this "house cut" as the implicit price of betting, and it is the primary way that sportsbooks make money.

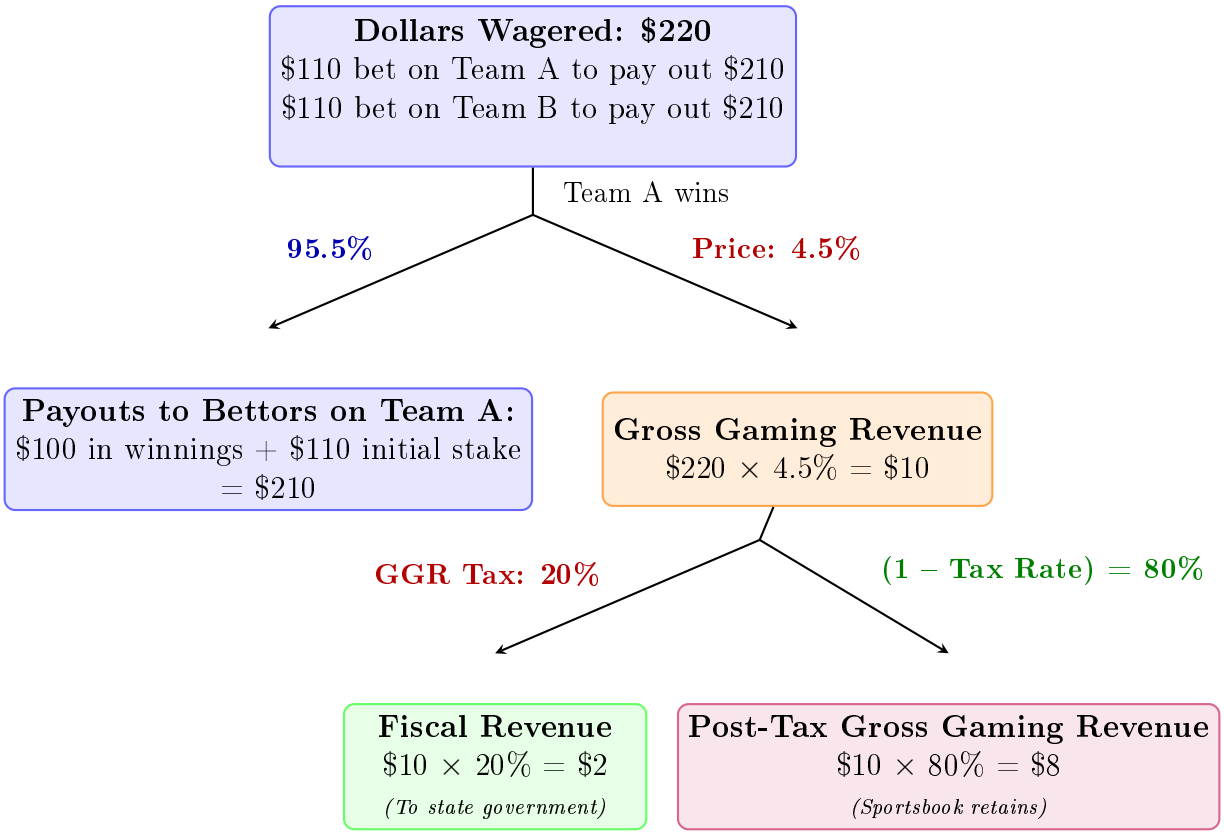
A numerical example illustrates how sportsbooks set prices and are taxed. Suppose a total of $220 is wagered on a contest between evenly matched teams, with $110 bet on each side. At typical market prices, when one team wins, the sportsbook pays out $210 (the $110 stake plus $100 in winnings) to the winning bettors and keeps the $110 from the losing side.

[Ó Ceallaigh et al., 2025].

[5] Though see Walker and Evans [2025] for an alternative view.

The sportsbook's gross gaming revenue (GGR) is \$10, about 4.5% of dollars wagered. From this \$10, the sportsbook pays taxes to the state government. If the GGR tax rate is 20%, the sportsbook pays \$2 in taxes and retains \$8 to cover expenses such as promotional credits, advertising, salaries, and technology costs. Figure 1 illustrates this flow.

Figure 1: Example Sports Betting Revenue Flow



Notes: The scenario simulates a 20% GGR tax. This diagram excludes all sportsbook expenses other than payouts, such as promotional credits, advertising, salaries, and technology costs.

2.3 Sports betting marketing

Marketing is a large expense for online sportsbooks. The marginal cost of increasing quantity for online sportsbooks is close to zero, since bets are accepted digitally. So, the primary cost of increasing dollars wagered is in customer acquisition and retention. Sportsbooks' two major types of marketing expenditure are advertisements and promotional credits.

In 2024, DraftKings spent 22% of revenue on advertising and FanDuel spent 14%.[6] These figures are 9 and 6 times the 2.4% of revenue that the average large firm spends on paid media [Gartner, 2025].[7] Even looking at sales and marketing—a broader category that

[6]Source: 2024 10Ks. DraftKings spent \$1.05B on advertising; Flutter Entertainment (FanDuel's parent company) spent \$2B globally across all brands.

[7]Sample: 402 CMOs of companies with \$1B or greater revenue.

includes advertising—only three NAICS industries average more than 14% of revenue [He et al., 2024].[8]

Promotional credits modify the terms of a bet in the bettor's favor. These include bonus bets (a free stake where the user keeps only the winnings), no-risk bets, deposit matches, and odds boosts. Promotional credits fall into two categories: large sign-up offers for first-time bettors, worth over $500 at several sportsbooks, and smaller ongoing bonuses to retain customers. We estimate that DraftKings spent between $500M and $1.2B on promotional credits in 2024, and FanDuel spent between $700M and $1.3B. This means sportsbooks' expenditure on promotional credits ranges from 35% to 115% of the amount they spend on advertising. We outline the assumptions going into this calculation in Table A2.

The welfare effects of sports betting marketing are ambiguous. At least two factors raise concern about harms. First, advertisements may steer bettors toward confusing bet types: about 20% of DraftKings' national TV advertising in 2023 mentioned *parlays*, or multi-leg wagers [The Wall Street Journal, 2024b]. Brown et al. [2025] find that parlay bettors are much more over-optimistic than those who bet only on standard wagers. Second, promotional credits are free samples of a potentially addictive good. Consumers may overestimate their ability to stop betting in the future or incorrectly navigate the tradeoff between short-term pleasure and long-term harms [Laibson, 1997, O'Donoghue and Rabin, 1999]. Free samples are outlawed for cigarettes. Concerns about the welfare effects of sportsbook marketing motivate policies like the SAFE Bet Act, which would ban sportsbook marketing during live sporting events and restrict promotional credit advertising [Tonko, 2025]. On the other hand, marketing could benefit consumers if it provides useful information [Stigler, 1961]. Similarly, promotional credits are simply cash transfers to unbiased consumers who do not become addicted.

2.4 Tax design

States typically tax GGR. States differ widely in the taxes they levy, from 6.75% in Iowa to 51% in New York; other states' GGR tax rates are listed in Figure A1. While GGR taxes are the dominant form of state taxation, two jurisdictions tax sports betting in other ways: Illinois has both a GGR tax and a per-wager tax. Tennessee taxes dollars wagered instead of GGR at 1.85%. In addition to state taxes, all sportsbooks, online and retail, pay a federal excise tax of 0.25% on dollars wagered, equivalent to 25 cents per $100 bet. This tax predates the recent wave of legalization, dating back to 1951, though the rate has changed over time.

State governors have emphasized raising tax revenue as a primary reason for legalizing sports betting. Governor Beshear said Kentucky needed to legalize to "find ways to generate more revenue without raising taxes on working families" [Beshear, 2020]. Governor Cuomo proposed that New York legalize sports betting to "bring this revenue back to New York [from New Jersey]" [Cuomo, 2021].

To capture more revenue, two states have recently raised their GGR tax rates. Illinois, the second-largest state by 2024 dollars wagered, launched at a 15% tax rate in 2020 and

[8] These industries are: information services (519); publishing industries (513); and computing infrastructure providers, data processing, web hosting, and related services (518).

raised its rate to a progressive schedule reaching 40% in 2024. New Jersey, the third-largest, launched at 14.25% in 2018 and raised its rate to 19.75% in 2025. Our findings are relevant to policymakers considering changing GGR tax rates, as we find that these taxes do not impact consumer prices but reduce firms' marketing.

3 Data

We get GGR tax rates for each state from the Tax Foundation. For states with graduated tax rates, we use the average tax rate, calculated as total tax revenue divided by total GGR. For aggregated dollars wagered, tax revenue, and GGR by state, we use data from Legal Sports Report [Ramsey, 2025]. State-level data reflects total regulated sports betting, combining online and retail channels; most states report only aggregated figures. Nationwide, more than 95% of dollars were wagered online in 2024 [American Gaming Association, 2024].

Our odds data is from the Odds API, a provider of odds data for professional sports bettors. We use NBA moneyline odds, bets on the winner of a game, from the 2021–2022 season. For each game, the data contains the odds offered by each major sportsbook, observed at approximately 11:00 AM Eastern on game day.

We measure two types of marketing expenditure: television advertising and promotional sign-up offers. For television advertising, we use Nielsen AdIntel [Shapiro et al., 2020] from 2018–2023. Nielsen AdIntel provides this data by firm for each Designated Market Area (DMA). DMAs are media markets constructed by Nielsen which correspond to a set of counties that receive the same local TV broadcasts. Many papers in economics use this data to study exposure to advertising [Shapiro et al., 2021, Gentzkow et al., 2024, Bordalo et al., 2025]. For our sample, we focus on seven of the largest sportsbooks by market share: DraftKings, FanDuel, BetMGM, Caesars, BetRivers, Fanatics, and bet365, which together represent over 90% of dollars wagered (Table A1). Figure 5b excludes Fanatics and BetMGM for measurement reasons, and the ads elasticity analysis in Section 5 applies additional sample restrictions described in Appendix B.2.[9]

We build two new datasets of promotional offers.

The first has cross-state variation, but no time variation. We scraped screenshots from sportsbooks' websites from January 23, 2026. These provide sign-up offers for each sportsbook by state. This data is a cross-sectional snapshot; to our knowledge, no archival data on promotional offers by state exists.

The second is panel data, but does not contain cross-state variation. We constructed a panel of sportsbooks' new customer promotional sign-up offers from archival data. We scrape the Internet Archive's snapshots of Action Network, a promotional offer aggregator. For each sportsbook, we extract the offer displayed at the top of Action Network's page for that sportsbook. We have good coverage from July 2023 through November 2025 for three major sportsbooks: DraftKings, BetMGM, and FanDuel.

Promotional offers are not directly comparable in dollars: a $1,000 bonus bet cannot be converted to $1,000 USD with certainty because bonus bets pay out winnings but do not return the stake. To convert promotional offers to dollar values, we use conversion rates from

[9] We exclude ESPN Bet because it was rebranded to theScore Bet in late 2025 following the early termination of Penn Entertainment's agreement with ESPN.

DarkHorse Odds, a service which helps people take advantage of promotional offers. It has been covered in the Wall Street Journal [DarkHorse Odds, 2025, The Wall Street Journal, 2024a].[10]

In Section 5, we measure deposits to sports betting accounts using Consumer Edge, a panel of debit and credit card transactions with more than 93 million cards. This lets us see inflows into sports betting accounts, but not betting behavior. Consumer Edge's finest geography is the first 3 digits of the cardholder's billing zip-code (ZIP3), i.e., a collection of ZIP codes. We aggregate transactions to the sportsbook-ZIP3-month level.

4 Firm Responses to Taxes

4.1 Effects on Prices

We begin by demonstrating that the local price of wagering a dollar is not associated with local GGR tax rates. Our first observation is that for a given betting product, prices are set uniformly across states. That is, the odds of a bet never depend on the location of the bettor. FanDuel and BetMGM confirmed their uniform pricing practice via email, and a news article confirms the same for DraftKings. Uniform pricing is inconsistent with pass-through of GGR taxes, because GGR taxes vary widely across states.

Even with uniform pricing, GGR taxes may still pass through to prices in more subtle ways. We consider two possibilities. First, since sportsbooks offer a variety of wagers and the demand for wagers varies across locations, sportsbooks could increase prices in high-tax states by offering worse odds for wagers popular among residents of those states. A concrete example would be to offer worse odds on wagers popular among New York residents, like bets on the New York Yankees. In Figure 2a, we reject this hypothesis, finding no relationship between GGR tax rates and the average house cut across states. Second, sportsbooks could adjust their prices over time when their national tax exposure changes. For example, when New York legalized sports betting, the average GGR tax on U.S. wagers increased substantially for all sportsbooks. A sportsbook that passes through the GGR tax subject to a uniform pricing constraint would increase its national prices following this event. Figures 2b and 2c reject this hypothesis, showing that FanDuel and DraftKings did not raise prices immediately after launching in New York.

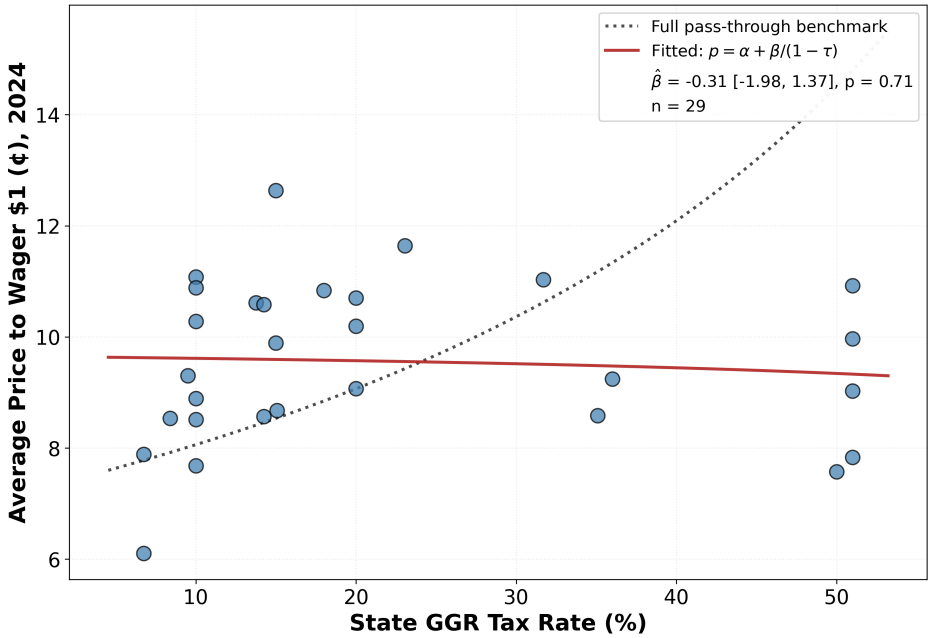
One possible explanation for the lack of pass-through is that there are technological limitations to local pricing in sports betting. To evaluate this explanation, we turn to a case study of firm responses to a per-wager tax in Illinois. The tax, introduced on July 1, 2025, was \$0.25 on each of an operator's first 20 million online wagers within a fiscal year, and \$0.50 on all remaining online wagers [Illinois Gaming Board, 2025].

Every major sportsbook responded to the tax by either increasing consumer fees or changing their product set. FanDuel, Caesars, and Fanatics pass through the full fee on every online wager. DraftKings and bet365 pass through the fee only on smaller wagers.[11]

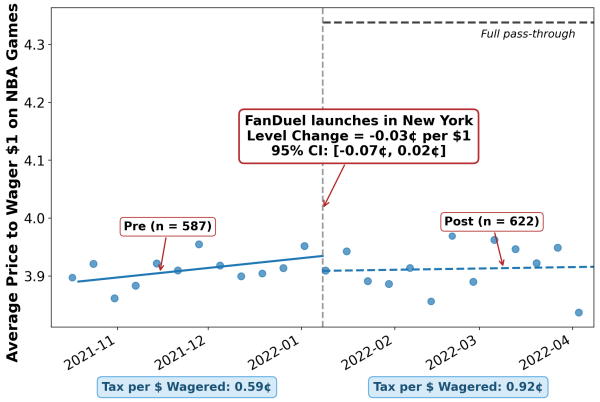
[10] DarkHorse Odds converts promotional offers into their expected value in dollars: bonus bets are valued at \$0.70 on the dollar and risk-free bets at \$0.50 on the dollar. Table A3 details each sportsbook's promotional offers and expected values in each state.

[11] For example, DraftKings exempts straight bets (bets on a single outcome) $\geq$ \$50, and exempts parlays

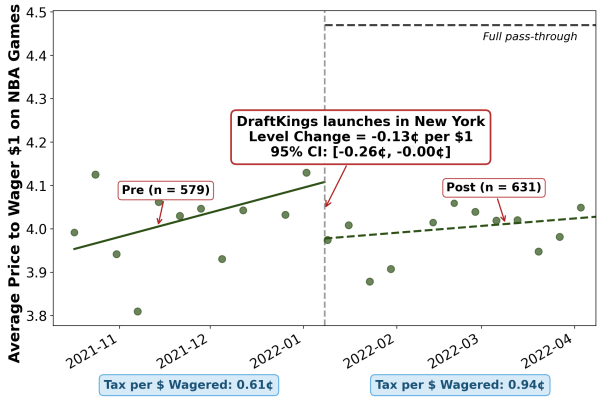
Figure 2: Associations between average price to bet and GGR taxes across space and time



(a) Across states: 2024 average prices



(b) Over time: FanDuel

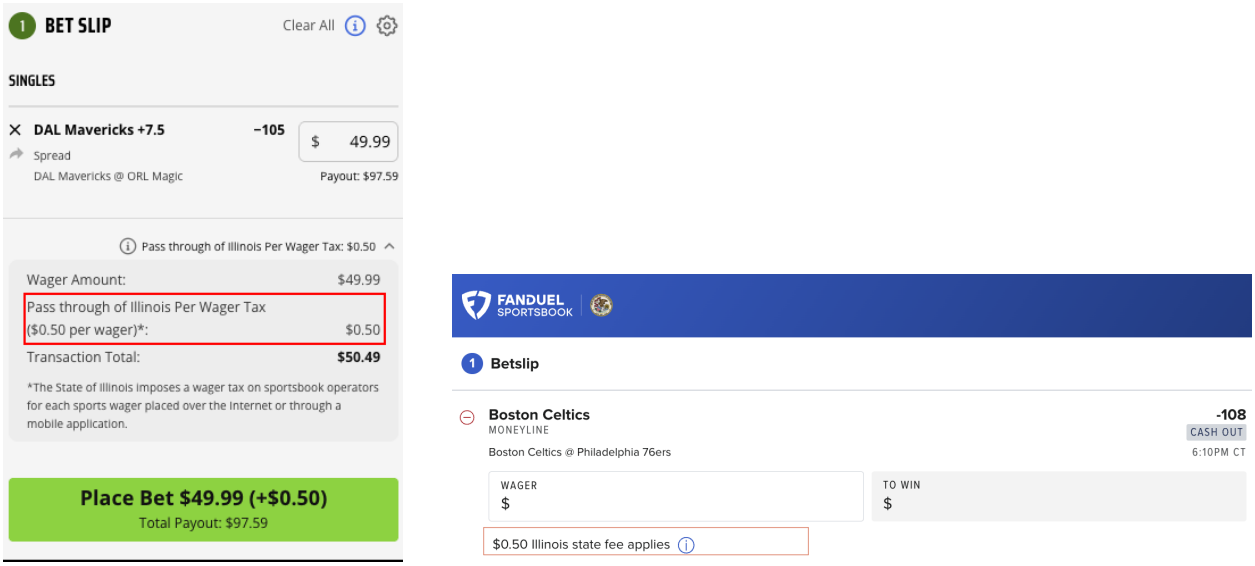


(c) Over time: DraftKings

Notes: Panel (a): average price to wager a dollar across 29 legal states in 2024; Florida excluded (tribal-only, no state reporting); Tennessee excluded (taxes dollars wagered, not GGR). The dotted curve shows the full pass-through benchmark, anchored to Massachusetts. Panels (b) and (c): theoretical margin per dollar wagered around New York's January 2022 launch for FanDuel and DraftKings. Each point is the weekly mean across NBA games, with point size proportional to the number of games. Solid lines show pre- and post-launch ITS fits; the dashed black line shows the full-pass-through counterfactual. The ITS model is $p_t = \beta_0 + \beta_1 t + \beta_2 \,\mathrm{Post}_t + \beta_3 (t \times \mathrm{Post}_t) + \epsilon_t$, where $\mathrm{Post}_t = 1$ after January 8, 2022. β_2 is the level change at the cutoff. Standard errors use the Newey-West estimator with 7 lags.

BetMGM and BetRivers raised minimum bet sizes instead of passing through a fee, equivalent to an infinite tax on small bets. Figure 3 shows how DraftKings and FanDuel described their fees to consumers. Both firms emphasize in their messaging that these price increases are the direct result of the Illinois tax. These facts demonstrate that firms are capable of passing cost increases on to consumers, but with GGR taxes, they choose not to do so.

Figure 3: Pass-Through of a Local Per-Wager Tax



(a) DraftKings ($49.99 wager) **(b)** FanDuel

Notes: Panel (a) shows DraftKings adding a $0.50 Illinois state fee to a $49.99 wager. Panel (b) shows FanDuel displaying the Illinois fee on the bet slip. The DraftKings screenshot file was captured March 6, 2026, and the FanDuel screenshot file was captured December 18, 2025. Both screenshots reflect the Illinois per-wager tax after its September 1, 2025 implementation. For DraftKings, the per-wager fee applies only to wagers of $50 or less.

Discussion.

Lack of pass-through is a distinctive feature of GGR taxes. Within the sports betting context, we have just shown that other local taxes, like the Illinois per-wager tax, can affect local prices. More broadly, Figure 4 illustrates that zero pass-through of the GGR tax is an anomaly compared to other sin taxes. For taxes on other consumer products that generate externalities or internalities, full pass-through or even overshifting of the tax (pass-through greater than 100%) is common [Butters et al., 2023, Hollenbeck and Uetake, 2021].

For policymakers, this result has implications for incidence and efficiency. While the Illinois per-wager tax was mostly borne by consumers, the direct fiscal incidence of GGR taxes falls entirely on firms. Typically, governments' ability to raise revenues with consumption taxes is limited by the elasticity of demand, since consumers reduce consumption in response to higher prices. Zero pass-through means that states can extract revenues through GGR taxes without distorting consumption. Of course, to the extent that reductions in sports

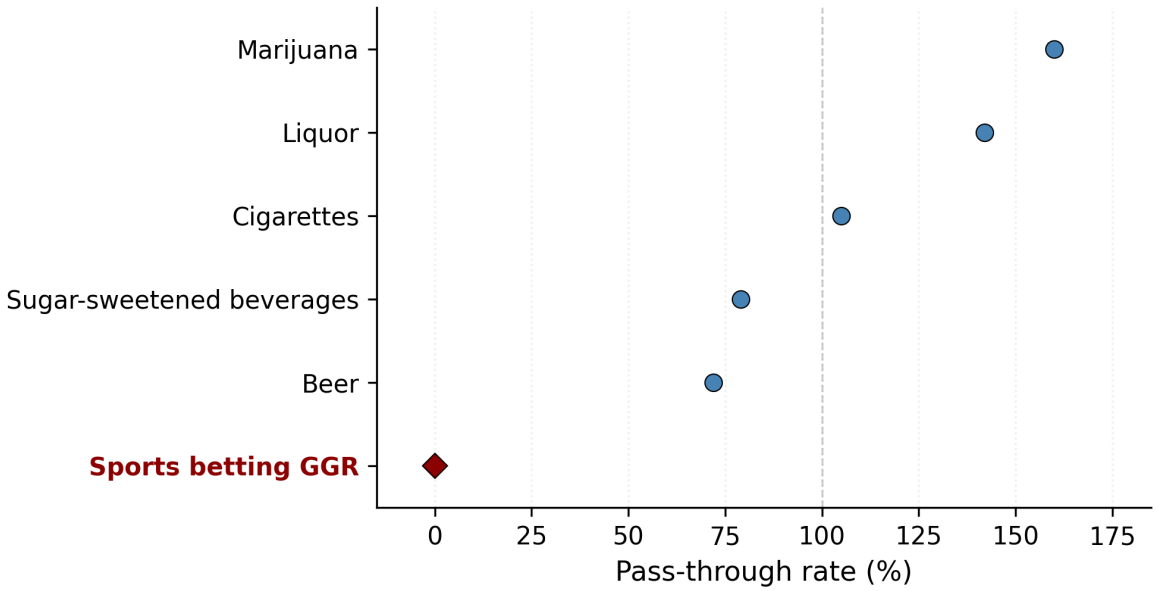
$\geq$ $10.

betting are socially *beneficial* due to negative externalities or internalities, zero pass-through also implies that GGR taxes do not achieve the corrective benefits of reduced consumption.

The lack of pass-through of the GGR tax is consistent with well-known results in the public finance literature on ad valorem taxation in imperfectly competitive markets [Delipalla and Keen, 1992, Pirttilä, 2002]. To see this, consider the pricing problem of a monopolist who produces a good at zero marginal production cost and sells it at price p. This simple case provides a useful benchmark for understanding sports betting, where marginal costs are small and a small number of firms dominate market share. A firm's profit function under a GGR tax of τ is given by $\pi = p \cdot x(p) \cdot (1 - \tau)$. The tax scales profits but does not affect the first-order condition for optimal price. In this example, the revenue tax is equivalent to a nondistortionary tax on pure profits.

Though revenue taxes are nondistortionary in this special case, in more general models they can distort firms' decisions along non-price margins. For example, taxes can reduce entry [Besley, 1989] or product quality [Barzel, 1976, Cremer and Thisse, 1994, Keen, 1998]. In sports betting markets, the decision of how much to spend on marketing is a key non-price margin. In the following subsection, we study how GGR taxes affect marketing decisions.

Figure 4: Pass-through rates across product categories



Notes: Pass-through estimates are from Butters et al. [2023], Table 5, except for marijuana, which is from Hollenbeck and Uetake [2021].

4.2 Effects on Local Marketing Expenditures

We begin by documenting narrative evidence that high GGR taxes caused specific firms to reduce marketing activity. In a 2022 investor day, BetMGM's holding firm (Entain) explicitly described a strategy of diverting their marketing budget towards states with relatively low GGR taxes [Entain Group, 2022]:

> During Q1 [2022], BetMGM made a concerted decision to pull back in our pursuit of players in New York due to its unfavourable tax environment. This reduced revenue slightly. However, marketing budget was diverted from New York to states with better economic returns. And this helped drive acquisition overperformance in those states.

BetMGM's statement is representative of statements from other sportsbooks about GGR taxes and marketing across jurisdictions. We collect several examples in Table 1.

Table 1: Industry statements on marketing responses to tax rates

Sportsbook	Quote	Source
Penn (ESPN Bet, since renamed to theScore Bet)	"We've been very disciplined on the promo side. The tax rate is extremely high [in NY] at over 50%, and you don't have any promo deduction opportunity before you pay taxes."	Q3 2024 earnings call [Penn Entertainment, 2024]
FanDuel	"During Q2, the Illinois Gaming Board announced an increase in gaming taxes which became effective from July 1, 2024. We expect to directly mitigate 50% of the cost in 2025 through locally optimized promotional and marketing spend."	Q2 2024 earnings release [Flutter Entertainment, 2024]
BetMGM	"During Q1 [2022], BetMGM made a concerted decision to pull back in our pursuit of players in New York due to its unfavourable tax environment. This reduced revenue slightly. However, marketing budget was diverted from New York to states with better economic returns. And this helped drive acquisition overperformance in those states."	May 2022 investor day [Entain Group, 2022]
DraftKings	"Q3 2024 What are the expectations for promotional activity in Illinois to offset the higher tax? A: Jason Robins stated that they have begun implementing changes to promotional activity in Illinois to mitigate the tax increase, but it's still a work in progress. There is potential upside as they continue to refine their approach."	Q3 2024 earnings call [DraftKings, 2024b]
DraftKings	"Promotional reinvestment for online sportsbook and iGaming improved by 300 basis points year-over-year as a percentage of gross gaming revenue as we reduced promotions for lower value customer segments and began to mitigate the impact of the Illinois tax increase.... We have made significant progress identifying customers with lower lifetime values, especially in high tax states. A high tax state is defined as a state that has multiple sports betting operators and a tax rate above 20%."	Q3 2024 investor relations [DraftKings, 2024c]

Notes: All quotes are from public earnings calls, investor presentations, or regulatory filings.

We next quantify the cross-sectional association between local GGR taxes and two forms of local marketing expenditure: TV advertising and the generosity of promotional offers. To do this, we collect data on local marketing expenditures at the sportsbook-state level, and regress marketing expenditures on local state taxes and sportsbook fixed effects. Specifically, our estimating equation for promotional offers is

$$\text{Promo}_{sb} = \alpha_b + \delta^{Promo} \cdot \tau_s + \epsilon_{sb} \tag{1}$$

where Promo_{sb} is the expected value of the sign-up offer from sportsbook b in state s and τ_s is the GGR tax in state s.[12] The estimating equation for local TV advertisements is similar:

$$\text{AdSpend}_{sbt} = \lambda_{bt} + \delta^{Ads} \cdot \tau_s + \nu_{sbt} \tag{2}$$

where $AdSpend_{sbt}$ is local TV ad spending per capita for sportsbook b in state s in year t. The only difference between these specifications is that local advertising is measured across years, so we include sportsbook-year fixed effects in equation 2. In both cases, the coefficient δ captures the association between local GGR taxes and local marketing, within a sportsbook across states. We standardize both the marketing expenditure variable and the tax variable, so both δ^{Promo} and δ^{Ads} are reported in units of SD change in marketing expenditure per SD change in GGR tax.

Figure 5 illustrates our results by plotting residualized taxes against residualized marketing expenditures. Consistent with our narrative evidence, GGR taxes are negatively associated with both measures of marketing expenditure. A 1 SD increase in the GGR tax ($\approx$12 p.p. for both regression samples) is associated with a 0.21 SD decrease in promotional generosity ($p = 0.08$) and a 0.17 SD decrease in TV ads ($p = 0.0367$). These magnitudes imply that modest changes in the GGR tax have economically significant impacts: they correspond to a \$90 (14.9% of the mean across state-sportsbooks) decrease in the expected value of sign-up offers and a \$5.99 (20.4% of the mean across state-sportsbooks) reduction in local TV ads per capita.

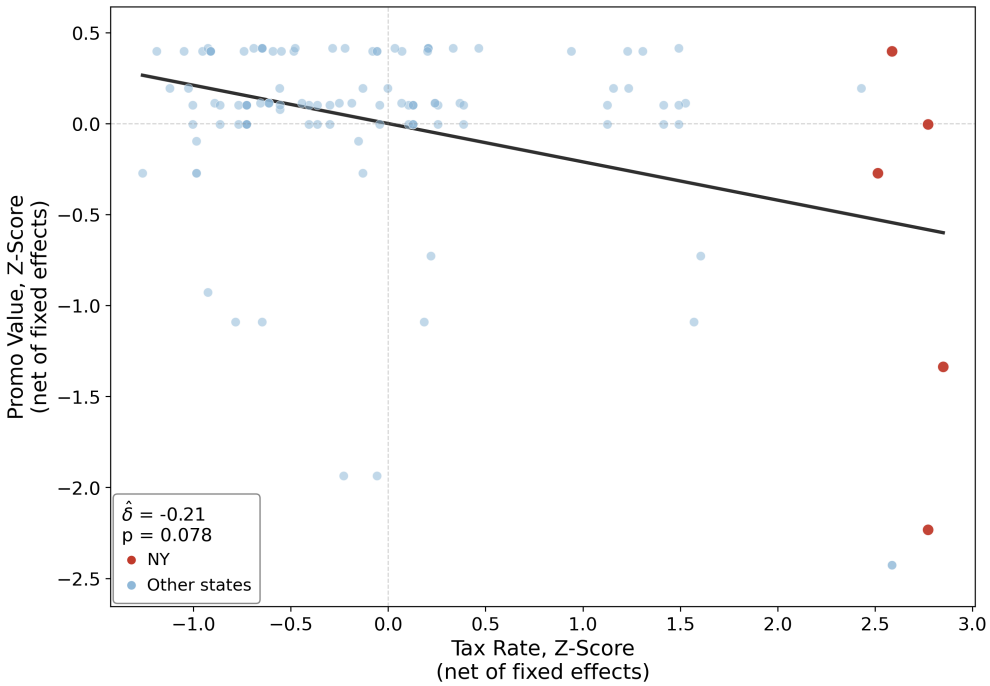
Discussion.

Taken together, the results in this section demonstrate that GGR taxes impact the sportsbook market through a marketing channel rather than through a pricing channel. Therefore, the incidence and efficiency of GGR taxes depend on how marketing affects sports betting demand. Since taxes act primarily by reducing marketing, the aggregate demand response to marketing determines the revenue-maximizing tax rate. Heterogeneity in marketing responsiveness across consumers determines whether ad-induced reductions in betting are well-targeted at externalities and internalities.[13] The next section estimates the demand response to marketing and characterizes which consumers are marginal to ads.

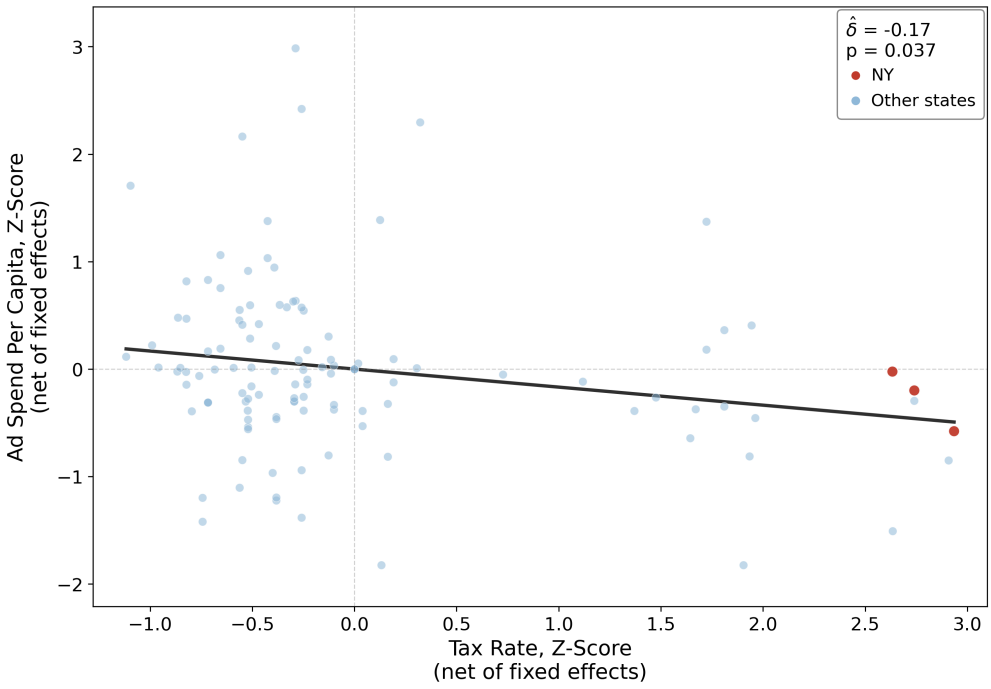
[12] We compute these expected values using conventions established by DarkHorse Odds, a service that helps users take advantage of promotional offers. It has been covered in the Wall Street Journal [DarkHorse Odds, 2025, The Wall Street Journal, 2024a]. The expected values of sign-up offers range from the low hundreds to over a thousand dollars, as shown in Table A3.

[13] One important but challenging question for welfare analysis regards whether marketing induces demand by increasing normative utility [Becker and Murphy, 1988] or through uninformative persuasion [Mullainathan et al., 2008]. An analysis of this question is beyond the scope of this paper.

Figure 5: Relationship between state tax rates and marketing activity



(a) Promotional generosity



(b) Local TV ad spending

Notes: Panel (a) plots promotional generosity against GGR tax rates. Each point is a state-sportsbook pair. Both axes are z-scored and residualized on sportsbook fixed effects, so the fitted line visualizes the same regression reported in the text. Red points are New York. This analysis uses data from 6 sportsbooks that offer state-specific promos: Bet365, BetMGM, BetRivers, DraftKings, FanDuel, Fanatics, which collectively represent 86.4% of national dollars wagered. Caesars offers uniform promos across all states and is excluded from this analysis. N = 124 state-sportsbook pairs across 28 states. Panel (b) plots local TV ad spending per capita against GGR tax rates. Each point is a state-sportsbook-year observation. Both axes are z-scored and residualized on sportsbook × year fixed effects. Local TV ad spending covers 2019–2023 from 5 large sportsbooks. N = 115 state-sportsbook-year observations across 16 states. p-value from wild cluster bootstrap, clustered by state for both panels. Appendix B.1 contains sample selection details.

5 The Effect of Sportsbook Marketing on Demand

This section estimates the relationship between sports betting marketing and sports betting demand. We focus on local TV advertising throughout, since we have clean identification and rich data for ads.

5.1 Empirical Strategy

A simple regression of sports betting consumption on advertising would suffer from standard endogeneity problems: firms likely target advertising to where demand is high. To isolate quasi-random variation in advertising, we implement a border design in the spirit of Shapiro [2018]. Nielsen divides the U.S. into 210 Designated Market Areas (DMAs), and a household's DMA determines which local TV ads it sees. As an example, we illustrate the border between New York City's DMA and the Philadelphia DMA, which bisects New Jersey, in Figure A4. We estimate the impact of advertising on demand by measuring how deposits and advertising co-vary over time on each side of a DMA "border experiment."

We implement this design using the exact specification from Shapiro [2018]:

$$\begin{aligned}\ln Y_{jmt} = \lambda \ln Y_{jm,t-1} + \gamma_1 a_{jmt}^{\text{own}} + \gamma_2 a_{jmt}^{\text{rival}} + \gamma_3 (a_{jmt}^{\text{own}})^2 \\ + \gamma_4 (a_{jmt}^{\text{rival}})^2 + \gamma_5 a_{jmt}^{\text{own}} a_{jmt}^{\text{rival}} + \alpha_{jbm} + \alpha_{jbq} + \varepsilon_{jmt}\end{aligned} \tag{3}$$

where j indexes sportsbooks, m indexes DMAs, t indexes months, and b indexes border experiments. An outcome Y_{jmt} is a measure of consumption at a sportsbook in a DMA-month (for example, deposits). a_{jmt}^{own} is sportsbook j's own advertising (\$/100 capita in the DMA), and a_{jmt}^{rival} is rival advertising. Quadratic and interaction effects allow for the possibility that advertising has diminishing marginal returns. The lagged term, $Y_{jm,t-1}$, controls for persistence in sports betting demand. The sportsbook $\times$ border $\times$ DMA fixed effects and sportsbook $\times$ border $\times$ quarter fixed effects absorb permanent differences between sides of a border and time-varying shocks common to both sides of a border respectively.

Because of the fixed effects, our estimates are identified from within-border experiment, within-quarter variation: one side of the border receives more advertising than the other in a given month, relative to the border-quarter average. To interpret our estimates causally, we assume that households on either side of the border would have behaved similarly absent such an advertising shock. Two institutional details of the local TV advertising market minimize threats to this assumption, as discussed in Shapiro et al. [2021]. First, local TV ads are usually bought several months ahead of airing, making it difficult to *time* advertisements to coincide with local demand shocks. Second, local TV ads are often bought in bulk, making it difficult to *locate* advertisements in specific markets.

Estimates from specification (3) represent contemporaneous responses to advertisements. To the extent that advertisements have impacts on consumption beyond a one-month time horizon, our estimates will understate the overall effect of advertisements on consumption. The advertising literature generally concludes that long-run elasticities exceed short-run elasticities [Sethuraman et al., 2011, Shapiro et al., 2021], and habit formation may make long-run impacts especially important in the gambling context [Guryan and Kearney, 2010]. We explore dynamics further in Section 5.3. A related concern is that advertisements may be

retiming demand instead of increasing it: a deposit that would have occurred in the future occurs now instead. To test for retiming, we run specifications that include one-month lags of own and rival advertising. Retiming would imply that lagged advertising has a negative effect on today's deposits. In fact, lagged coefficients are either positive or not statistically significant, suggesting retiming is not a major concern (Table A9).

We impose two sample restrictions when taking this design to the data. First, to avoid confounds from state-specific regulatory shocks, we restrict all border experiments to be within states.[14] Second, we restrict to households that we can confidently locate within a given DMA, given the underlying geographic information in the Consumer Edge data.[15] After applying these restrictions, our preferred specification uses 135 border experiments. We show in Figure A5 that results are stable as we vary the sample restriction criterion, and we provide further details on sample construction in Appendix B.2.

Our outcome is logged; we also include a lag of this outcome on the right-hand side. We drop observations where either the outcome or its lag is zero. Methods designed to accommodate zeros in the outcome, such as Poisson pseudo-maximum likelihood [Santos Silva and Tenreyro, 2006], do not accommodate zeros on the right-hand side, and would thus require dropping a nearly identical set of observations as we drop.

Dropping zeros removes 38.3% of observations in our main specification. Two heuristic tests suggest that dropping zeros does not upwardly bias our estimates. First, we find the dropped observations have significantly lower advertising than the observations in our sample, conditional on the fixed effects in our regression ($p < 0.001$). We find a positive effect of advertising on deposits despite dropping observations with both low ads and zero deposits. This suggests that a method that included these observations would find a coefficient further from zero; i.e., if anything, our estimates are attenuated. Second, Table A11 restricts the sample to the two largest sportsbooks, DraftKings and FanDuel, where zeros are much less prevalent. 10.0% of observations are dropped in this sample. If the method we used to drop zeros was biasing our results, that bias should be smaller in a sample with fewer zeros. All of our main results hold when we restrict to this sample.

[14] Tax rates on sportsbooks, promotional sign-up offers, and the set of legal competitors all vary across state borders and change over time, and these changes may be timed with changes in marketing expenditure. Results are qualitatively robust to allowing cross-state border experiments (Table A10).

[15] The underlying household geography variable is at the ZIP3 level, and ZIP3s do not perfectly align with DMA boundaries. In our preferred specification, we assign each ZIP3 to the DMA containing at least 80% of its area, and drop ZIP3s which do not have 80% of their area in any DMA.

5.2 Contemporaneous Effects of Advertising

Table 2: Effect of Advertising on Sports Betting Deposits

		Customers		Dep./Customer	
	Deposits	New	Existing	New	Existing
	(1)	(2)	(3)	(4)	(5)
$\ln Y_{j,m,t-1}$	0.35323***	0.14277***	0.40995***	−0.13967***	0.26952***
	(0.02447)	(0.02369)	(0.02655)	(0.01749)	(0.02633)
Own	0.02090***	0.05216***	0.02425***	−0.00586	−0.00062
	(0.00465)	(0.00714)	(0.00326)	(0.00706)	(0.00391)
Rival	0.01813***	0.02738***	0.01630***	−0.00186	0.00321
	(0.00300)	(0.00336)	(0.00315)	(0.00378)	(0.00294)
Own^2	−0.00036***	−0.00105***	−0.00040***	0.00020	0.00009
	(0.00012)	(0.00019)	(0.00007)	(0.00015)	(0.00009)
Rival^2	−0.00020***	−0.00027***	−0.00022***	0.00008	−0.00002
	(0.00006)	(0.00007)	(0.00007)	(0.00006)	(0.00005)
Own × Rival	0.00002	−0.00001	−0.00001	−0.00011	−0.00009
	(0.00017)	(0.00017)	(0.00014)	(0.00019)	(0.00015)
SB × Border × DMA FE	Yes	Yes	Yes	Yes	Yes
SB × Border × Quarter FE	Yes	Yes	Yes	Yes	Yes
Observations	12,850	12,850	12,850	12,850	12,850
R^2	0.938	0.868	0.965	0.518	0.805

Sportsbook × DMA clustered standard errors in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Column (1) pools all depositors. Columns (2)–(5): "New" = first deposit at that sportsbook in that calendar month. Border experiments restricted to quarters in which sports betting is legal and to ZIP3s where a majority of the population resides in one state.

We find that advertising increases sportsbook deposits. Column (1) of Table 2 reports the relevant estimates. The coefficient on own advertising indicates that a $1 per 100 capita increase in monthly local TV advertising increases deposits by approximately 0.021 log units. The coefficient on rivals' advertising is similar in magnitude to that on own advertising, suggesting that local TV advertising primarily impacts demand through market expansion, rather than business stealing.

Taken together, our estimates imply that a policy that reduces local TV advertising by sportsbooks by 10% for one month would reduce industry-wide sports betting deposits in that month by 1.81%.[16] Extrapolating under the assumption that dollars wagered scales linearly with deposits, this effect would correspond to a reduction of 2.7 billion dollars

[16]The population-weighted mean of local TV advertising in our sample is $\bar{a}^{\text{own}} = \$3.36$ per 100 capita per

wagered, holding aggregate demand fixed at 2024 levels.[17] This estimate is a lower bound on the contemporaneous effects of broader advertising regulations, which would also restrict national TV advertising and digital advertising.

We next turn to the mechanisms by which advertising impacts deposits. In columns (2) through (5) of Table 2, we decompose the effect of advertising into the extensive margin (the chance of a household making any deposit) and the intensive margin (the amount deposited, conditional on making at least one deposit). To understand whether ads attract new customers versus increase the spending of existing ones, we also split households according to whether they have ever made a deposit at the sportsbook in the past, and estimate (3) for each sub-sample.

We find that advertising exclusively works through the extensive margin. Coefficients on own and rival ads are positive and significant when the dependent variable is unique deposits, but they are precise nulls when the dependent variable is dollars per deposit. The effects are also proportionally larger for new customers: the own-ads extensive margin coefficient is more than twice as large for new customers as for existing customers. These findings are broadly consistent with other results in the advertising literature.[18]

While the analysis above exclusively studies the impact of TV advertisements, we also conduct a similar analysis to measure the impacts of promotional sign-up offers on sports betting demand. Our point estimates indicate that promotional offers increase the chance of a deposit, especially for new customers, but these estimates are imprecise. We provide details on our analysis and results in Appendix A.5.

5.3 Dynamics of Sports Betting and Bettors Marginal to Advertising

Our above estimates only look at the contemporaneous effects of advertisements. Now we explore the dynamics of sports betting over time for people who were exposed to plausibly exogenous variation in advertising at sign-up. Understanding who these consumers are is important because the welfare effects of a reduction in ads (either through taxes or regulation) depend on whether marginal bettors are casual bettors or bettors with self-control or misperception problems.

---

month and $\bar{a}^{\text{rival}} = \$7.89$. A 10% reduction means moving from $\bar{a}$ to $0.9\bar{a}$, and yields the following effect:

$$\begin{aligned}\Delta \ln Q &= \hat{\gamma}_1(0.9\bar{a}^{\text{own}} - \bar{a}^{\text{own}}) + \hat{\gamma}_2(0.9\bar{a}^{\text{rival}} - \bar{a}^{\text{rival}}) \\ &\quad + \hat{\gamma}_3\left[(0.9\bar{a}^{\text{own}})^2 - (\bar{a}^{\text{own}})^2\right] + \hat{\gamma}_4\left[(0.9\bar{a}^{\text{rival}})^2 - (\bar{a}^{\text{rival}})^2\right] \\ &\quad + \hat{\gamma}_5\left[(0.9\bar{a}^{\text{own}})(0.9\bar{a}^{\text{rival}}) - \bar{a}^{\text{own}}\bar{a}^{\text{rival}}\right] \\ &= -0.018\end{aligned}$$

Converting to percent: $\exp(-0.018) - 1 \approx -1.81\%$. The linear own- and rival-advertising terms $(\hat{\gamma}_1, \hat{\gamma}_2)$ alone give a 2.11% reduction; the quadratic and interaction terms $(\hat{\gamma}_3, \hat{\gamma}_4, \hat{\gamma}_5)$ partially offset this. Descriptive statistics are in Appendix A.4.

[17] Americans wagered $149.6 billion in 2024 [Gustafson, 2025]. $\$149.6\text{B} \times 1.81\% \approx \$2.7\text{B}$.

[18] On the extensive vs. intensive margin, Bertrand et al. [2010] find that advertising influences take-up but not the amount of consumer loans. On new vs. existing consumers, Blake et al. [2015] find that new and infrequent users are positively influenced by ads but that most advertising is spent on frequent users, for whom advertising is not effective.

We examine two types of outcomes for depositors: (i) the share of depositors who make a deposit at $t = 1 \ldots 6$ months after the first month they make a deposit, (ii) average monthly dollars deposited, including those who make no deposits.

Before exploring heterogeneity, two patterns show up in population averages. First, Figure 6a shows that only 34% of new depositors to a sportsbook make a deposit in the next month. In fact, only 44% make at least one deposit in the six months following their first deposit month. Second, Figure 6c shows that on average, a depositor's first month is their highest deposit-month; average monthly deposits decline from \$441 to \$164 six months after the first deposit month.

Knowing which individuals are marginal to ads is not possible because we don't observe the same person being exposed to ads vs. not. Instead, we compare people who first deposited in high vs. low advertising months. The difference is informative about the characteristics of bettors marginal to advertising.

Our measure of ads exposure residualizes own advertising using the same fixed effects and sample as Equation 3. We residualize out sportsbook × border × side ($\hat{\alpha}_{jbm(z)}$) and sportsbook × border × quarter fixed effects ($\hat{\alpha}_{jbq}$), leaving a residual $\tilde{a}^{\text{own}}_{jzbt}$ that is defined separately for each border experiment b:

$$\tilde{a}^{\text{own}}_{jzbt} = a^{\text{own}}_{jm(z)t} - \hat{\alpha}_{jbm(z)} - \hat{\alpha}_{jbq} \tag{4}$$

where $m(z)$ is the DMA containing ZIP3 z. The residual $\tilde{a}^{\text{own}}_{jzbt}$ is plausibly exogenous by the same argument as the identifying variation in Equation 3. Because a ZIP3 can belong to multiple border experiments, we average these residuals across border experiments, to give each sportsbook–ZIP3–month a single value, $\tilde{a}^{\text{own}}_{jzt}$.

Since a person can deposit at multiple sportsbooks, the unit of analysis is the depositor-sportsbook pair. We split the entire sample of depositor-sportsbooks in half based on the level of $\tilde{a}^{\text{own}}_{jzt}$ in that depositor's ZIP3 (z) in the month (t) of their first deposit to that sportsbook (j).

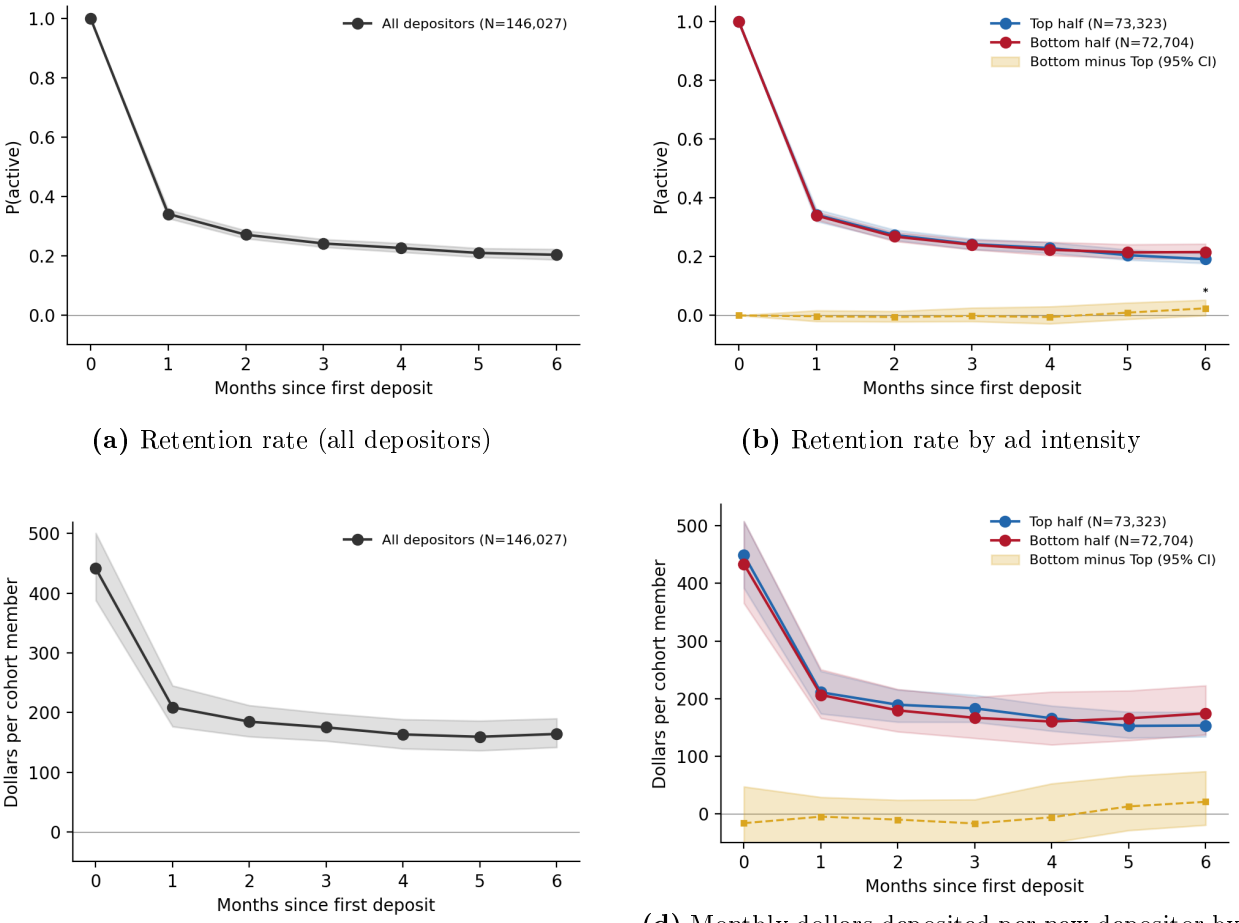
New depositor-sportsbook pairs in the above-median half made their first deposit in periods when that sportsbook's ads were, on average, 2.6 times higher than for new depositors to that sportsbook in the below-median half. Figure 6 compares outcomes for new depositors in the above-median and below-median halves based on the ad environment at the time of their first deposit. The two halves are similar in sportsbook composition (which book depositors signed up for) and cohort-year composition (when they first deposited); Table A8 confirms that the halves have similar shares of each sportsbook and year-of-first-deposit.

We find no evidence that high-$\tilde{a}^{\text{own}}$ periods bring in a disproportionately high share of high-volume gamblers. We find that people who make their first deposit in high-ad periods do not deposit more in their first month than people who make their first deposit in low-ad periods, consistent with the intensive margin analysis in Table 2. This pattern persists in their first several months of activity. By month 6, our 95% confidence interval rules out that the difference between those who sign up in high-ad vs. low-ad periods is larger than \$19 dollars per month per depositor-sportsbook. We can also rule out that sign-ups during high-ad periods are meaningfully more likely to remain active six months after their first deposit; at the upper end of our 95% confidence interval, this difference is 0.03 pp. In fact, our point estimate suggests people who make their first deposit in high-ad periods are 2.4 pp

less likely to be active six months later, though this difference is not statistically significant.

These results have implications for the design of sports betting policy. We show in Section 4 that the main consequence of GGR taxes is to reduce sportsbook marketing. Other proposals and regulations, like the SAFE Bet Act, are explicitly designed to reduce advertising, often in the name of mitigating harms from problem gambling. Our results suggest that policies restricting advertising would be an effective but blunt tool to accomplish this goal: we do not find evidence that advertising disproportionately brings high-intensity bettors into the market.

Figure 6: Dynamics of sports betting deposits, by ad-exposure in month of first deposit



(a) Retention rate (all depositors)

(b) Retention rate by ad intensity

(c) Monthly dollars deposited per new depositor

(d) Monthly dollars deposited per new depositor by ad intensity

Notes: The left column pools all depositors across ad intensity. The right column compares above- vs. below-median residualized own-advertising intensity in the month of first deposit. Stars denote two-sided p-values (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$) from the bootstrap distribution constructed by resampling DMA × sportsbook blocks (all ZIP3s and time periods in that block) with replacement. Shaded bands show 95% bootstrap confidence intervals.

6 Conclusion

This paper shows that the main tax instrument in the sports betting market does not affect the price of sports betting. Instead, GGR taxes reduce sportsbook marketing, which in turn reduces sports betting consumption. Policymakers designing taxes on sports betting should thus account for both the marketing response of firms and the demand response of consumers to marketing.

Several empirical questions remain open. Perhaps most importantly, our paper is mostly silent on the normative interpretation of marketing-induced demand. Sportsbook marketing is more likely to be welfare-reducing if it induces biased consumers to start betting than if it merely informs rational consumers the product exists.

The mechanism we document, in which taxes reduce marketing and thereby lower consumption, may apply to other products with large marketing expenditures and externalities. For example, alcohol and sugar-sweetened beverages are both marketed heavily and associated with externalities. To our knowledge, sufficient statistics for an optimal corrective commodity tax that accounts for the effects of taxation on firms' incentive to advertise have not been developed.

References

Rossi Abi-Rafeh, Pierre Dubois, Rachel Griffith, and Martin O'Connell. The effects of sin taxes and advertising restrictions in a dynamic equilibrium. *American Economic Journal: Microeconomics*, 2025. (Forthcoming).

American Gaming Association. How much did americans wager on sports last year? NGPF Blog, 2024. URL https://www.ngpf.org/blog/question-of-the-day/question-of-the-day-how-much-did-americans-wager-on-sports-last-year/.

Scott R. Baker, Justin Balthrop, Mark J. Johnson, Jason D. Kotter, and Kevin Pisciotta. Gambling away stability: Sports betting's impact on vulnerable households. Working Paper 33108, National Bureau of Economic Research, November 2024. URL http://www.nber.org/papers/w33108.

Yoram Barzel. An alternative approach to the analysis of taxation. *Journal of Political Economy*, 84(6):1177–1197, 1976. doi: 10.1086/260507.

Gary S. Becker and Kevin M. Murphy. A theory of rational addiction. *Journal of Political Economy*, 96(4):675–700, 1988.

Marianne Bertrand, Dean Karlan, Sendhil Mullainathan, Eldar Shafir, and Jonathan Zinman. What's advertising content worth? evidence from a consumer credit marketing field experiment. *The Quarterly Journal of Economics*, 125(1):263–306, 2010. doi: 10.1162/qjec.2010.125.1.263.

Andy Beshear. Budget address, January 2020. URL https://governor.ky.gov/attachments/20200128_Budget-Address.pdf. Accessed: 2026-03-25.

Timothy Besley. Commodity taxation and imperfect competition: A note on the effects of entry. *Journal of Public Economics*, 40(3):359–367, 1989. ISSN 0047-2727. doi: https://doi.org/10.1016/0047-2727(89)90048-0. URL https://www.sciencedirect.com/science/article/pii/0047272789900480.

BetMGM. Best welcome casino bonus. Archived webpage, October 2025. URL https://web.archive.org/web/20251009220452/https://casino.betmgm.com/en/blog/best-welcome-casino-bonus/.

Thomas Blake, Chris Nosko, and Steven Tadelis. Consumer heterogeneity and paid search effectiveness: A large-scale field experiment. *Econometrica*, 83(1):155–174, 2015. doi: 10.3982/ECTA12423.

Pedro Bordalo, Giovanni Burro, Nicola Gennaioli, Gad Nacamulli, and Andrei Shleifer. Ads as cues. Working Paper 34387, National Bureau of Economic Research, 2025.

Matthew Brown, Nick Grasley, and Mariana Guido. Do Sports Bettors Need Consumer Protection? Evidence from a Field Experiment. 2025. URL https://mattbrownecon.github.io/assets/papers/jmp/sportsbetting.pdf.

R. Andrew Butters, Daniel W. Sacks, and Boyoung Seo. How do national firms respond to local cost shocks? *American Economic Review*, 113(6):1737–1772, 2023. doi: 10.1257/aer.20210811.

David Card and Gordon B. Dahl. Family violence and football: The effect of unexpected emotional cues on violent behavior*. *The Quarterly Journal of Economics*, 126(1):103–143, 02 2011. ISSN 0033-5533. doi: 10.1093/qje/qjr001. URL https://doi.org/10.1093/qje/qjr001.

Casino Reports. US sports betting market stats database. Database, 2025. URL https://www.casinoreports.com/us-sports-betting-market-stats-database/. In collaboration with Alfonso Straffon, citing state filings.

Martin J. Chegere, Paolo Falco, Marco G. Nieddu, Lorenzo Pandolfi, and Mattea Stein. The magic of the game: Experimental evidence on sports betting behavior. *Journal of Economic Behavior & Organization*, 240:107301, 2025. doi: 10.1016/j.jebo.2025.107301.

Covers.com. Fanatics Illinois sports betting surcharge, July 2025. URL https://www.covers.com/industry/fanatics-illinois-sports-betting-surcharge-july-1-2025.

Helmuth Cremer and Jacques-François Thisse. Commodity taxation in a differentiated oligopoly. *International Economic Review*, 35(3):613–633, August 1994.

Andrew M. Cuomo. 2021 state of the state, 2021. URL https://www.governor.ny.gov/sites/default/files/atoms/files/SOTS2021Book_Final.pdf. Accessed: 2026-03-25.

DarkHorse Odds. DarkHorse Odds: Sports betting arbitrage consulting. Website, 2025. URL https://www.darkhorseodds.com.

Deadspin. BetMGM Illinois implements higher minimum bet cost to offset tax increase, 2025. URL https://web.archive.org/web/20260218174027/https://deadspin.com/legal-betting/betmgm-illinois-implements-higher-minimum-bet-cost-to-offset-tax-increase/.

Sofia Delipalla and Michael Keen. The comparison between ad valorem and specific taxation under imperfect competition. *Journal of Public Economics*, 49(3):351–367, 1992.

Kwabena Donkor, Lorenz Goette, Maximilian W. Müller, Eugen Dimant, and Michael J. Kurschilgen. The price of identity: Overoptimism and congruence concerns. Available at SSRN: https://ssrn.com/abstract=4670092, 2025.

DraftKings. Q2 2024 earnings call transcript. Earnings call via Insider Monkey, 2024a. URL https://www.insidermonkey.com/blog/draftkings-inc-nasdaqdkng-q2-2024-earnings-call-transcript-1329726/.

DraftKings. Q3 2024 earnings call transcript. Earnings call via Yahoo Finance, 2024b. URL https://finance.yahoo.com/news/draftkings-inc-dkng-q3-2024-070600600.html.

DraftKings. Q3 2024 investor relations materials. Investor relations, 2024c. URL https://draftkings.gcs-web.com/static-files/436fd512-12f4-4c0e-b4ef-87472a2f7a8d.

DraftKings. Illinois wager tax FAQs, 2025a. URL https://support.draftkings.com/dk/en-us/illinois-wager-tax-faqs-us?id=kb_article_view&sysparm_article=KB0011351.

DraftKings. Q2 2025 earnings call transcript. Earnings call via GuruFocus, August 2025b. URL https://www.gurufocus.com/news/3047735/q2-2025-draftkings-inc-earnings-call-transcript.

Entain Group. BetMGM investor day transcript. Investor presentation, May 2022. URL https://www.entaingroup.com/media/bfcdjy1d/22betmgm-cmd-transcript-1.pdf.

ESPN. How does regional home-team bias impact sportsbooks? News article, January 2020. URL https://www.espn.com/chalk/story/_/id/28533298/how-does-regional-home-team-bias-impact-sportsbooks.

Flutter Entertainment. Q2 2024 results announcement. SEC filing, 2024. URL https://www.sec.gov/Archives/edgar/data/1635327/000119312524199772/d744140dex991.htm.

Gartner. Gartner 2025 CMO spend survey reveals marketing budgets have flatlined at 7.7% of overall company revenue, may 2025. URL https://www.gartner.com/en/newsroom/press-releases/2025-05-12-gartner-2025-cmo-spend-survey-reveals-marketing-budgets-have-flatlined-at-

Matthew Gentzkow, Jesse M Shapiro, Frank Yang, and Ali Yurukoglu. Pricing power in advertising markets: Theory and evidence. *American Economic Review*, 114(2):500–533, 2024. doi: 10.1257/aer.20220943.

Jonathan Guryan and Melissa S. Kearney. Is lottery gambling addictive? *American Economic Journal: Economic Policy*, 2(3):90–110, August 2010. doi: 10.1257/pol.2.3.90. URL https://www.aeaweb.org/articles?id=10.1257/pol.2.3.90.

Brandon Gustafson. 2024: A year of growth for sports betting revenue. CBS Sports, mar 2025. URL https://www.cbssports.com/betting/news/2024-a-year-of-growth-for-sports-betting-revenue/.

Bianca He, Lauren I Mostrom, and Amir Sufi. Investing in customer capital. Working Paper 33171, National Bureau of Economic Research, November 2024. URL http://www.nber.org/papers/w33171.

Brett Hollenbeck and Kosuke Uetake. Taxation and market power in the legal marijuana industry. *The RAND Journal of Economics*, 52(3):559–595, 2021. doi: https://doi-org.proxy.uchicago.edu/10.1111/1756-2171.12384. URL https://onlinelibrary-wiley-com.proxy.uchicago.edu/doi/abs/10.1111/1756-2171.12384.

Brett Hollenbeck, Poet Larsen, and Davide Proserpio. The financial consequences of legalized sports gambling. Manuscript dated April 2025, April 2025.

Illinois Gaming Board. FAQs on new statutory sports wager tax. Press release, June 2025. URL https://igb.illinois.gov/content/dam/soi/en/web/igb/documents/press-releases/additional-news/20250617-faqs-on-new-statutory-sports-wager-tax.pdf.

Jo Ingles. Sports betting companies face penalties for breaking Ohio law in ads. Ohio Public Radio/TV Statehouse News Bureau, January 2023. URL https://www.statenews.org/government-politics/2023-01-05/sports-betting-companies-face-penalties-for-breaking-ohio-law-in-ads.

Michael Keen. The balance between specific and ad valorem taxation. *Fiscal Studies*, 19(1): 1–37, 1998.

David Laibson. Golden eggs and hyperbolic discounting. *The Quarterly Journal of Economics*, 112(2):443–477, 1997. ISSN 00335533, 15314650. URL http://www.jstor.org/stable/2951242.

Legal Sports Report. DraftKings seeks favorable alternative to fee on winning bettors. News article, September 2024. URL https://www.legalsportsreport.com/199765/draftkings-seeks-favorable-alternative-to-fee-on-winning-bettors/.

Legal Sports Report. BetRivers raises Illinois minimum as sports bets fall, 2025a. URL https://web.archive.org/web/20260306140012/https://www.legalsportsreport.com/250740/betrivers-raises-illinois-minimum-as-sports-bets-fall/.

Legal Sports Report. Florida sports betting. State guide, 2025b. URL https://www.legalsportsreport.com/sports-betting-states/florida/.

Kyutaro Matsuzawa and Emily Arnesen. Sports betting legalization amplifies emotional cues & intimate partner violence. *SSRN Electronic Journal*, aug 2024. doi: 10.2139/ssrn.4938642. URL https://ssrn.com/abstract=4938642.

E. McGrane, H. Wardle, M. Clowes, L. Blank, R. Pryce, M. Field, C. Sharpe, and E. Goyder. What is the evidence that advertising policies could have an impact on gambling-related harms? A systematic umbrella review of the literature. *Public Health*, 215:124–130, 2023. doi: 10.1016/j.puhe.2022.11.019.

Sendhil Mullainathan, Joshua Schwartzstein, and Andrei Shleifer. Coarse thinking and persuasion. *The Quarterly journal of economics*, 123(2):577–619, 2008.

New Hampshire Public Radio. Vermont selects three companies to usher in state sports betting system. News article, December 2023. URL https://www.nhpr.org/2023-12-12/vermont-selects-three-companies-to-usher-in-state-sports-betting-system.

North American Association of State and Provincial Lotteries. A year of adjustment: FY24 lottery sales. NASPL Insights, 2024. URL https://www.nasplinsights.com/post/a-year-of-adjustment.

D. Ó Ceallaigh, S. Timmons, D. A. Robertson, and P. D. Lunn. Effects of inducements on sports gambling and decision-errors: An experimental study. *Journal of Behavioral Addictions*, 14(2):959–971, 2025. doi: 10.1556/2006.2025.00056.

Ted O'Donoghue and Matthew Rabin. Doing it now or later. *American Economic Review*, 89(1):103–124, 1999. doi: 10.1257/aer.89.1.103.

Office of Governor Kathy Hochul. Governor hochul signs legislation to fight the addictive effects of problem gambling, oct 2024. URL https://www.governor.ny.gov/news/governor-hochul-signs-legislation-fight-addictive-effects-problem-gambling.

Penn Entertainment. Q3 2024 earnings call. Earnings call transcript, 2024. URL https://www.alphaspread.com/security/nasdaq/penn/investor-relations/earnings-call/q3-2024.

Jukka Pirttilä. Specific versus ad valorem taxation and externalities. *Journal of Economics*, 76(2):177–187, 2002.

Marc N. Potenza, Iris M. Balodis, Jeffrey Derevensky, Jon E. Grant, Nancy M. Petry, Antonio Verdejo-Garcia, and Sarah W. Yip. Gambling disorder. *Nature Reviews Disease Primers*, 5(1):51, 2019. doi: 10.1038/s41572-019-0099-7.

Eric Ramsey. Us sports betting revenue and handle by state. Legal Sports Report, 2025. URL https://www.legalsportsreport.com/sports-betting-states/revenue/.

J. M. C. Santos Silva and Silvana Tenreyro. The log of gravity. *The Review of Economics and Statistics*, 88(4):641–658, November 2006. doi: 10.1162/rest.88.4.641.

SBC Americas. NY sports betting hearing 2023: Tax rate discussion. News article, February 2023. URL https://sbcamericas.com/2023/02/01/ny-sports-betting-hearing-2023-tax-rate/.

SBC Americas. bet365 Illinois $10 25-cent fee, September 2025a. URL https://sbcamericas.com/2025/09/02/bet365-illinois-10-dollar-25-cent-fee/.

SBC Americas. Caesars Illinois 25-cent per-wager fee, August 2025b. URL https://sbcamericas.com/2025/08/26/caesars-illinois-25-cent-per-wager-fee/.

SBC Americas. Illinois sports betting tax: September impact, November 2025c. URL https://sbcamericas.com/2025/11/17/illinois-sports-betting-tax-september/.

Raj Sethuraman, Gerard J. Tellis, and Richard A. Briesch. How well does advertising work? Generalizations from meta-analysis of brand advertising elasticities. *Journal of Marketing Research*, 48(3):457–471, 2011. doi: 10.1509/jmkr.48.3.457.

Bradley Shapiro. Positive spillovers and free riding in advertising of prescription pharmaceuticals: The case of antidepressants. *Journal of Political Economy*, 126(1):381–437, 2018. doi: 10.1086/695475. URL https://doi.org/10.1086/695475.

Bradley T Shapiro, Günter J Hitsch, and Anna Tuchman. Research note: Procedure for building nielsen ad intel data and merging with nielsen rms scanner data. Working paper, SSRN, 2020. URL https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3761483.

Bradley T Shapiro, Günter J Hitsch, and Anna Tuchman. Tv advertising effectiveness and profitability: Generalizable results from 288 brands. *Econometrica*, 89(4):1855–1879, 2021. doi: 10.3982/ECTA17674.

SportsHandle. New york sports betting. State guide, October 2025. URL https://sportshandle.com/new-york/.

George J. Stigler. The economics of information. *Journal of Political Economy*, 69(3): 213–225, 1961.

Daniel B. Suits and Richard A. Musgrave. Ad valorem and unit taxes compared. *Quarterly Journal of Economics*, 67(4):598–604, 1955.

The Wall Street Journal. The arbitrage consultants promising risk-free sports betting. *The Wall Street Journal*, 2024a. URL https://www.wsj.com/business/the-arbitrage-consultants-promising-risk-free-sports-betting-c1aea930.

The Wall Street Journal. What are parlays? sports betting gambling. *The Wall Street Journal*, 2024b. URL https://www.wsj.com/business/what-are-parlays-sports-betting-gambling-881bdaee.

Paul Tonko. SAFE Bet Act fact sheet. Congressional fact sheet, 2025. URL https://tonko.house.gov/uploadedfiles/safe_bet_fact_sheet_3.25_119th.pdf.

U.S. Senator Richard Blumenthal. Blumenthal & tonko reintroduce safe bet act addressing sports gambling, mar 2025. URL https://www.blumenthal.senate.gov/newsroom/press/release/blumenthal-and-tonko-reintroduce-safe-bet-act-addressing-sports-gambling.

Douglas M. Walker and Brent Evans. How bad sports betting research can lead to bad sports betting regulations. Available at SSRN: https://ssrn.com/abstract=5490526, September 2025.

A Additional Figures and Tables

Table A1: Market share by sportsbook, in dollars wagered, for the month of August 2025

Operator	Market Share (%)
DraftKings	35.2
FanDuel	29.6
BetMGM	14.3
Caesars	6.9
ESPN Bet (since rebranded as theScore Bet)	3.4
Rush Street Entertainment	3.4
Fanatics	2.6
bet365	1.3
Other	3.3

Notes: Source: Casino Reports [2025]. Rush Street Entertainment owns BetRivers.

A.1 Estimating National Promotional Credit Spending

In Table A2, we estimate national promotional credit spending by extrapolating from state-level administrative data. We walk through the DraftKings calculation using Ohio data as an example.

The Ohio Casino Control Commission reports that DraftKings offered $103M in promotional credits (face value) in calendar year 2024, on $2.91B in dollars wagered in Ohio. This implies a promotional credit rate of 3.54% of dollars wagered. If DraftKings offers promotional credits at a similar rate nationwide, we can extrapolate to a national face value of $\$48.10B \times 3.54\%$.

However, promotional credits are not worth their face value. A $100 bonus bet, for example, cannot be converted to $100 in cash with certainty. We consider two conversion rates. The "low" rate of 45¢ on the dollar assumes users naively bet into standard -110 two-way markets. The "high" rate of 70¢ on the dollar assumes users exploit promos optimally, using the DarkHorse Odds conversion rate for bonus bets (see Section 3).

At the high conversion rate, DraftKings' national promotional credit cost is $1.19B, which is 113.5% of their $1.05B advertising spend. At the low conversion rate, the cost is $766M, or 72.9% of advertising.

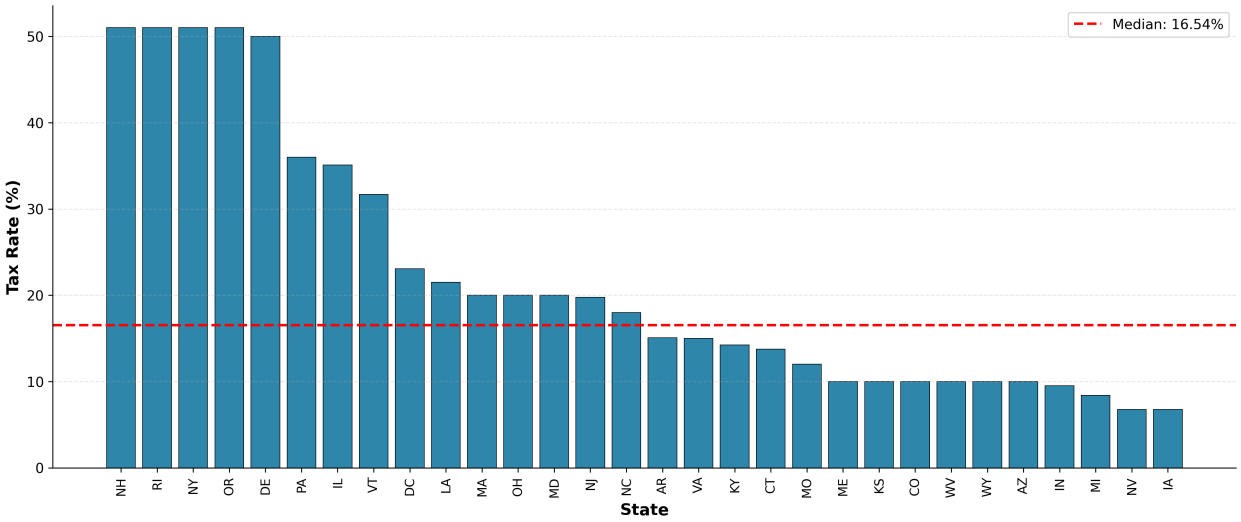
The promo-to-dollars-wagered ratios differ across states and sportsbooks. Table A2 presents the full set of calculations for two sportsbooks (DraftKings and FanDuel) and two states (Ohio, using calendar year 2024 data, and Pennsylvania, using fiscal year July 2024 – June 2025 data). These estimates assume sportsbooks offer promos at the same rate nationwide as they do in these states. Ohio legalized sports betting relatively recently (January 2023), which may lead to higher promo rates. Pennsylvania allows promotional credit deductibility but has a relatively high tax rate (36%).

Table A2: Estimates of national promotional credit costs for DraftKings and FanDuel (2024)

	Low Conversion (45¢)	High Conversion (70¢)
Panel A: DraftKings (National Dollars Wagered: $48.10B, Advertising: $1.05B)		
Pennsylvania (FY 2024-25)		
State promo credits (face value)	$76M	$76M
State dollars wagered	$2.25B	$2.25B
Promo rate (face value)	3.36%	3.36%
Promo cost rate	1.51%	2.35%
National promo cost (extrapolated)	$727M	$1.13B
Promos % of national advertising	69.2%	107.7%
Ohio (CY 2024)		
State promo credits (face value)	$103M	$103M
State dollars wagered	$2.91B	$2.91B
Promo rate (face value)	3.54%	3.54%
Promo cost rate	1.59%	2.48%
National promo cost (extrapolated)	$766M	$1.19B
Promos % of national advertising	72.9%	113.5%
Panel B: FanDuel (National Dollars Wagered: $50.90B, Advertising: $1.97B)		
Pennsylvania (FY 2024-25)		
State promo credits (face value)	$106M	$106M
State dollars wagered	$3.35B	$3.35B
Promo rate (face value)	3.17%	3.17%
Promo cost rate	1.43%	2.22%
National promo cost (extrapolated)	$726M	$1.13B
Promos % of national advertising	36.9%	57.5%
Ohio (CY 2024)		
State promo credits (face value)	$109M	$109M
State dollars wagered	$2.92B	$2.92B
Promo rate (face value)	3.73%	3.73%
Promo cost rate	1.68%	2.61%
National promo cost (extrapolated)	$854M	$1.33B
Promos % of national advertising	43.4%	67.6%

Notes: State-level promo credits and dollars wagered are from administrative data (Ohio Casino Control Commission, Pennsylvania Gaming Control Board). National dollars wagered and advertising are from 2024 10K filings. Low conversion rate (45¢) assumes naive betting into -110 markets. High conversion rate (70¢) uses DarkHorse Odds optimal conversion for bonus bets.

Figure A1: Tax rates on sports betting gross gaming revenue (2025)



Notes: For Illinois, which has a graduated tax rate on operators, a per-wager tax, and county-level taxation, we show the average tax rate inclusive of all taxes, calculated as total tax payment divided by gross gaming revenue for online sports betting for October 2024–September 2025. For Arkansas, which has a graduated tax rate, we use the average tax rate for total sports betting (online and retail combined) from September 2024–August 2025. Vermont negotiates revenue-sharing with each sportsbook, which is between 31% and 33% for FanDuel, DraftKings, and Fanatics [New Hampshire Public Radio, 2023]; we use the value reported by the State Tax Foundation here. For Washington, DC, different operators face different rates; we use the average tax rate for total sports betting (online and retail combined) from September 2024–August 2025.

A.2 Promotional Offer Values by Sportsbook

Table A3 shows how we compute the expected dollar value of promotional sign-up offers as of January 23, 2026. Conversion rates follow DarkHorse Odds [DarkHorse Odds, 2025]: bonus bets at \$0.70 on the dollar, risk-free bets ("second chance" or "safety net" offers) at \$0.50 on the dollar, and 100% profit boosts at \$0.66 on the dollar (reflecting that bettors can hedge on underdogs to extract guaranteed value).

Table A3: Promotional Offer Expected Values by Sportsbook.

Sportsbook	Default Offer	Conversion	EV	Deviations from Default
DraftKings	Bet \$5, Get \$300 bonus bets + \$1000 deposit match	\$300 × 0.70 + \$1000	\$1,210	MA, NC: \$210 (no deposit match); OR, NH: \$0
BetMGM	\$1,500 First Bet (risk-free)	\$1,500 × 0.50	\$750	iGaming (NJ, WV, PA, MI): \$150 bonus bets = \$105; NV: \$250 bonus bets = \$175; NY: \$0
Fanatics	Bet & Get up to \$2,000 in No Sweat Bets	\$2,000 × 0.50	\$1,000	NY: \$0
BetRivers	2nd Chance Bet (risk-free)	× 0.50	varies	\$500 (face) → \$250 (EV): DE, IL, IN, LA, MD, MI, PA, VA \$250 (face) → \$125 (EV): CO, NJ \$100 (face) → \$50 (EV): AZ, IA, NY, OH, WV
FanDuel	Bet \$5, Get \$250 bonus bets	\$250 × 0.70	\$175	MO: \$210 (\$300×0.7)
Caesars	\$250 bonus bets	\$250 × 0.70	\$175	(uniform)
Bet365	\$1,000 Safety Net (risk-free)	\$1,000 × 0.50	\$500	iGaming states (NJ, PA): \$200 bonus bets × 0.70 = \$140

Notes: Conversion rates from DarkHorse Odds [DarkHorse Odds, 2025, The Wall Street Journal, 2024a]. Expected values computed as offer amount × conversion rate. Bonus bets convert at 0.70; risk-free/second chance/safety net bets convert at 0.50. iGaming states are NJ, DE, WV, PA, MI, CT. Caesars offers uniform promos across all states and is excluded from Figure 5a. Bet365 offers uniform promos across non-iGaming states but varies promos within iGaming states, so it is included in the main analysis. Figure A3 reports robustness excluding iGaming states. States of operation as of Jan 23, 2026: DraftKings (AZ, CO, CT, DC, IL, IN, IA, KS, KY, LA, MA, ME, MD, MI, MO, NH, NC, NJ, NY, OH, OR, PA, TN, VA, VT, WV, WY); BetMGM (AZ, CO, DC, IN, IA, IL, KS, KY, LA, MA, MD, MI, MO, NC, NJ, NV, NY, OH, PA, TN, VA, WV, WY); Fanatics (AZ, CO, CT, DC, IA, IL, IN, KS, KY, LA, MA, MD, MI, MO, NC, NJ, NY, OH, PA, TN, VA, VT, WV, WY); BetRivers (AZ, CO, DE, IL, IN, IA, LA, MD, MI, NJ, NY, OH, PA, VA, WV); FanDuel (AZ, CO, CT, DC, IL, KS, KY, LA, IN, IA, MA, MD, MI, MO, NC, NJ, NY, OH, PA, TN, VA, VT, WV, WY); Caesars (AZ, CO, DC, IL, IN, IA, KS, KY, LA, MA, MD, ME, MI, MO, NC, NJ, NV, NY, OH, PA, TN, VA, WV); Bet365 (AZ, CO, IA, IL, IN, KS, KY, LA, MD, MO, NC, NJ, OH, PA, TN, VA).

Table A4: Evidence for Uniform Pricing Across States

Sportsbook	Quote	Date	Source
FanDuel	"We can confirm that odds are the same in every state FanDuel operates"	August 2025	Email communication between FanDuel and the authors
BetMGM	"BetMGM offers the same odds in each state." However, there can be differences in the markets we offer. Each state has different regulations on what props they allow.	October 2025	Email communication between BetMGM and the authors
DraftKings, FanDuel	"Neither [DraftKings nor FanDuel] sportsbook employs state-specific odds or pricing, spokespeople with DraftKings and FanDuel confirmed."	September 9, 2024	Legal Sports Report [2024]
DraftKings	"Despite the state's insanely high 51% tax rate, most New York sportsbooks offer the same exact odds and lines featured on their platforms in other states with reasonable rates. For example, any and all odds offered by DraftKings in New York will mirror their offerings available over the bridge in New Jersey. So contrary to popular belief, New York's extraordinary gambling tax isn't going to affect your day-to-day sports betting operations, at all."	October 2025	SportsHandle [2025]
Multiple	"We understand that most US bookmakers use the same sportsbook (same odds) in each state that they operate in."	August 2025	Email Communication between staff at odds provider Odds API, and author
DraftKings	Jason Robins: If you look at sort of the way it's typically done in other industries, whether it'd be hotel taxes or even the sales tax that you pay when you buy something at the store, taxis, you name it. It's typically line itemed out separately and usually 100% passed along to the consumer. In this case, we're obviously subsidizing a chunk of it. So, we just thought that was most sort of in line with how it's typically done versus trying to obfuscate it...	Q2 2024	DraftKings [2024a]
DraftKings	[DraftKings CEO] "Robins cautioned DraftKings would likely resort to 'draconian' measures like reducing promotional spend even further and **adding additional juice [higher price to wager a dollar] to bets placed in New York**."	Feb 2023	SBC Americas [2023]
Caesars	For the most part, companies such as Caesars Entertainment and William Hill [since acquired by Caesars] offered identical lines and odds in every jurisdiction	January 2020	ESPN [2020]
DraftKings	Jason Robins: "...tweaking pricing is something you need to consider and some of it will depend on your first question, tax treatment... in terms of other states [besides Illinois], I think we have to see how this one goes...this will be a really interesting experiment to find out what the sort of net effects of implementing such a [state-specific] charge will be. And that will give us great data upon which to rely as we think about other states that may have higher tax rates and what we want to do there.	August 2025	DraftKings [2025b]

A.3 Comparing Uniform Pricing and Full Pass-through

Table A5: Model Comparison: Uniform Pricing vs. Pass-Through

	(1) Uniform Pricing	(2) Pass-Through	(3) General
α (constant)	9.543		9.954
	(0.270)		(1.131)
β		6.654	-0.306
		(0.382)	(0.815)
Observations	29	29	29
SSE	59.35	228.52	59.05

Notes: Standard errors in parentheses. F-test for $\beta = 0$ (Model 1 vs 3): F = 0.14, p = 0.710. t-test for $\alpha = 0$ (in Model 3): t = 8.80, p = 0.000. Sample includes all states with legal online sports betting and a GGR tax as of 2024. Tennessee is excluded because it levies a tax on dollars wagered rather than on gross gaming revenue.

The price to bet in state s is calculated as the sum of all operators' gross gaming revenue divided by the sum of all operators' dollars wagered, as in the example in Figure 1. This price can be interpreted as a weighted average:

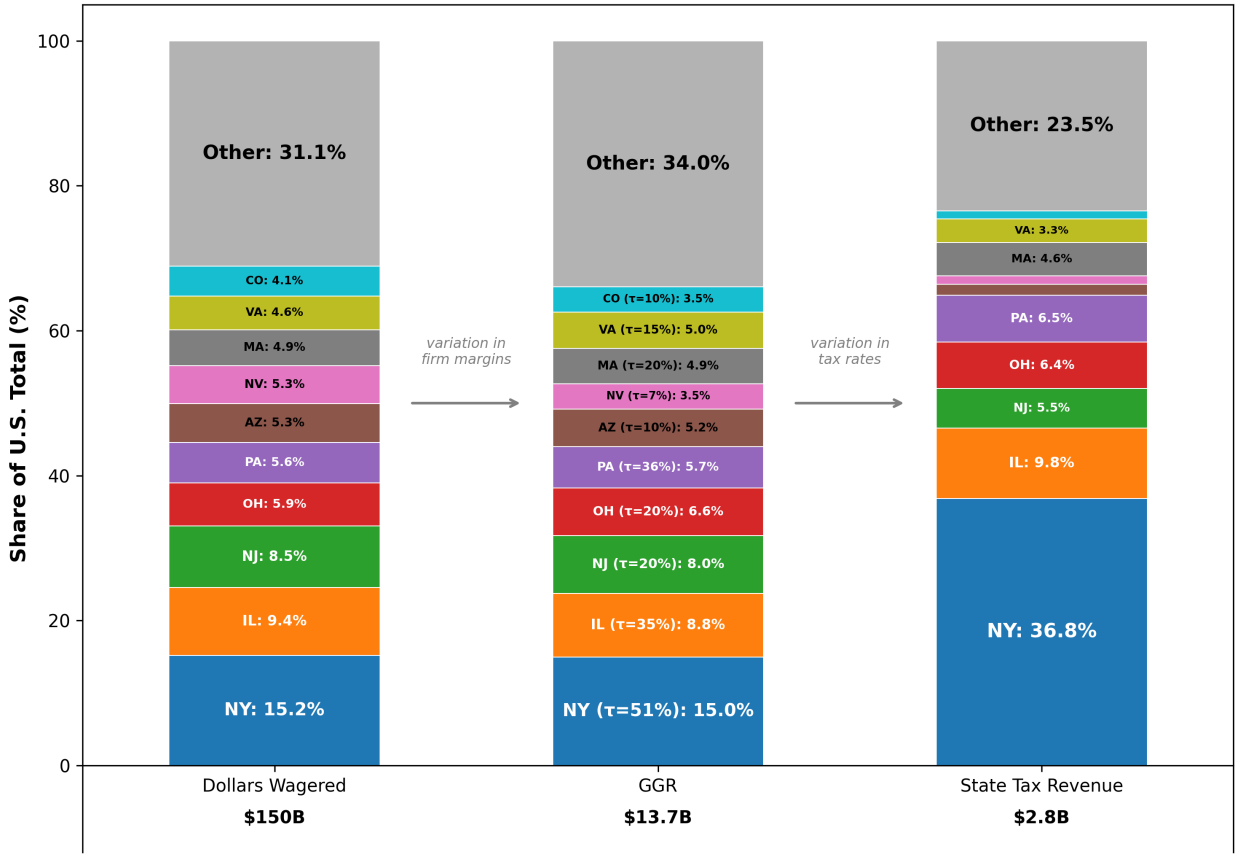
$$p_s = \sum_b \omega_{sb} \sum_e \theta_{sbe} \cdot p_{sbe}$$

where ω_{sb} is sportsbook b's market share in state s, θ_{sbe} is the share of bets on event type e at book b in state s, and p_{sbe} is the price for that event-book pair. We do not observe these components individually—only the aggregate p_s. Thus, p_s combines three objects: (i) the price to bet on a given event at a given sportsbook, (ii) the mix of events bet on (e.g., parlays vs. straight bets), and (iii) the market shares of different sportsbooks. The latter two vary across states, which is why the y-axis is not constant in Figure 2a.

Table A6: Sportsbook responses to the Illinois per-wager tax

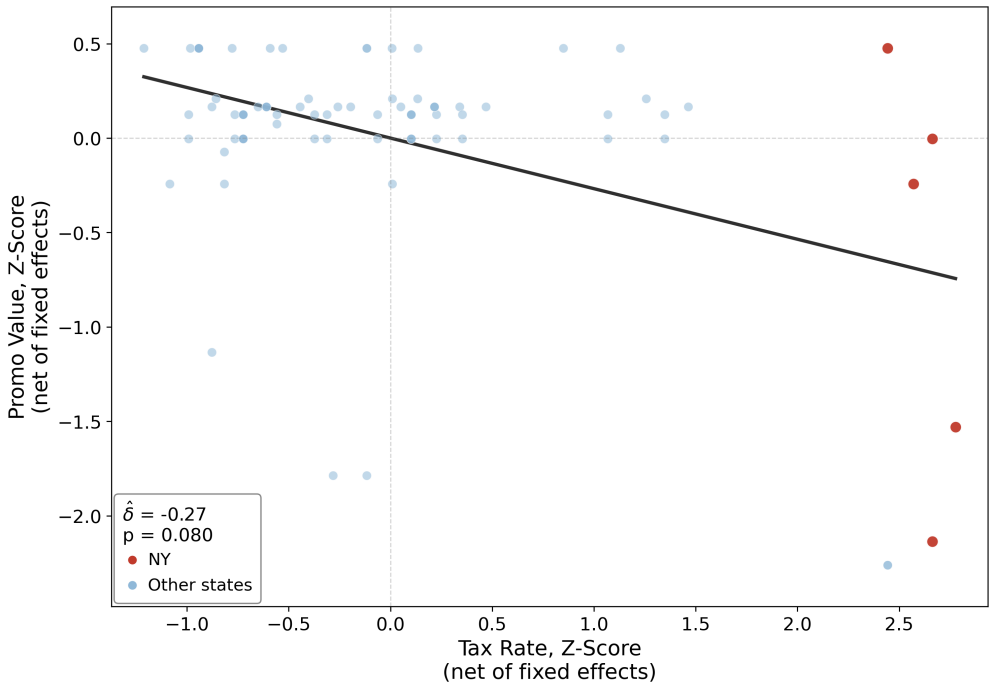
Strategy	Sportsbook	Details	Source
Full pass-through, all wagers	FanDuel	-	SBC Americas [2025
	Caesars	-	SBC Americas [2025
	Fanatics	-	Covers.com [2025]
Full pass-through, with exemptions	DraftKings	Exempts singles $\geq$ \$50, parlays $\geq$ \$10	DraftKings [2025a]
	bet365	Exempts wagers $\geq$ \$10	SBC Americas [2025
Minimum bet increase	BetMGM	Raised minimum to \$2.50	Deadspin [2025]
	BetRivers	Raised minimum to \$5	Legal Sports Report

Figure A2: Share of 2024 U.S. sports betting dollars wagered, gross gaming revenue, and tax revenue, by state



Notes: Reflects total sports betting (online and retail combined).

Figure A3: Promotional offers vs. tax rates excluding iGaming states



Notes: This replicates the analysis in Figure 5a but excludes the six iGaming states (NJ, DE, WV, PA, MI, CT). N = 85 state-sportsbook pairs across 22 states.

A.4 Advertising Descriptive Statistics and Robustness Checks

This subsection collects descriptive tables and robustness checks for the advertising-elasticity analysis, including a specification with lags, an expanded sample that includes cross-state border experiments, and a sample restricted to DraftKings and FanDuel.

A.5 Promotional Sign-Up Offers

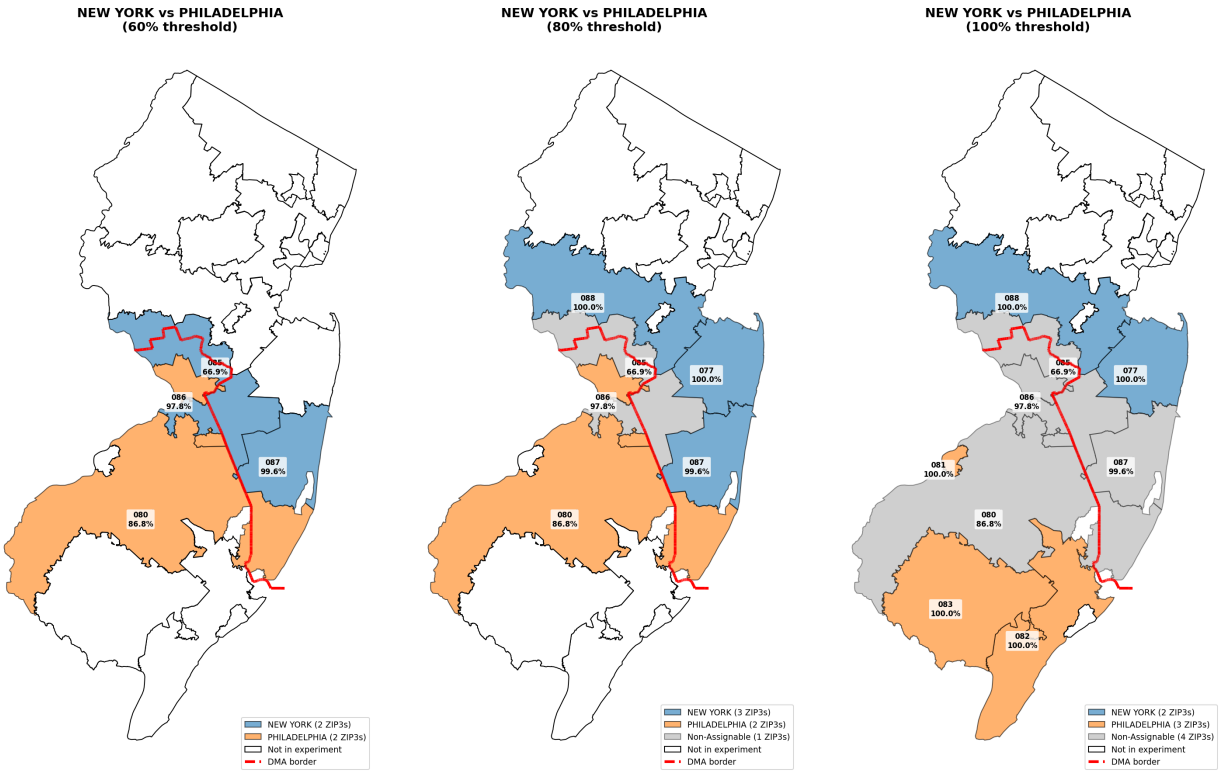
We next examine the effect of promotional sign-up offers on the demand for betting.

Unlike television advertising, promotional offers are specifically targeted at new customers. So, when estimating the effects of sign-up offers, we focus on this population. Since we do not anticipate effects of sign-up offers on existing customers, we use this population as placebo checks.

To do this exercise, we require time variation within sportsbooks' promos. This required scraping archival data from the Internet Archive, and we are limited to what was archived historically; sportsbooks themselves do not list historical promotional offers.

Our historical promotional offer data is visible in Figure A6. The Internet Archive data restricts our analysis in three ways. First, we do not have state-level variation; the data we scrape is only the offer which Action Network lists as the headline offer for that sportsbook. It also means that not every person living in a legal state was able to use this offer in every period. Second, we only have reliable scraping for the three largest sportsbooks: FanDuel, DraftKings, and BetMGM. Third, the sample only goes back to July 2023. To get more

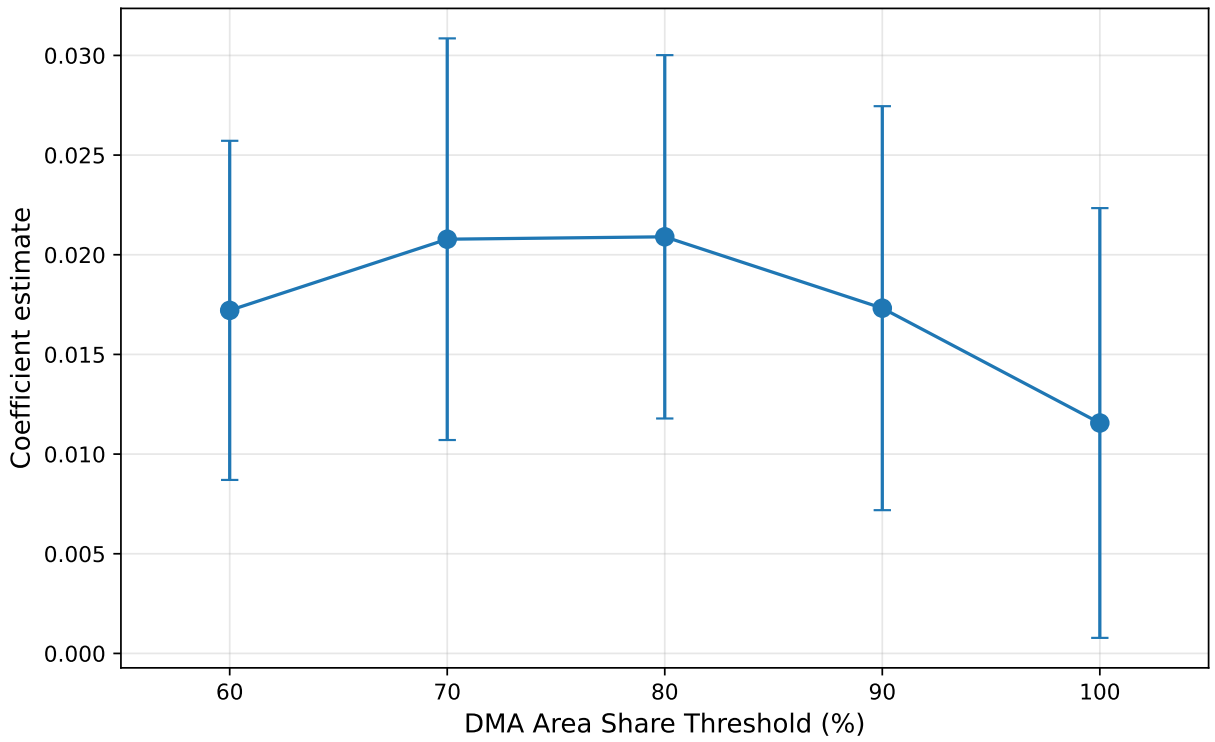
Figure A4: Example of geographies used for the New York DMA / Philadelphia DMA border experiment depending on area-share threshold used



(a) 60% threshold **(b)** 80% threshold **(c)** 100% threshold

Notes: Percentages show the share of each ZIP3's area in its assigned DMA.

Figure A5: Sensitivity of the own-advertising coefficient to the chosen DMA area-share threshold



Notes: The figure plots the estimated own advertising coefficient across alternative choices of the DMA area-share threshold.

Table A7: Descriptive Statistics: Advertising and Deposits

Ad spend ($/100 capita)	
Mean	2.598
Std Dev	5.387
Median	0.024
25th Percentile	0.000
75th Percentile	2.504
Deposits ($)	
Mean	68,914
Std Dev	226,678
Median	15,267
25th Percentile	4,061
75th Percentile	47,549
Observations	12,850
Border experiments	135
DMAs	89
Sportsbooks	5

Observation: side × sportsbook × month.
Ad spend in $/100 capita in DMA. Deposits in $.

Table A8: Composition of above- and below-median advertising halves for Section 5.3

	Below median	Above median
Sportsbook		
DraftKings	57%	58%
FanDuel	37%	33%
Caesars	1%	3%
BetRivers	3%	2%
Bet365	2%	3%
Cohort year		
2018	1%	0%
2019	4%	5%
2020	9%	9%
2021	19%	20%
2022	40%	33%
2023	28%	33%

Table A9: Advertising Semi-Elasticity Estimates with Lagged Advertising

		Customers		Dep./Customer	
	Deposits	New	Existing	New	Existing
	(1)	(2)	(3)	(4)	(5)
$\ln Y_{j,m,t-1}$	0.34725***	0.12332***	0.39803***	−0.14112***	0.27069***
	(0.02450)	(0.02367)	(0.02760)	(0.01774)	(0.02627)
Own	0.02195***	0.05043***	0.02347***	−0.00665	0.00065
	(0.00512)	(0.00800)	(0.00354)	(0.00753)	(0.00445)
Own Lag (t-1)	0.00017	0.00621**	−0.00086	0.00120	−0.00118
	(0.00202)	(0.00251)	(0.00135)	(0.00345)	(0.00199)
Own^2	−0.00041***	−0.00108***	−0.00040***	0.00023	0.00005
	(0.00014)	(0.00022)	(0.00008)	(0.00017)	(0.00010)
Rival	0.01874***	0.02593***	0.01597***	0.00005	0.00271
	(0.00313)	(0.00369)	(0.00297)	(0.00452)	(0.00286)
Rival Lag (t-1)	0.00229*	0.00114	0.00155*	−0.00204	0.00237*
	(0.00119)	(0.00163)	(0.00088)	(0.00237)	(0.00138)
Rival^2	−0.00022***	−0.00026***	−0.00022***	0.00006	−0.00002
	(0.00006)	(0.00007)	(0.00007)	(0.00006)	(0.00005)
Own × Rival	0.00004	−0.00000	0.00001	−0.00011	−0.00006
	(0.00017)	(0.00018)	(0.00014)	(0.00020)	(0.00016)
SB × Border × DMA FE	Yes	Yes	Yes	Yes	Yes
SB × Border × Quarter FE	Yes	Yes	Yes	Yes	Yes
Observations	12,382	12,382	12,382	12,382	12,382
R^2	0.938	0.867	0.966	0.515	0.806

Sportsbook × DMA clustered standard errors in parentheses. $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Column (1) pools all depositors. Columns (2)–(5): "New" = first deposit at that sportsbook in that calendar month. Border experiments restricted to quarters in which sports betting is legal and to ZIP3s where a majority of the population resides in one state.

Table A10: Advertising Semi-Elasticity: Allowing Cross-State Border Experiments

		Customers		Dep./Customer	
	Deposits	New	Existing	New	Existing
	(1)	(2)	(3)	(4)	(5)
$\ln Y_{j,m,t-1}$	0.38854***	0.17055***	0.43771***	−0.07493***	0.30338***
	(0.02435)	(0.02374)	(0.03048)	(0.02005)	(0.02682)
Own	0.02303***	0.05580***	0.02223***	−0.00665	0.00101
	(0.00478)	(0.00795)	(0.00330)	(0.00704)	(0.00395)
Rival	0.01435***	0.02853***	0.01477***	−0.00390	−0.00032
	(0.00291)	(0.00388)	(0.00229)	(0.00468)	(0.00269)
Own^2	−0.00043***	−0.00114***	−0.00039***	0.00025*	−0.00000
	(0.00012)	(0.00019)	(0.00006)	(0.00015)	(0.00010)
Rival^2	−0.00016***	−0.00030***	−0.00019***	0.00011	−0.00000
	(0.00006)	(0.00008)	(0.00005)	(0.00008)	(0.00006)
Own × Rival	0.00007	−0.00008	0.00006	−0.00022	0.00005
	(0.00017)	(0.00018)	(0.00012)	(0.00024)	(0.00017)
SB × Border × DMA FE	Yes	Yes	Yes	Yes	Yes
SB × Border × Quarter FE	Yes	Yes	Yes	Yes	Yes
Observations	14,454	14,454	14,454	14,454	14,454
R^2	0.939	0.867	0.966	0.518	0.814

Sportsbook × DMA clustered standard errors in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Column (1) pools all depositors. Columns (2)–(5): "New" = first deposit at that sportsbook in that calendar month. Border experiments restricted to legal quarters but cross-state borders allowed.

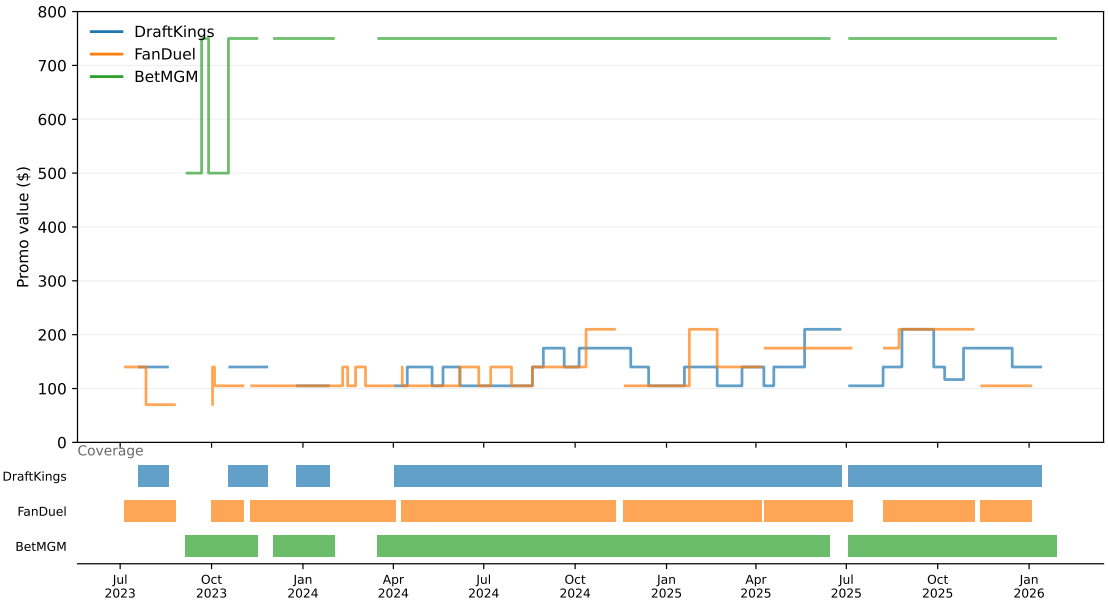
Table A11: Advertising Semi-Elasticity: DraftKings and FanDuel Only

		Customers		Dep./Customer	
	Deposits	New	Existing	New	Existing
	(1)	(2)	(3)	(4)	(5)
$\ln Y_{j,m,t-1}$	0.36452***	0.16653***	0.42670***	−0.12829***	0.27618***
	(0.02792)	(0.02621)	(0.03066)	(0.01947)	(0.03093)
Own	0.02143***	0.05722***	0.02566***	−0.00557	−0.00335
	(0.00491)	(0.00727)	(0.00332)	(0.00690)	(0.00413)
Rival	0.02517***	0.03915***	0.02691***	−0.00605	0.00315
	(0.00416)	(0.00632)	(0.00455)	(0.00659)	(0.00405)
Own^2	−0.00032***	−0.00096***	−0.00033***	0.00007	0.00008
	(0.00012)	(0.00020)	(0.00007)	(0.00017)	(0.00009)
Rival^2	−0.00041***	−0.00039***	−0.00046***	0.00001	−0.00011
	(0.00011)	(0.00012)	(0.00015)	(0.00012)	(0.00009)
Own × Rival	−0.00014	−0.00072***	−0.00040*	0.00036	0.00014
	(0.00024)	(0.00026)	(0.00021)	(0.00027)	(0.00021)
SB × Border × DMA FE	Yes	Yes	Yes	Yes	Yes
SB × Border × Quarter FE	Yes	Yes	Yes	Yes	Yes
Observations	10,836	10,836	10,836	10,836	10,836
R^2	0.942	0.864	0.964	0.484	0.791

Sportsbook × DMA clustered standard errors in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. Column (1) pools all depositors. Columns (2)–(5): "New" = first deposit at that sportsbook in that calendar month. Border experiments restricted to quarters in which sports betting is legal and to ZIP3s where a majority of the population resides in one state.

power, we assume that if promo data is missing, a promo stayed in place for 30 days from the last time we observe it offered; after that, we treat that sportsbook's promo as missing.

Figure A6: Promotional sign-up offer values over time for DraftKings, FanDuel, and BetMGM



Notes: All offers are converted to expected value in dollars. Values are extracted from Internet Archive snapshots of Action Network pages. When snapshots are missing between days, we carry forward promo values for 30 days, or until the next snapshot in the Internet Archive, whichever comes first. The bottom panel shows coverage windows.

A.5.1 Empirical Strategy

We estimate a week-level extensive margin elasticity with sportsbook and month fixed effects:

$$\ln(\text{Depositors}_{bw}) = \varepsilon \ln(\text{Promo}_{bw}) + \alpha_b + \delta_m + u_{bw} \tag{5}$$

Depositors is the number of Consumer Edge cards which make a deposit to that sportsbook in that week. Our specification is at the sportsbook × week level. b indexes sportsbook (DraftKings, FanDuel, BetMGM), w indexes week, and m indexes month. α_b are sportsbook fixed effects. δ_m are month fixed effects.

Within a month, we compare weeks when cross-book promo differences are large vs small. When a sportsbook's promo is higher relative to the other books, do its deposits rise relative to the others?

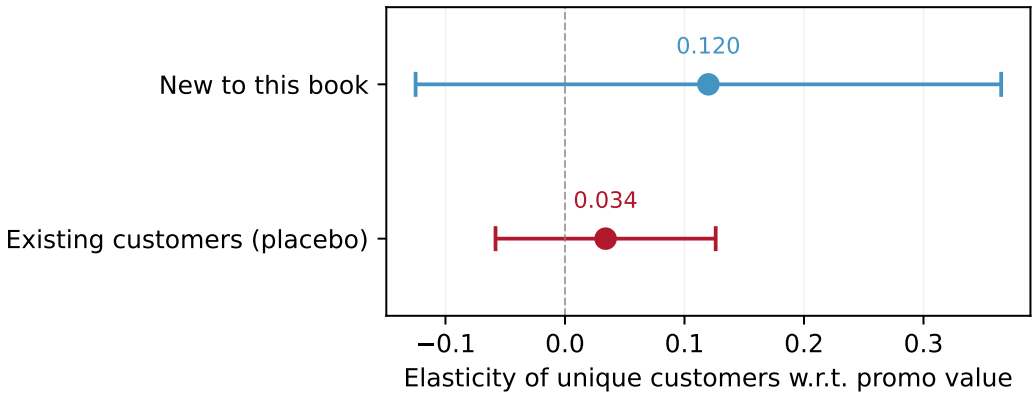
Book fixed effects absorb the fact that sportsbooks differ in size and promotional offer generosity. Month fixed effects absorb seasonal patterns common across books like the Super Bowl, March Madness, etc.

There are two threats to this analysis. First, we do not have sportsbook-month fixed effects, so if only DraftKings does a non-promo marketing push in a month, and that push is correlated with a bump in DraftKings' promos, the elasticity is upwardly biased. Second, we

do not have week fixed effects. The elasticity is identified from cross-sportsbook changes in promos, so within-month unobserved demand shocks, common to all sportsbooks, bias our estimates if books differentially adjust promos in response to those shocks. For example, if all sportsbooks increase their promos a similar amount in the week of the Super Bowl, those promo changes do not contribute identifying variation to our elasticity estimate.

A.5.2 Results

Figure A7: Elasticity of unique depositors with respect to promotional offer value, by population



Notes: New-to-book depositors have no prior deposit at that sportsbook; existing customers have deposited before and serve as a placebo. The figure shows 95% confidence intervals. Regressions include book and month fixed effects, with Driscoll–Kraay standard errors (lag = 4). N = 331 (125 weeks × 3 books).

Sign-up offers are only available to customers who have never deposited at that sportsbook, so we split depositors into two mutually exclusive groups: new-to-book customers, who have no prior deposit at that sportsbook, and existing customers, who have deposited before.

We find a positive but noisy point estimate on the elasticity of new depositors to sign-up offers.

We test the effect on existing customers as a placebo. If sign-up offers show a positive effect on this group, that finding must be spurious: this group is ineligible to use sign-up promos. Any positive effect would have to be from unobserved demand shifters correlated with sign-up offers. The estimated elasticity for existing customers is a precise zero, consistent with our identifying assumption that cross-sportsbook promo variation within months is uncorrelated with other unobserved demand shifters.

B Sample Construction

B.1 Sample Construction for Advertising-Tax Correlation (Figure 5b)

From the seven major sportsbooks, we use five sportsbooks for this analysis: DraftKings, FanDuel, Caesars, BetRivers, and bet365. We drop two: Fanatics only entered the market in 2023, and only advertised in multi-state DMAs (Boston and Washington DC), so Fanatics is dropped. BetMGM's ads for online casino vs. sports betting are indistinguishable in the Nielsen data, so BetMGM is dropped.

Among the five sportsbooks in this analysis, we remove advertisements whose brand description contains "fantasy" (to exclude daily fantasy sports) and keep only those containing "sports."

Starting from the 29 states (including Washington, DC) with legal online sports betting at the end of 2023 (when the Nielsen data ends), we apply the following filters:

1. **No major sportsbooks operate there (3 states) or the state has no GGR tax (1 state).** This is the same reasoning described in Section B.3. We drop Arkansas, Rhode Island, and Florida, where none of the sportsbooks in our sample operate. We drop Tennessee, which taxes dollars wagered rather than gross gaming revenue.

2. **No county-level Nielsen DMA coverage (1 state).** We drop Connecticut, which has planning regions instead of counties. Counties are used to define the Nielsen DMA regions, so we cannot reliably calculate the population of the DMA for Connecticut DMAs.

3. **Multi-state DMAs (3 states).** Our variation is at the state level, so we keep only Nielsen DMAs that lie entirely within one state. This drops all DMAs from New Jersey, the District of Columbia, and New Hampshire.

4. **Legalized during 2023 (5 states).** We include a state-year observation only if the state legalized by December 31 of the prior year. States that legalized during 2023 (Ohio, Massachusetts, Kentucky, Maine, Delaware) are entirely excluded.

B.2 Sample Construction for Advertising-Deposit Elasticity Analysis (Table 2)

Constructing border experiments. Unlike counties, ZIP3s do not align with DMA boundaries (Figure A4). For each ZIP3 intersected by a DMA boundary:

1. If $\geq$80% of its area lies in one DMA, it joins that DMA-side (e.g., ZIP3 080 in Figure A4b). Adjacent ZIP3s with $\geq$80% of their area in the other DMA form the other side.

2. If $<$80% lies in any single DMA, the ZIP3 is dropped (e.g., ZIP3 085 in Figure A4b). Adjacent ZIP3s on either side of the border meeting the 80% threshold are added.

This procedure creates a gap between the two sides of each border experiment. The median experiment has a 13-mile gap between the nearest edges of opposing ZIP3s. Figure A4 illustrates how the experiment changes under alternative thresholds: stricter thresholds retain fewer ZIP3s near the border. Figure A5 shows how our coefficient on own-advertising changes as we vary this threshold choice.

Other sample restrictions.

1. We drop BetMGM because we cannot distinguish between ads for online casino and online sports betting in the Nielsen data.

2. We restrict to states where at least one major sportsbook operates, dropping RI, DE, and AR.

3. Sports betting is regulated at the state level, so we drop cross-state variation. If a DMA border coincides with a state border, we drop the experiment. If a border-side spans states, we keep only ZIP3s from whichever state has the most ZIP3s on that border-side.

4. We drop observations when sports betting was illegal in a state, only including post-legalization months for states that eventually legalized, and dropping states that didn't legalize sports betting during our sample period.

5. After the above restrictions, the balanced side-sportsbook-month sample contains 42,322 observations. Of these, 16,219 (38.3%) have zero deposits and are dropped because we estimate $\log(Q)$.

B.3 Sample Construction for Promotional Analyses

Our sample includes 28 states (including Washington, DC). From the 32 states (including Washington, DC) with legal online sports betting, we drop 4 for data limitations.

None of the sportsbooks in our sample operate (3 states): We drop three states because none of the sportsbooks in our sample operate there. We drop Florida, where the only legal online sportsbook is Hard Rock Bet (Seminole Tribe).[19] We drop Rhode Island (served only by Sportsbook Rhode Island) and Arkansas. Arkansas regulations require licensees to retain 51% of net sports-betting revenue in any market-access agreement with a third-party operator, which discourages national operators.

No GGR tax (1 state): We drop Tennessee, which taxes dollars wagered rather than gross gaming revenue.

Robustness check: Drop iGaming states: Six states have legal online casino (iGaming): New Jersey, Delaware, West Virginia, Pennsylvania, Michigan, and Connecticut. During a conversation with an employee at DarkHorse Odds, they mentioned that sportsbooks set promotional offers for iGaming states separately. Firms vary promos in these states primarily based on whether a state has legal iGaming, rather than the state's tax rate. Firms appear to operate as if they have a fixed promotional budget per potential customer, which

[19] Hard Rock Bet is the only legal online betting app in Florida [Legal Sports Report, 2025b].

they divide between sportsbook and iGaming offers. For example, as of October 2025, BetMGM was offering a $1,000 iGaming sign-up bonus to residents in the four iGaming states it operates in, but offered its lowest sports betting promotional offers in these same states [BetMGM, 2025]. We include these states in the main analysis. As a robustness check, Figure A3 excludes them and estimates $\hat{\beta} = -0.27$ ($p = 0.08$).