When Saving is Gambling*

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July 2, 2015

Abstract

This paper investigates whether financial gambles substitute for casino gambling using proprietary data on casino cash withdrawal transactions, and the introduction of lottery-linked savings accounts in Nebraska as a natural experiment. After the introduction of lottery-linked savings, consumers in affected regions reduce casino gambling by half relative to unaffected regions. This estimated effect is stronger when savings lotteries and casino gambling have similar attributes, consistent with the interpretation that the effect reflects substitution across gambling products with similar attributes. Examining heterogeneity in the substitution pattern, I find savings lotteries appeal most to high-dollar-value gamblers with *better* financial habits. These findings suggest that savings lotteries can be an effective tool to improve savings rates by appealing to gambling preferences, but the introduction of savings lotteries is not merely a substitute for financial education. Indeed, the impact of savings lotteries on casino gambling may be greater if consumers have better *ex ante* financial habits.

*The author gratefully acknowledges helpful comments from conference and seminar participants at the 2015 Finance Down Under Conference, the 2015 Israel Behavioral Finance Conference, the 2015 Boulder Summer Conference on Consumer Financial Decision Making, the Federal Reserve Bank of Cleveland, Colorado State University, University of Nevada - Las Vegas, Montana State University and the University of Colorado. In addition, the present draft owes much to helpful suggestions from Jamie Brown, Rob Dam, Shaun Davies, Rawley Heimer, Carsten Murowski, Carly Urban, and Ed Van Wesep. All remaining errors are my own.

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Introduction

> "There are many harsh lessons to be learned from the gambling experience, but the harshest one of all is the difference between having fun and being smart."
>
> – Hunter S. Thompson

Do households view financial risks as complements or substitutes for other types of risk? If risks are viewed as complements, greater exposure to risk-taking may increase a household's general propensity to take risks (e.g., stock trading games in the classroom may lead students toward greater stock market participation in real-world markets).[1] On the other hand, if risks are viewed as substitutes, policies that promote risk-taking in one domain can effectively crowd out seemingly unrelated gambles. Depending on how households make choices among categories of risky activity, the same policy can have dramatically different consequences. It is, thus, important to know whether risks tend to be substitutes or complements.

In this context, I evaluate how households change their casino gambling activity in response to the introduction of lottery-style savings accounts, which reward saving by holding monthly raffles to allocate interest. The savings lottery accounts I study – Save-to-Win (STW) accounts – became available to members of select credit unions in Nebraska in January 2012. The empirical analysis uses a proprietary transaction-level data set on casino cash withdrawals to measure how households in affected counties change their casino gambling activity differently from households in nearby counties unaffected by the new accounts. Using this difference-in-difference approach, I find robust evidence that the introduction of savings lotteries reduced the amount of casino gambling. That is, households' newfound opportunity to gamble while saving in STW accounts is a strong substitute for gambling at commercial casinos.

According to my main specification, an additional participating credit union in a county reduces the amount of gambling in that county by 17.88 percent, which implies the median patron withdraws $101.88 less cash at casinos over the six-month period following the introduction of savings lotteries. This is a sizable effect in comparison to the $857 average amount of savings

[1] Recent findings in neuroeconomics have questioned whether the dramatic increase casino gambling increased households' propensity to take risks elsewhere (Kuhnen and Knutson, 2011). In the context of casino openings and investor portfolios, Liao (2013) has applied this idea, finding that investors who appear to be exposed to additional risk through a nearby casino tend to construct riskier investment portfolios.

over this same period. This effect arises because of less visition, not a change in gambling behavior conditional on visiting the casino. At the patron level, individuals who were exposed to savings lotteries were 15.4 percentage points less likely to visit the casino in the post period. In addition, the nature of casino gambling is unaffected by the introduction of savings lotteries (e.g., the frequency of daytime and weekend transactions, the average transaction size, the frequency of not-sufficient funds transactions are unaffected). This pattern of results is consistent with behavioral models of casino gambling where patrons lack self control upon arriving at the casino (Barberis, 2012), but it also suggests an element of rationality. Because patrons exhibit restraint from visiting casinos while they may not exhibit similar restraint inside the casino, this result has the flavor of effective self restraint, perhaps through a commitment device (Thaler and Shefrin, 1981; Bryan et al., 2010).

The effects of savings lotteries on casino gambling appear to reflect substitution among similar risks rather than broad substitution across all consumption categories. Based on gambling characteristics alone, lottery-style savings are likely to substitute more strongly for the thrills from gambling locally than for more distant destination gambling for which the trip is part of the enjoyment. Indeed, this is what I find: the overall reduction of casino demand after savings lotteries are introduced is entirely due to patrons substituting away from transactions at local casinos (within 120 miles), while transactions at casinos more than 120 miles away from the patron's residence are unaffected by the introduction of savings lotteries. Further, as the savings raffle occurs only once per month, savings lotteries are likely a weaker substitute for casino transactions that occur early in the month when the raffle date is more distant. Consistent with this hypothesis, I find that the introduction of savings lotteries reduces casino gambling significantly for transactions that occur late in the month, but less so for transactions that occur early in the month. These results are robust to alternative specifications, including using only adjacent-state control counties, evaluating whether the effect is driven by daytime and weekend market segments, and allowing for a pre-trend in the effect of casino gambling.

Because my data indicate stronger substitution away from categories of casino gambling activity that are more similar to lottery savings, my findings contrast with an interpretation that STW reduced gambling through an attention-grabbing effect, or through effective advertising that was

broadly targeted toward Nebraska consumers in served counties (Becker and Murphy, 1993; Barber and Odean, 2008; Hastings et al., 2013). Although it is possible that these effects contribute to the broad reduction in casino gambling in targeted counties, they cannot explain why gambling activity at local casinos is more sensitive to the introduction of savings lotteries, nor the result that late-in-the-month casino transactions are more sensitive to savings lotteries.

When I examine how different types of consumers respond to the introduction of savings lotteries, I find that the substitution effect is strongest among patrons who exhibit greater *ex ante* financial awareness – e.g., low propensity to request unavailable funds on debit transactions and infrequent reliance on credit cards to obtain cash at casinos.[2] This finding suggests that prize-linked savings accounts are only marginally effective in redirecting gambling expenditures to savings for individuals with worse *ex ante* financial decision making. On the other hand, more substitution among gamblers with greater financial awareness is natural if they are better at recognizing financial opportunities. Moreover, the implication for the effectiveness of Save-to-Win is sensible: to the extent that financial education can influence awareness, lottery savings accounts and financial education complement one another. In other words, savings lotteries may not solve the household savings problem on their own, but they can be an effective tool to redirect savings from gambling expenditure as part of a broader program.

My findings contribute to a growing literature on the role of gambling in financial markets, which has received significant recent attention (Barberis and Huang, 2008; Kumar, 2009; Gao and Lin, 2011; Li, 2012; Liao, 2013). Although authors have noted that investors appear to exhibit gambling-style behavior in the construction of their investment portfolios, they have not quantified the degree to which gambling in financial contexts replaces gambling in other contexts. By providing evidence on the substitution away from casino gambling, my work suggests that financial alternatives to gambling may lead to welfare improvements for individuals who replace commercial gambling, which yields negative expected returns, with financial gambling, which tends to yield positive returns.[3]

[2] I also document that the substitution effect is concentrated among individuals who pay minimal or no fees to access cash, consistent with savings lotteries and financial sophistication being complements rather than substitutes.

[3] The welfare implication of the substitution between financial gambling and commercial gambling is ambiguous, which is the point my study makes. Indeed, investment losses exceed gambling losses in some contexts. For example, Barber et al. (2009) present a comparison of lottery losses to individual trading losses that were estimated from detailed

In addition, my work is related to an emerging empirical literature on the effects of innovative savings programs and behavioral biases on saving (Thaler and Benartzi, 2004; Chetty et al., 2013). A number of these analyses of savings behavior relate to savings lottery accounts. For example, Tufano (2008) studies savings and gambling behavior in premium bonds in the United Kingdom, Cole et al. (2014) study South African savings lottery accounts (specifically, Million-a-Month-Account; MaMA) showing their efficacy for increasing savings, and Filiz-Ozbay et al. (2013) provide laboratory evidence on lottery savings as a mechanism unto itself to encourage greater saving. By analyzing actual gambling patterns, my work complements these analyses by showing that savings lotteries lead to significant substitution away from casino gambling, rather than the uptake of savings lotteries being one part of a broad increase in the share of gambling products as a fraction of income, which is a theoretical possibility in Kuhnen and Knutson (2011) and the broad growth in gambling is highlighted as an empirical finding in Kearney (2005a).

More generally, the study of gambling has been a subject of curiosity in the economics literature since the development of the expected utility hypothesis, with early theoretical and empirical contributions (Friedman and Savage, 1948; Rosett, 1965). Because this paper empirically links formal gambling and gambling through the use of a financial product (savings lotteries), my findings relate to the general study of gambling behavior, which occurs well beyond gambling markets (Becker et al., 2005). In this broader literature, my findings should be of interest to scholars who study consumer finance outcomes (e.g., idiosyncratic house price risk as in Peng and Thibodeau, 2014), gambling motives in the mergers and acquisitions market (Schneider and Spalt, 2013), and gambling motives in occupational choice (Zhang, 2014).

Finally, researchers have sought evidence on the likely winners and losers from the significant growth in gambling opportunities in the United States over the past few decades (Eadington, 1999; Evans and Topoleski, 2002; Kearney, 2005b; Grinols and Mustard, 2006). A number of authors have found that expansion of gambling to new jurisdictions reduces the tax base in local economies through competing with local products (Anders et al., 1998; Elliot and Navin, 2002), but their evidence necessarily relies upon tax receipts, and few studies in this area provide direct

data from Taiwan on individual investor trades. In that context, the authors estimate that lottery losses and trading losses similar in magnitude, but that investment losses were larger. In my context, however, savings lottery losses are negligible (individuals receive slightly less interest, retaining the principal), so the welfare implication is flipped.

observation of gambling activity. In this way, my study contributes to this literature by introducing the direct observation of detailed non-survey information on individual gambling choices, and using quasi-experimental variation to quantify the level of cross-product competition. Aside from indicating that gambling enterprises should be concerned with competing with opportunities to gamble more broadly, my study suggests that allowing banks to offer products that compete directly with casino gambling products can effectively capitalize on the long-term growth in demand for gambling to – in addition – increase savings.

The remainder of this paper is organized as follows. Section 1 gives context for the empirical analysis by describing prize-linked savings accounts, their rollout in Nebraska, and the status of the casino gambling industry. Section 2 gives more detail on the data sources for this project, and describes their match the affected and unaffected counties for the empirical analysis. Section 3 presents the main results, and interprets the broad findings. Section 4 uses patron-level information to decompose the overall effect into intensive and extensive margins. Section 5 presents a series of nuanced tests to evaluate mechanisms through which savings lotteries affect casino demand. Section 6 concludes.

1 Setting

1.1 Background on Prize Linked Savings

Though uncommon in the United States, lottery savings accounts and related financial products exist in other countries, and in some cases, have existed for a long time. To cite a prominent example, since 1956, investors in the United Kingdom have been able to invest in premium bonds (issued by the National Savings and Investments agency). These bonds pay interest, but instead of the interest being allocated to individual accounts, a lottery determines the set of accountholders who receive the interest payments as well as the payment amounts. In an analysis of U.K. premium bonds, Tufano (2008) noted that investors treat lottery-style accounts as part savings, part gambling, and he conjectured that the gambling feature of these accounts could be used to

increase savings rates. Similar products are offered throughout the world in at least 18 countries.[4] In a product similar to the recently-introduced savings lottery products in the United States, First National Bank in South Africa implemented a prize-linked savings program as well (studied in Cole et al. (2014)).

In the United States, lottery savings accounts first became available in Michigan in 2009 with the launch of the Save-to-Win (STW) program in select Michigan locales. Subsequently, similar STW programs were introduced in Nebraska (2012, described in detail below), North Carolina (2013), and Washington (2013). Savings lotteries in other states are technically prohibited, and thus, are unavailable to consumers in those states. Of these four introductions of savings lotteries in the United States, my empirical work focuses on the Nebraska STW rollout because my casino gambling data are available before and after Nebraska first offered savings lotteries, which enables a more careful empirical design.

Under the STW program, participating credit unions[5] offer one-year certificates of deposit (CDs) in which each $25 deposit qualifies the accountholder for an entry in monthly raffles as well as the raffle for the annual grand prize. The amount of the grand prize varies by implementation, year, and jurisdiction, but it is generally a significant amount of money. For example, Michigan's grand prize in 2009 was $100,000, while Nebraska's grand prize in 2012 was $25,000. In these pilot programs, the accounts also earned a nominal rate of interest, but the salient feature of these accounts is the raffle component. To this point, the STW program was implemented in a low interest environment, but the prizes amounted to nearly three percent of year-end 2012 balances.

The stated goal of the STW program is to encourage low-to-moderate income individuals to save, and to harness household gambling demand to achieve this end. As part of this mission, the Doorways to Dreams Fund has collected a wealth of survey information on the characteristics of STW accountholders. Panel (a) of Table 1 reports summary information about amounts saved

[4]Kearney et al. (2010) provide this information (up-to-date as of 2010) while also describing the history of prize-linked savings products and details of those programs throughout the world. Their Table 1 details the structure of these programs, as well as the countries that have implemented them. Of these products, the Swedish and Danish lottery bonds have generated some interesting research in financial economics because of their unique tax characteristics (Green and Rydqvist, 1999; Florentsen and Rydqvist, 2002).

[5]Banks that are federally regulated are prohibited from offering prize linked savings accounts because of gambling regulation. Because credit unions do not fall under the same regulation, they are the only existing outlet for savings lotteries in the United States.

through STW programs, as well as characteristics of accountholders. For example, 43 percent of accountholders reported never saving before, and a significant fraction report having very little in savings and an inability to pay three months of expenses from savings. Nonetheless, these same individuals report a very high propensity to gamble, with 63 percent report having played the lottery in the past 6 months, and 38 percent having visited casinos or racetracks. These are strikingly high reported propensities to gamble, especially given the tendency of individuals to underreport behavior for which there is a social stigma, like gambling.

1.2 Prize Linked Savings Accounts in Nebraska

The Nebraska STW program was launched in January 2012 by Doorways to Dreams Fund in collaboration with nine participating credit unions.[6] As with STW programs in other states, members of participating credit unions can open a one-year balance-building certificate of deposit (CD) with a minimum of $25 on deposit, and each $25 contributed to the account per month qualifies the individual for an entry into the raffle (up to 10 entries per month). Beyond retaining the principal and receiving a nominal amount of interest, each entry qualifies the accountholder for monthly drawings – a monthly credit-union specific drawing, and the annual drawing for the grand prize.

In 2012, Nebraska STW held monthly drawings for amounts up to $1500 (with many smaller amounts possible), as well as a grand prize drawing in which one winner received $25,000. According to updates by the Doorways to Dreams Fund, nearly 1600 Nebraska credit union members opened STW accounts by the end of 2012 (out of around 200,000 eligible members). More than a quarter of accountholders (445) won a prize of some amount through the program, and the total dollar value of prizes distributed equal to $51,375, which is 2.7 percent of the $1.9 million saved by STW accountholders over the year. Although the large prizes receive the most press, the average prize amount was $115. The average accountholder held $857 by July 2012, $1163 by year-end 2012, and $1641 by year-end 2013, indicating that there was significant and persistent growth of the program in its initial couple of years.

[6] A tenth credit union joined the program during 2012. For the purposes of the empirical analysis, I focus on the nine initial participating credit unions. The possibility that the other credit union affects additional (control) counties later in the year likely biases against finding any effect of the program.

1.3 Credit Union Membership and Nebraska

Given that the STW program is only available through credit unions (due to a regulatory prohibition at federally-regulated banks), it is important to understand the scope of the program relative to the population of Nebraska. The Nebraska STW program launched with the participation of nine credit unions, which serve 10 of Nebraska's 93 counties. Panel (b) of Table 1 lists the credit unions that were enlisted by Doorways to Dreams to offer STW to their members, as well as their main branch location and the counties served by each credit union. Further, Figure 2 presents a map that highlights the geographic distribution of affected and unaffected counties.

Although the affected counties occupy a small portion of Nebraska's land area, the treated counties cover a sizable fraction of the population of Nebraska. By year end 2012, there were over 200,000 members of participating credit unions alone, a sizable fraction of the 1.4 million individuals in Nebraska counties covered by my sample.[7] Because there is such significant credit union membership in Nebraska, my findings should speak more directly to the typical resident's experience than if the study were conducted in another state with lower credit union membership. Furthermore, the high rate of credit union membership in Nebraska (and hence better representativeness of the overall population) enhances claims to external validity if the conclusions from my analysis were applied to banks rather than credit unions.[8]

1.4 The Casino Gambling Industry

The casino gambling industry has experienced significant growth over the past 25 years. Figure 1 presents a timeline for important events in the growth of the casino industry. As late as the 1950s, casino gambling in the United States was exclusively confined to Nevada. The casino gambling industry grew in fits and starts throughout the 1970s and 1980s with the start of casino gambling in Atlantic City (1978) and the construction of high-stakes bingo parlors and Indian casinos on a

[7] See Appendix Table 12 for a breakdown of the sample by Nebraska and adjacent to Nebraska regions. This fraction is even greater when the denominator is the adult population of Nebraska. According to the BEA, just over two thirds of Nebraska's population was 21 or older. Thus, the more appropriate denominator is approximately 1 million, implying that approximately 20 percent of the population of interest is a member of a participating credit union.

[8] The high rate of credit union membership in Nebraska is likely a legacy of Nebraska having an important agricultural sector, historically. Agricultural credit unions are quite common, and they have evolved to serve customers in present day Nebraska (with less agriculture historically).

number of prominent American Indian reservations (Seminole (FL) 1979; Cabazon (CA) 1980; Foxwoods Casino (CT) 1986). After the Indian Gaming Regulatory Act of 1989, the casino gambling industry grew dramatically in the 1990s, both from Indian casinos that were explicitly authorized under the act, but also from independent authorizations of riverboat gaming, special casino districts, and casinos across a large span of states from the Midwest to the Gulf region.

From the 2000s, the industry continued to expand. As of August 2012, there were casinos in 41 states, and the traditional centroid of the casino gambling industry (Nevada) only comprised approximately 20 percent of the industry's casinos (and a similar percentage of the industry revenues). Using an industry database, Cookson (2014a) reports that there were 134 plans to enter the casino industry from March 2003 through August 2012. Although not all of these plans successfully result in a new casino, recent casino industry growth has been sizable. Casino industry growth has reached the point that some observers have expressed concern that the industry is reaching a saturation point, and a number of prominent casino closings (rare for the industry over the past 20 years) have been taken as evidence for this (Calvert and Kamp, 2014).

Given the geographic dispersion of casinos in the United States, willing patrons no longer need to travel long distances to visit a casino. Consequently, casino visitation is a part of the expenditure profile of consumers in every state. Nebraska is no exception. Over the course of the 26 months covered in the proprietary cash withdrawal data set (May 2010-June 2012), Nebraska patrons withdrew a total of $19.3 million in cash from American casinos. This pervasiveness of casino gambling in Nebraska sets a quantitatively important backdrop for studying the effect of prize linked savings as a substitute for casino gambling.

Despite there being considerable growth in the industry at large, comprehensive casino industry data described in Cookson (2014a) indicate that there was no casino entry in the greater Nebraska region during the sample period (2010 - 2012), and 21 successful entries overall (during the 2003-2010 period). Cookson (2014a) shows that these entries into the casino industry predominantly affect patrons who live local to the casino. The fact that there is not entry in the Nebraska region casino industry alleviates the potential concern that the effects are driven by differential exposure to entering casinos by treatment and control counties.

2 Data and Measurement

2.1 Casino Cash Withdrawal Data

The data set on casino gambling activity is a proprietary transaction-level database of cash transactions at casinos throughout the United States.[9] For each transaction in the database between May 2010 and June 2012, the data provide a casino identifier, a patron identifier, a timestamp for the transaction, the type of transaction (withdrawal, inquiry, deposit), the form of transaction (credit, debit, etc.), casino characteristics, and characteristics of the patron such as a gender and home ZIP code. The empirical analysis focuses on cash withdrawals by gambling patrons whose home ZIP code is in Nebraska or in counties that are within 20 miles of a Nebraska county (Collard-Wexler, 2014). Thus, out of the 22 million record database, this paper utilizes 54,375 cash withdrawal records between May 2010 and June 2012.

Compared with survey-based assessments of gambling behavior, using actual casino cash withdrawals is advantageous because individuals tend to under-report their amount of gambling activity due to social stigma (Meyer et al., 2009). Across Nebraska and adjacent counties, a total of 11,755 patrons withdrew $41.39 million in cash from casinos in the United States, with about half of the withdrawn cash coming from Nebraska patrons. The average amount per transaction was slightly larger than $750, and over the 26 month sample, the average patron withdrew around $3500.[10]

In addition to measuring overall gambling activity, the data provide insight into the nature of gambling activity as well. For example, around 12 percent of cash withdrawal attempts request more funds than available in the bank account (not sufficient funds). In addition, 42 percent of the transaction in the overall sample are transactions where the patron uses a credit card to obtain cash. This regularity of using credit cards to obtain cash at casinos provides a direct link between consumer debt and gambling behavior. Beyond the types of transactions, the precise timestamp can be used to compute the fraction of daytime and weekend transactions, which help assess

[9] DISCLAIMER: All information, data, reports and other information used herein was provided to the author in a proprietary, confidential and anonymous manner with respect to the identification of any particular casino or patron.

[10] Appendix Table 12 describes key characteristics of the sample, as well as geographic coverage by Nebraska / adjacent to Nebraska. The balance of attributes table (Table 2) presents similar information, but split by treatment/control counties.

balance of attributes and the nature of selection effects of the policy. Finally, the demographic characteristics of the counties covered by the sample indicate that the regions in Nebraska and adjacent states are quite similar in both overall population and average per capita income, which is useful empirically.

2.2 Empirical Approach

The implementation of Nebraska STW provides quasi-experimental variation in exposure to savings lotteries because credit union membership is based on whether the individual works or lives in a credit union's counties. Moreover, the counties where savings lotteries were introduced are near state borders, which provides a natural set of counties in adjacent states that can also serve as control counties in the empirical analysis. To exploit this variation in exposure of savings lotteries around their 2012 introduction, I adopt a difference-in-difference strategy, which identifies the effect of savings lotteries on gambling by contrasting how patrons in treated counties (where STW is available) respond differently to the introduction of STW than patrons in nearby control counties.

My main sample is an aggregated county-month panel covering 54 Nebraska and adjacent counties across 26 months from May 2010 to June 2012. To ensure the reliability of the aggregated gambling measure, the final sample retains month-county observations with at least five transactions, and counties that have five transactions for at least ten months of the sample period. Table 2 presents a summary of observation counts for both treated and control counties. The monthly frequency of the county-month panel enables an analysis of differential pre-trends in the difference-in-difference specification.

The treatment-control structure is likely to produce a conservative estimate of the effects of savings lotteries. This is because if nearby households in adjacent regions are affected by the policy (i.e., because they work in the credit union's county), their inclusion in the control counties will dampen the difference between treatment and control. In support of this idea, I complement my county-month tests using patron-level location information, which enables finer measurement of exposure to savings lotteries using the distance of the patron's home ZIP code from branches of participating credit unions. Previewing the results, the estimated effects using prox-

imity to credit unions are slightly stronger, which matches the intuition that the treatment-control approach should conservatively estimate the effect.[11]

My empirical work also employs a sample of observations at the patron-by-$\{pre, post\}$ level. As this sample is useful to condition the effects of savings lotteries on patron characteristics and to explore heterogeneous effects of savings lotteries, I employ patron-level tests throughout the paper. Nonetheless, because there are few observations per patron, patron-level tests must be conducted on the patron-$\{pre, post\}$ level rather than a more granular patron-month panel. As such, the patron-level tests cannot account for trends. In this way, it is natural to conduct the main tests on county-month aggegrates, and supplement with patron-level information.

2.3 Balance of Attributes and Parallel Trends

Figure 2 portrays the geographic dispersion of the treatment and control counties. As the figure indicates, counties where prize linked savings accounts are available are geographically close to counties where prize linked savings accounts are unavailable, even for control counties in adjacent states.

Moreover, the treatment and control counties are reasonably well balanced across casino gambling attributes. Table 2 presents means of pre-treatment gambling and demographic characteristics, and tests of the difference in means. The treatment and control counties are well matched on the amount of gambling, the number of transactions, the fraction of male patrons, the fraction of daytime transactions, and the fraction of weekend transactions. The only gambling characteristics that differ significantly between treatment and control are the propensity of patrons to use a credit card for cash and to request a transaction amount for which there is not sufficient funds. Upon conditioning the difference in means test on whether the county has greater than 100,000 residents, the only gambling characteristic that differs across treatment and control is the propensity to use credit cards to obtain cash.

In comparing the demographic characteristics between treatment and control counties, population is significantly greater in treatment counties, suggesting that the STW program was targeted to more urban areas. Indeed, 37.74 percent of treated counties have greater than 100,000 residents

[11] See Table 20 for the presentation of these results, which are broadly concordant with the rest of the analysis.

while only 4.41 percent of control counties do. In addition, per capita income in treated counties is slightly greater, though only significant when conditioning on the large population dummy. Nonetheless, it is important to control for these characteristics when assessing whether the availability of lottery savings accounts reduced the amount of gambling in treatment counties relative to control counties. For this reason, all of the empirical specifications control for population and per capita income.

Finally, Figure 3 presents a plot that evaluates the assumption of parallel trends in the response variable – the logged amount of cash withdrawn. As the plot indicates, there is a negligible difference between the slopes of treatment versus control leading up to the introduction of savings lotteries at the beginning of 2012. Indeed, the p-value on the test that the slopes are different equals 0.514, and the magnitude of the slope is not significant relative to the jump at the introduction of savings lotteries. On this basis and the fact that treatment and control counties are well balanced, the difference-in-difference analysis is informative of the causal effect of savings lotteries on casino gambling. It is useful to note that, beyond checking the conditions for the difference-in-difference analysis, I also present a battery of robustness tests in the Appendix, which further demonstrate the robustness of my main results to differential pre-trends, and potential time-varying confounding factors that influence the desirability of gambling.

3 Main Findings

This section presents the main empirical findings, which are based on a difference-in-difference specification for the effect of the availability of saving lotteries on casino gambling demand.

3.1 Specification for Total Cash Withdrawals

To exploit the heterogeneity in the degree to which counties are affected by Nebraska STW, I estimate the difference-in-difference specification:

$$log(1 + cashwithdrawn_{it}) = \gamma_i + \gamma_t + \beta_1 CU_i + \beta_2 post_t + \beta_3 CU_i \times post_t + \xi X_{it} + \epsilon_i \quad (1)$$

where $cashwithdrawn_{it}$ the total amount of cash withdrawn by patrons living in county i during month-year t, γ_i and γ_t are county and month-year fixed effects, CU_i is a count of the number of participating credit unions in county i,[12] $post_t$ is an indicator that equals one after the Nebraska STW program was rolled out in January 2012, and X_{it} is a vector of controls for demographic characteristics (logged population and per capita income) from the Bureau of Economic Analysis. In this difference-in-difference specification, the coefficient on the $CU_i \times post_t$ interaction β_3 is the coefficient of interest.

Table 3 reports the results from estimating equation (1) using OLS with county clustered standard errors. The difference-in-difference estimate is highly significant across specifications, regardless of whether I employ a treatment dummy or CU_i to capture the intensity of treatment. According to column 2, an additional participating credit union decreases casino demand in county i by 17.88 percent,[13] an effect that is statistically significant at the one percent level. The typical difference between treatment and control counties is stark, the treatment county experiences a reduction of 55.2 percent in the amount of casino gambling from the introduction of Nebraska STW (column 4). This effect is significant at the one percent level, and robust to the inclusion of county and month-year fixed effects.

A back of the envelope calculation gives context for the magnitude of the effects in Table 3. The median Nebraska patron withdrew $800 over the 26 month sample, which amounts to $184.56 per six months. Using this amount of gambling, an average reduction of 55.2 percent implies that patrons in the treatment counties reduced casino cash withdrawals by $101.88 for the median patron. Relative to the $857 average amount saved in Nebraska STW accounts over the first half of 2012 (see Table 1), this is a sizable reduction in the amount of casino gambling.

These estimated magnitudes are large. Nevertheless, the reduction of casino gambling in treated counties may not be entirely due to consumers who opened STW accounts. Although

[12] In addition to the main results based on the count of participating credit unions, I also present specifications where CU_i is replaced by a treatment dummy variable that indicates whether a participating credit union serves county i. The main specifications employed throughout the paper use CU_i because it also contains information about the the intensity of treatment. One concern with this approach is that the count of credit unions may pick up size/scale effects, but bear in mind that each specification also controls for population, and the most preferred specifications include a rich set of county and month-year fixed effects.

[13] This calculation employs the exact formula provided by Wooldridge (2003) for calculating the percentage effect with a logged dependent variable $effect = e^{\hat{\beta}} - 1$.

this is likely an important for the overall effect, the launch of the Nebraska STW program was also accompanied with an anti-gambling advertising campaign directed at a total of more than 200,000 credit union members. Thus, in addition to consumers who literally substitute their gambling spending for deposits in STW accounts, other consumers who did not open a STW account may have reduced their gambling due to the influence of the STW anti-gambling advertising.

3.2 Decomposition of Total Cash Withdrawals

Beyond documenting the substitution between savings lotteries and casino gambling, it is instructive to know whether the decline in gambling was due to fewer visits to the casino (an extensive margin effect), or withdrawing less money per transaction (an intensive margin efect). To evaluate this, I estimate specifications analogous to equation (1) separately using $log\left(1 + transactions\right)$ and $log\left(1 + average\_withdrawal\right)$ as response variables.

Table 4 presents the results, focusing on the count of participating credit unions CU_i as the treatment variable. The results imply the overall reduction of demand documented in Table 3 arises from both a reduction in number of transactions as well as a reduction in the average transaction size, but the difference-in-difference effect on the number of transactions exhibits greater statistical significance – always significant at the one percent level, while the effect on average transaction amount is marginally statistically insignificant.

The finding that casino patrons respond more consistently along the extensive margin of how many gambling transactions to make than on the intensive margin of how much cash to withdraw once at the casino is consistent with the prospect theory model of casino gambling of Barberis (2012). It appears that consumers who substitute away from gambling in favor of prize-linked savings accounts do so by avoiding the casino rather than gradually reducing the amount of gambling they do. This result is consistent with the prescription of how to quit a rational addition cold turkey (Becker and Murphy, 1988; Gruber and Koszegi, 2001).

3.3 Sample Composition Tests

It is also useful to evaluate whether the effect is accompanied by composition changes in the sample because this would suggest that the nature of gambling changed after the introduction

of savings lotteries. To evaluate this possibility, this section explores whether the composition of daytime transactions, weekend transactions, or the fraction of males who initiate transactions is affected by the introduction of savings lotteries. I also present tests for whether the method of accessing cash changed after treatment.

According to Panel (a) of Table 5, the availability of prize-linked savings accounts does not appear to be related to either the day-of-week or time-of-day timing of gambling transactions. In addition, if particular types of gamblers tend to gamble more frequently during the daytime or the weekend, this null finding rules out changes in the sample composition of day-of-week specific or time-of-day specific consumers. Column 3 of Table 5(a) indicates a slight increase in the fraction of transactions made by males, a finding that suggests females substitute more strongly away from gambling than do males.

The specifications in Panel (b) of Table 5 evaluate whether the introduction of savings lotteries affected how gambling patrons accessed cash – in particular whether they changed their frequencies using credit cards frequently to obtain cash, or making cash withdrawal attempts when there are not sufficient funds. Inconsistent with the notion that customers are influenced through illiquidity to substitute away from casino gambling, savings lotteries do not appear to affect the frequency of credit card use to obtain cash, nor the frequency of "not sufficient funds" transactions.

4 Patron-Level Evidence

My main empirical tests employ county-month aggregated measures for which there is enough data to use the transaction data to reliably represent casino demand for that county. A potential concern is that this sample construction could bias the estimated substitution effect. On one hand, the sample selection could overstate the substitution effect if the selected sample of counties is an environment that is especially responsive to the introduction of savings lotteries. On the other hand, the sample selection could understate the true substitution effect if the introduction of savings lotteries tends to reduce gambling below my sample inclusion cutoffs.

To evaluate these possibilities, I analyze data at the patron-by-$\{pre, post\}$ level.[14] This data set has two observations per patron, one observation aggregated over the patron's pre-treatment transactions, and the other aggregated over post-treatment transactions. When aggregating the data in this way, approximately 30 percent patrons make transactions both before and after the introduction of savings lotteries in January 2012. Using this patron-level data set, I estimate a difference-in-difference specification that is analogous to the difference-in-difference specification for the county-month panel:

$$Y_{kt} = \gamma_z^* + \beta_1^* post_t + \beta_2^* CU\_treated_i \times post_t + \gamma^* X_i + \epsilon_{kt}^* \quad (2)$$

where the outcome variable Y_{kt} reflects one of three outcomes: (i) the logged amount withdrawn by patron k in period $t \in \{pre, post\}$, (ii) an indicator for whether patron k had positive withdrawals in post-treatment period, and (iii) the logged amount of cash access fees paid by patron k in period $t \in \{pre, post\}$. As in the county-month data specifications, the coefficient of interest is the difference in difference coefficient β_2^*, which captures the effect of being treated by greater exposure to participating credit unions that offer savings lotteries.[15]

Columns 1 and 2 of Table 6 present the results from estimating equations (2) with logged cash withdrawn as the dependent variable. According to these specifications, an additional participating credit union reduces the amount of gambling in the post period by 14.4 percent. This is a similar estimated effect as obtained using the county-month aggregated sample, and the effects are significant at the one percent level using standard errors clustered by ZIP code.

To evaluate the extensive margin of gambling, I focus on the sample of patrons who were observed in the pre period, and use the $no\_gambling_{kt}$ indicator as the dependent variable. In

[14] The patron-level data set also allows for an alternative identification strategy that exploits variation in the distance of the patron to participating credit union branches rather than assigning treatment and control based on county of residence. As the distance of the patron from access to STW increases, it becomes increasingly less likely that the patron had access to STW accounts after their introduction in January 2012. Table 20 presents results from these specifications on the intensive and extensive margins of casino gambling demand, and finds that using close proximity to credit union branches yields similarly significant results to using county of residence. This finding supports the validity of using participating county residence as an indicator of treatment in my main specifications.

[15] To evaluate the intensive margin of gambling, I focus on the persistent sample of patrons who are observed in both pre and post periods. To the extent that treatment reduces the propensity of the patron to gamble at all, these estimates understate the true effect.

this context, the difference-in-difference estimate reflects the differential propensity to avoid gambling in the post period, given that the patron was observed to withdraw cash in the pre period. Columns three and four of Table 6 present the results from this estimation. These estimates highlight that the introduction of savings lotteries was important to the extensive margin to gambling as well. An additional participating credit union increases the probability of not gambling in the post period by 3.6 percentage points. In aggregate, being in a county that has at least one participating credit union reduces the propensity to gamble in the post period significantly. Patrons in affected counties are 15.4 percent more likely to not gamble at all in the post period.

It is also informative to analyze the effect of the introduction of savings lotteries on the amount of cash access fees paid because – in comparison to the main evidence of substitution – it indicates the amount of sophistication among those who substitute. The results in columns 5 and 6 show that there is no change in the fees paid by affected patrons relative to unaffected patrons. This finding suggests that the customers who substitute away from casino gambling are the ones who pay minimal or no fees to access cash. That is, the substitution effect appears to most strongly affect individuals who exhibit more sophisticated cash access behavior. This finding foreshadows the analysis of the heterogeneity in how patrons respond to the introduction of savings lotteries.

5 Robustness and Heterogeneity

This section provides greater insight into why consumers are substituting away from casino gambling. The effects documented in this section suggest that most of the effect is driven by consumers who are financially sophisticated. Moreover, the effects seem to reflect genuine substitution toward a similar product (either close proximity or nearer realization of the payoff). The findings on heterogeneity generally contrast with the theory that the effect of savings lotteries on casino demand are a transient phenomenon spurred by an exciting, attention-grabbing product (Barber and Odean, 2008) or broadly-targeted advertising (Becker and Murphy, 1993; Hastings et al., 2013).

5.1 Financial Awareness and the Substitution Effect

To better understand why patrons substitute away from casino gambling when savings lotteries are introduced, I investigate how the substitution effect depends on the propensity to request unavailable funds, the intensity of credit card usage to obtain cash at the casino. This exercise is informative because whether savings lotteries primarily influence gambling patrons with low financial awareness has important implications for the effectiveness of the program.

To evaluate the effect of savings lotteries by high and low financial awareness, I present results from triple difference specifications that interact the effect of savings lotteries with these characteristics. The results in Table 7 strongly indicate that savings lotteries most strongly appeal to consumers with greater financial awareness (e.g., less likely to use credit cards to obtain cash at a casino, and less likely to overdraw their account). For example, according to column (1), the effect of introducing savings lotteries is nearly twice as large in a county a standard deviation below the mean of credit card usage (sd = 25.7 percentage points) compared with a county with average credit card usage. In addition, the effect of savings lotteries is also greater when patrons have relatively few transactions that request unavailable funds. A standard deviation decrease in the fraction of not sufficient funds transactions increases the effect by approximately 15.7 percent.

These effects do not merely reflect economic conditions in the county because I control for population and per capita income in each specification. Nonetheless, the effects of savings lotteries may interact with regional economic conditions. To this end, the estimates in columns (2) and (4) also control for a measure of the strength of the local economy – the employment to population ratio – interacted with the effect. In these specifications, indicators greater financial awareness continue to amplify the substitution effect of savings lotteries.[16]

Moreover, these findings on financial awareness are consistent with my findings of a negligible substitution effect on fees in Section 4. Consistent with the findings in this section, the individuals who substitute away from the casino pay little or no cash access fees, indicative of greater financial

[16] Additionally, interpreting the coefficient estimate on employment to population ratio, regions with better economic conditions exhibit stronger substitution due to the introduction of savings lotteries. Although its primary purpose in the specification is to control for economic conditions, this finding complements the main finding in that it highlights that the effects of savings lotteries are less pronounced among financially sensitive individuals (low financial awareness, worse economic conditions). Further, in unreported specifications, I have also controlled for the interaction of per capita income with the effect, and the main conclusions on employment to population ratio and financial awareness are unchanged.

savvy. Taken together, these results indicate that patrons who have relatively more self control – as exhibited by their cash access behavior at the casino – tend to substitute more strongly away from casino gambling.

5.2 Substitution with Local Casino Gambling

The casino cash withdrawal data not only provide the location of the patron, but they provide the location of the casino as well. This is informative to whether the reduction in gambling is a substitution effect among similar products or substitution toward high-attention products (Barber and Odean, 2008). For example, according to the substitution-among-similar products hypothesis, savings lotteries should be more substitutable with local casino activity if destination gambling involves other elements of entertainment such as visiting a new area, while local gambling transactions are much closer to pure gambling.[17]

Table 8 presents results from estimating equation (1) where the dependent variable only aggregates cash withdrawals local transactions (within 120 miles) and non-local transactions (farther than 120 miles), separately.[18] Consistent with substitution among similar products, the results imply that local casino activity is more sensitive to the introduction of savings lotteries than casino activity at non-local casinos. An additional STW-participating credit union reduces the amount of casino gambling by 20 percent, while the average distance between treated and control counties in local casino demand is 53.37 percent.[19] For transactions far away from the patron's home ZIP code, the introduction of savings lotteries does not seem to matter.

The finding that local gambling is more substitutable with savings lotteries suggests a sensible pattern of substitution across gambling products. This is not a broad-based reduction in gambling as one would expect if the substitution were driven through purely advertising or attention-grabbing products channels. Rather, the findings seem consistent with consumers substituting

[17] These results are similar at the patron-level, controlling for ZIP code level fixed effects. In unreported specifications, I have also examined the degree to which amenities at the casino (e.g., nightlife) matter for the substitituion effect. They do. In fact, the entire effect is concentrated among casino patrons who visit casinos that do not have nightlife. This effect is consistent with the intuition of product differentiation to the extent that nightlife differentiates the casino gambling product from pure wagering.

[18] In unreported specifications, I also computed the aggregated transaction amount within 60 miles, and find a slightly stronger effect when restricting to counties for which there are nonzero dollar amounts wagered within 60 miles, within 120 miles and farther than 120 miles.

[19] This is computed using Wooldridge's formula: $effect = 1 - exp\,(-0.763)$.

across products that are less differentiated in attribute space.[20]

In theory, an effect like the one documented in Table 8 could arise mechanically if gambling trips are planned in advance and locked in, rather than being about attribute substitution as I argue. If the effect is mechanical due to locked-in plans, the substitution effect will eventually show up in far regions later in the sample when patrons are not locked into their destination trip. Appendix Table 17 addresses this possibility by splitting the post period into two subsets: the first three months and the last three months. In these specifications, we do not observe a substitution effect in any part of the post period for far transactions, a finding that supports the attribute substitution interpretation. In fact, the statistically insignificant effects for destination gambling appear to diminish even further in the last three months of the post period for non-local gambling.

5.3 Immediacy of Payoff and Substitution with Casino Gambling

The timing of monthly drawings also provides useful variation in how substitutable the savings lotteries are with casino gambling. As much of the rush of casino gambling is the immediate payoff, lotteries with more immediate payoffs should intuitively exhibit greater substitutability with casino gambling. Because Nebraska STW has monthly drawings where accountholders qualify with a deposit during that month, payoffs from the savings lottery become more immediate closer to the end of the month. According to this logic, the substitution effect should be magnified later in the month relative to earlier in the month.

Table 9 presents results from estimating equation (1) where the dependent variable only aggregates cash withdrawals over part of the month. Indeed, the results indicate a greater effect on casino cash withdrawals that occur when savings lotteries are more substitutable with casino gambling. For example, the reduction in week one gambling due to an additional credit union is 15.7 log points and statistically insignificant, while the reduction in week four gambling (22nd and after) is 23.9 log points and significant at the one percent level. Moreover, the effect becomes more

[20] In an unreported exercise, I have also verified that the introduction of prize linked savings accounts did not have a significant effect on non-gambling consumption (e.g., consumer spending on Nielsen grocery items). That is, the effect appears to be a strong substitution across gambling products in different domains rather than a broad substitution away from consumption.

statistically significant and generally larger in magnitude as the time period shifts from week 1 to week 4.

This pattern of results highlights the immediacy of payoff as an important factor behind casino demand, which suggests that there is more to the substitution away from casino gambling than offering an attention-grabbing alternative or merely advertising the STW programs to participants of the credit union.

5.4 Heterogeneity in the Effect

A natural question underlying this analysis is whether there is heterogeneity in the effect that depends on the underlying propensity of individuals to gamble. Areas with large amount of casino gambling may be more (or less) responsive to the introduction of a new, competing product. If the heterogeneity is well captured by variation in $\log(cashwithdrawals_{it})$, a conceptually straightforward way to estimate whether the effect of STW is different for different parts of the distribution of casino gambling is to estimate equation (1) using quantile regression for a variety of quantiles. An additional advantage of the quantile regression method is that it also reduces sensitivity of the analysis to outliers, relative to mean-based methods (e.g., OLS).

Panel (a) of Table 10 presents results from estimating how the introduction of STW affects casino gambling demand using quantile regression for quantiles $\tau \in \{0.2, 0.3, ..., 0.8\}$. Although the effect of STW is significant for all deciles between 0.2 and 0.8, the effect of STW becomes stronger for higher quantiles. In quantile regressions with month-year fixed effects, the estimated effect at the $\tau = 0.8$ quantile is nearly three times the estimated effect at the $\tau = 0.2$ quantile (-0.273 versus -0.097). This heterogeneity in the effect suggests that the districts with the most gambling experienced the largest casino gambling-reducing effects of STW.[21]

To evaluate whether the effect is due to patron-level substitution, or due to changes in the number of patrons, I construct a patron $\times$ pre/post treatment data set (described in more detail in Section 4) to perform an analogous quantile regression at the patron level. Panel (b) of Table 10 presents the results from estimating heterogeneous effects at the patron level rather than the

[21] If county fixed effects are included, the heterogeneity in the effect that is apparent in Table 10 reduces significantly because the fixed effects account for cross-county heterogeneity.

county-month level. Although the magnitude of the difference is not as large, the results in Panel (b) portray a similar story to the quantile regression on county-month aggregates in Panel (a): the effect size generally increases as the patron's quantile increases. That is, the substitution effect is greatest on a percentage basis among the patrons who gamble the most.

5.5 External Validation Using Lottery Data

One concern with the results thus far is the possibility that patrons bring cash to the casino more frequently in response to the introduction of savings lotteries, but do not necessarily change gambling activity. (e.g., patrons to bring cash to the casino rather than access cash at the casino itself). This is a potential problem because I infer gambling activity from cash access at casinos, but not gambling expenditures directly. I evaluate this potential issue by separately investigating whether savings lotteries substitute for lottery scratch ticket sales, which should also be responsive to the introduction of savings lotteries.[22] In this section, I use data on lottery sales by ZIP code, month, and type of scratch lottery game from the Nebraska Lottery to evaluate whether savings lotteries substitute more generally for gambling products. The exercise here serves as an external validity check on the viability of using cash access at casinos to stand in for casino demand.[23]

To evaluate the effect of savings lotteries on scratch lottery ticket sales using these data, I estimate the specification

$$log(sales_{igt}) \quad = \quad \gamma_i + \gamma_{gt} + \beta_1 CU\_treated_i \times post_t + \epsilon_i \tag{3}$$

[22]The reason to focus on scratch games instead of jackpot games is that jackpot games in Nebraska (Mega Millions and Powerball) exhibited some problematic properties in early 2012. First, regarding Powerball, the Nebraska lottery reported that Powerball doubled the initial size of its progressive jackpot from $20 million to $40 million in early 2012, and that this led to a corresponding increase in ticket sales. Second, the Mega Millions lottery had a record $656 million jackpot in March of 2012, also boosting sales. To rule out that the effects of savings lotteries I have documented arise from changes to the jackpot games, Table 19 in the Appendix controls for jackpot lottery ticket sales in the difference-in-difference specifications (both for the within-Nebraska sample, and for the whole sample while using a dummy variable for the missing observations outside of Nebraska). Rather than explaining away the effect, the substitution effect becomes slightly stronger when controlling for jackpot lottery sales.

[23]Given the close link between scratch lottery tickets and savings lotteries, it is natural to question why I analyze casino gambling in the first place. Relative to ZIP-month-type lottery data, the casino gambling data enable a more sophisticated analysis of the substitution effect because I can construct measures of awareness from the transactions data, and examine whether savings lotteries changed the nature of gambling. These are tests that cannot be effectively run using the lottery data.

which is observed at the ZIP-game-month-year level. Each specification includes $game \times month - year$ fixed effects to allow for each scratch lottery game to have an arbitrarily different time trend, as well as county (or ZIP code) fixed effects to capture differences across geographic units. As in the main specifications on gambling demand, the coefficient of interest is the difference-in-difference effect that capture how treated counties (those with STW participating credit unions) differ from the baseline control counties.

Table 11 presents the results from estimating the difference-in-difference specification in (3). The estimates imply a 1.8 to 2.5 percent reduction in scratch lottery ticket sales for each additional participating credit union after the introduction of savings lotteries, and the effect is statistically significant at the one percent level, clustering by county.[24] This finding suggests that the broad conclusions using the cash access data are not primarily reflecting changes in how patrons access cash, but rather appear to reflect a change in gambling behavior.

5.6 Robustness and Alternative Specifications

Beyond my main analysis, I performed a number of empirical tests that address additional identification concerns as well as deepen the interpretation of the results. Although this analysis is reported in the Appendix, a succinct summary of these robustness exercises is useful to convey the degree to which the results withstand further scrutiny.

To evaluate sensitivity of the difference-in-difference estimates to trends, I extended the main specification to allow for a pre-trend reduction in casino gambling that could explain the effects documented in the main text. Although there is a moderate pre-trend in the year before (or in more refined tests, the three month period before STW begins), the difference between pre and post periods remains significant (see Appendix Table 15) with an effect size that exceeds 10 percent. In a complementary exercise, I show the effects are robust to differential pre-trends. Appendix Table 16 presents results of specifications that allow for differential trends by large and small population areas, as well as by high and low unemployment areas.

[24]The percentage effect of savings lotteries on scratch ticket sales – effects ranging from 1.8 to 2.5 percent – is smaller than the effects I documented for casino gambling, but represents greater substitution in dollar terms. In fact, due to the much larger amount of lottery gambling, the dollar value of substitution is greater for scratch lottery sales than it is for casino gambling. This finding is consistent with the notion that savings lotteries and lotteries are more similar on attributes than casino gambling and savings lotteries.

Further, the main findings and magnitudes are robust to the sample employed – in particular, whether adjacent-state control counties are dropped, or if within-state control counties are dropped. Appendix Table 14 reports results separately using either adjacent-state control counties or within-state control counties. The findings are also robust to dropping all observations from July through December to focus the identification solely on casino gambling that occurs in January-June (which are the only months observed the post period). This finding implies that the results are not driven by seasonality (see Appendix Table 18).

Finally, I also present results using an alternative identification strategy at the patron-level with respect to the distance to participating credit union branches (and headquarters locations). Consistent with the main results, patrons who live far from STW-participating credit unions substitute less dramatically away from casino gambling after the introduction of savings lotteries (see Appendix Table 20).

6 Conclusion

How important is the substitution between traditional gambling products and gambles in other domains? In the context of a natural experiment in the introduction of savings lotteries, this paper finds that the linkages across lottery-style products are quite strong. The availability of savings lotteries in Nebraska reduced casino activity in affected counties by approximately half, and the effect's heterogeneity is consistent with substitution across similar kinds of gambling – e.g., casino transactions near the end of the month (when the lottery payoffs is nearest) are most affected, and local gambling that most resembles a pure wager (because it does not need to be bundled with an overnight trip) is most affected. These findings should be of interest to an emerging literature that explores the substitution between gambling by investors in financial contexts and non-financial contexts (Kumar, 2009).

Moreover, this paper's findings are relevant to assessing the implications of the casino gambling boom that has occurred over the past 35 years. One concern that observers have had is that exposure to casino gambling can lead to increased risk in other aspects of life (financial, or socioeconomic; e.g., see Liao (2013) and Evans and Topoleski (2002)). My finding that casino gambling

risk tends to be a substitute for other kinds of risks suggests that the spillovers between risk-taking in different domains are minimal, at least in comparison to the substitution effect. This is not to say that casinos do not exhibit externalities in nearby communities – they likely do, e.g., Grinols and Mustard (2006) – but it does imply a different pattern of substitution across risks, which should be of interest to financial economists more generally.

Finally, my findings suggest that offering innovative savings products like Save-to-Win can be an effective technique to harness demand for gambling in the United States, and use it to address the lack of saving among American households. In showing that significant gambling resources (as measured by casino cash withdrawals) were redeployed when savings lotteries become available, my findings lend credence to an emerging literature on prize-linked savings as a tool to improve consumer financial outcomes (Tufano, 2008; Filiz-Ozbay et al., 2013; Cole et al., 2014). On the other hand, prize-linked savings accounts are not a panacea for improving household savings. An important sub-population of casino patrons – those with less financial awareness – do not respond to the introduction of savings lotteries. Although this finding implies that prize-linked savings accounts are not a full replacement for other savings enhancement programs, the significant effects that I find for those who exhibit greater financial awareness imply that savings lotteries and these other measures can be complements. Under the right conditions, savings lotteries can dramatically reshape consumption patterns, thereby increasing saving.

7 Tables and Figures

7.1 Figures

Figure 1: Timeline of Notable Events and Growth in the American Casino Industry

Note: This figure provides a timeline of notable changes to the casino industry during the recent casino era, as discussed in detail by Rose (1991). The statistics on entry and extent of the casino gambling market post-2003 are taken from the Gambling Business Directory (Casino City Press, 2012) as computed in Cookson (2014b).

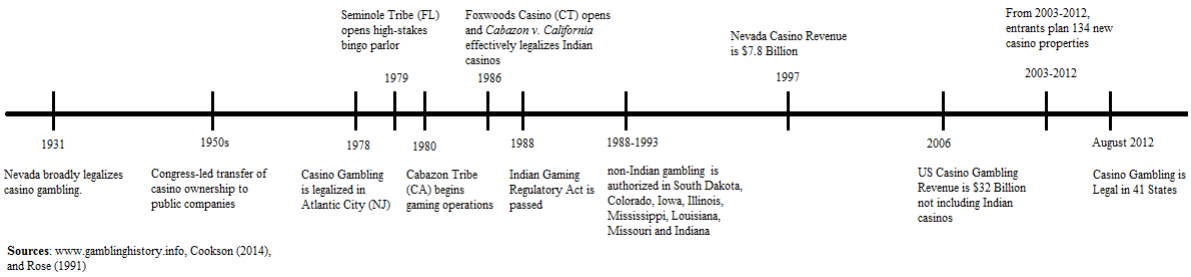


Figure 2: Map of Treatment and Control Counties

Note: This map portrays the geographic distribution of treatment and control counties used in the empirical analysis. The 8 treatment counties (red) are counties served by a credit union participating in the Save-to-Win program. Within-Nebraska control counties (brown) are Nebraska counties that were not served by a credit union participating in the Save-to-Win program. Adjacent-state control counties (gray) are counties within 20 miles of the Nebraska border. For inclusion in the empirical analysis, the county must have sufficient gambling activity to construct the county-month level data set. For inclusion in the sample, a county must have at least five transactions in more than 10 months of the sample period. The excluded counties (lighter colors) do not satisfy these sample inclusion criteria.

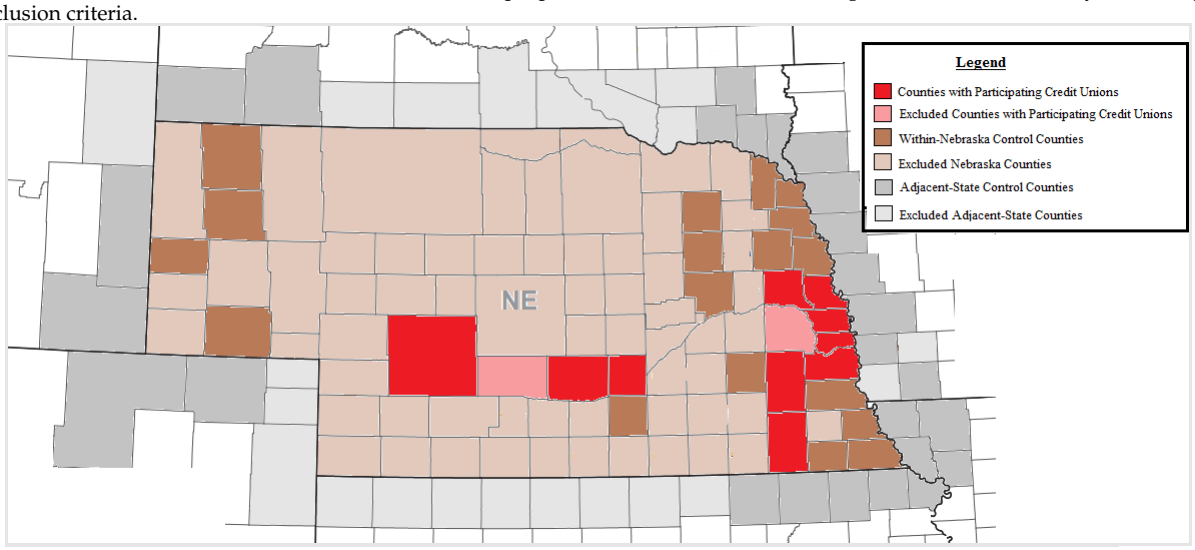
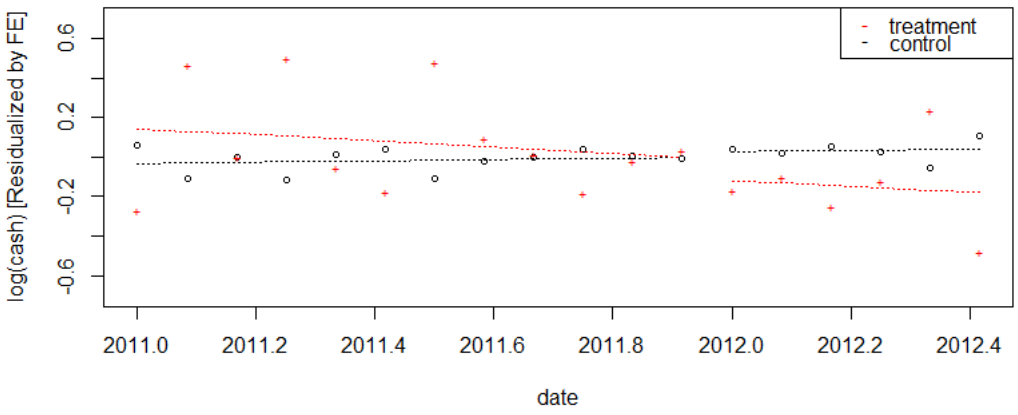


Figure 3: Testing for Differential Trends in Gambling by Treatment and Control Counties

Note: This figure presents a graphical depiction of the pre-trend in the dependent variable logged cash withdrawals after residualizing by county and month-year fixed effects, plotted for the years 2011 and 2012 in the sample. The difference in slopes with respect to the *date* variable equals −0.189 (with a p-value of 0.514). This effect is economically insignificant as well in that it can only explain an effect size of 0.0158 going from December 2011 to December 2012, while the jump is an order of magnitude larger.



7.2 Summary Tables

Table 1: Details of the Nebraska Save to Win Program

Note: This table summarizes the rollout of Save-to-Win savings lottery accounts in Nebraska. Panel (a) provides summary statistics compiled from various surveys reported by the Doorways to Dreams Fund. Source: Doorways to Dreams Fund White Papers. Panel (b) provides the names of the nine Save-to-Win participating credit unions, the town of their main branch, and the counties the credit union serves.

Total Amount Saved	
... July 2012	$1.1 million
... January 2013	$1.9 million
... January 2014	$2.4 million
Average Account Balance	
... July 2012	$857
... January 2013	$1163
... January 2014	$1641
Percent of Accountholders who Reported	
... Never Saving Before	43%
... Less Than $5000 in Financial Assets	31%
... Inability to Pay for 3 Months Expenses	50%
... Playing the Lottery (MI 2011)	63%
... Visiting Casinos / Racetracks (MI 2009)	38%

(a) Save-to-Win Accountholder Characteristics

Credit Union Name	Main Branch Location	Counties Served
Family Focus FCU	Omaha	Douglas, Hall, Lincoln, Sarpy
Gallup FCU	Omaha	Douglas
Kearney FCU	Kearney	Buffalo, Dawson
KEE FCU	Kearney	Buffalo, Dawson
Liberty First FCU	Lincoln	Lancaster
MembersOwn	Lincoln	Gage, Lancaster
Mutual 1st FCU	Omaha	Cass, Douglas, Sarpy, Washington
Omaha Police FCU	Omaha	Cass, Dodge, Douglas, Lancaster, Sarpy, Saunders, Washington
SAC FCU	Bellevue	Cass, Douglas, Sarpy, Saunders, Washington

(b) Save-to-Win Participating Credit Unions

Table 2: Summary of County-Level Data by Treated and Non-Treated Counties

Note: This table reports averages of key variables in the pre-treatment period, based on cash withdrawal data using counties in which a participating Save-to-Win (STW) credit union operates to separate treated counties from non-treated counties in Nebraska, as well as the difference and conditional difference. The comparisons in this table are based entirely on within-state differences between treatment and control counties. The conditional difference is computed as the coefficient on a treatment indicator in a regression that also controls for whether the county has population greater than 100,000. Standard errors are two-way clustered by county and month-year. ***, **, and * denote statistical significant differences at the one, five and ten percent levels.

	Treated	Not Treated	Difference	Conditional Difference
# of Counties	10	44		
# of Months	26	26		
# of Observations	207	1183		
... Before	159	907		
... After	48	276		
Pre-Treatment Characteristics (All Control Counties)				
Mean Transaction Amount ($)	537.40	453.97	80.43	76.75
Mean # of Transactions	63.85	25.27	38.58	-7.56
% Male	58.44	55.10	3.44	2.99
% Not Sufficient Funds	14.45	11.53	2.31*	1.80
% Use Credit Card for Cash	54.96	40.18	14.78***	14.76***
% Daytime Transactions	34.22	35.91	-1.69	-1.31
% Weekend Transactions	46.41	48.54	-2.13	-2.48^{**}
Per Capita Personal Income ($1000s)	41.54	39.91	1.63	2.47*
Population (1000s)	122.25	25.47	96.78**	–
% with Population > 100,000	30.15	4.61	25.54*	–

7.3 Main Tests

Table 3: The Effect of the Availability of Prize Linked Savings on Gambling Demand

Note: This table presents results from estimating the difference-in-difference specification:

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \mathbf{fl}X + \epsilon_i$$

where $cashwithdrawn_{it}$ is the total amount of cash withdrawn at casinos by individuals in county i during month-year t, $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW. The variable $cashwithdrawn_{it}$ is winsorized at the 99th percentile to reduce sensitivities to extreme observations. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	(1)	(2)	(3)	(4)
post × # of participating CUs	-0.188^{***}	-0.197^{***}		
	(0.047)	(0.049)		
# of participating CUs	-0.132			
	(0.097)			
post × STW accounts available			-0.567^{***}	-0.594^{***}
			(0.173)	(0.182)
STW accounts available			-0.757^{***}	
			(0.270)	
Month-Year FE	x	x	x	x
County FE		x		x
R^2	0.488	0.675	0.511	0.676
# of Counties	54	54	54	54
# of Months	26	26	26	26
N	1390	1390	1390	1390

Table 4: The Effect of the Availability of Prize Linked Savings on Number of Transactions and Average Transaction Size

Note: This table presents OLS and instrumental variables results for the difference-in-difference specification:

$$log(gambling\_activity_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \mathbf{fl}X + \epsilon_i$$

where $gambling\_activity_{it}$ is either one plus the number of cash withdrawal transactions (extensive margin) or one plus the average transaction amount (intensive margin, winsorizing at the 99th percentile) in county i during month-year t, $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	# of Transactions		Average Amount Withdrawn	
	(1)	(2)	(3)	(4)
post × # of participating CUs	-0.084^{***}	-0.089^{***}	-0.095	-0.117
	(0.023)	(0.024)	(0.069)	(0.072)
# of participating CUs	-0.104		-0.000	
	(0.100)		(0.027)	
Month-Year FE	x	x	x	x
County FE		x		x
R^2	0.533	0.836	0.248	0.352
# of Counties	54	54	54	54
# of Months	26	26	26	26
N	1390	1390	1390	1390

Table 5: Sample Composition and the Nature of Gambling

Note: This table presents results from estimating the difference-in-difference specification:

$$log(gambling.activity_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \mathbf{fl}X + \epsilon_i$$

where in Panel A $gambling.activity_{it}$ is either the fraction of weekend transactions, the fraction of daytime transactions, or the fraction of transactions by males in county i and month-year t, and in Panel B $gambling.activity_{it}$ is either the fraction of transactions where the patron had not sufficient funds for the cash withdrawal, or the fraction of transactions where the patron used a credit card for cash in county. As for the RHS variables, $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	% Daytime	% Weekend	% Male
post × # of participating CUs	0.000	−0.008	0.038*
	(0.005)	(0.005)	(0.023)
Month-Year FE	x	x	x
County FE	x	x	x
R^2	0.088	0.112	0.339
# of Counties	54	54	54
# of Months	26	26	26
N	1390	1390	1091

(a) Tests for Changes in Sample Composition

	% NSF	% Credit Card
post × # of participating CUs	0.004	0.011
	(0.006)	(0.010)
Month-Year FE	x	x
County FE	x	x
R^2	0.193	0.447
# of Counties	54	54
# of Months	26	26
N	1390	1390

(b) Tests for Changes in Gambling Behavior

Table 6: The Effect of Savings Lotteries on Gambling, Propensity to Gamble, and Cash Access Fees (Patron Level Evidence)

Note: Each observation in this table is a patron × (before, after) treatment. This table presents results from estimating the difference-in-difference specification:

$$log(gambling\_outcome_{kt}) \quad = \quad \gamma_z + \beta_1 post_t + \beta_2 CU\_treated_i \times post_t + \mathbf{fl}X + \epsilon_{kt}$$

where $gambling\_outcome_{it}$ is either one plus the total amount of cash withdrawn at casinos by the patron k during treatment period t (transactions are aggregated before versus after treatment) or an indicator for whether the patron had any withdrawals during the treatment period t, γ_z are ZIP code fixed effects, $post_i$ equals one post-treatment observations that were aggregated for transactions after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW. For each specification, the $cashwithdrawn_k$ variable is winsorized at the 99th percentile to reduce sensitivity to extreme observations. The estimates for logged withdrawal amount are constructed using the persistent sub-sample, which contains only patron × treatment for which we observe pre and post observations. The estimates for the indicator for no withdrawals are constructed using a sample of patron transactions for which the patron was observed in the pre-period. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis interacted with the post period. Standard errors are clustered by ZIP code, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	Log(Cash Withdrawn)		No Withdrawals Dummy		Log(Fees)	
	(1)	(2)	(3)	(4)	(5)	(6)
post × # of participating CUs	-0.156^{***}		0.036^{***}		0.007	
	(0.055)		(0.007)		(0.016)	
post × STW Accounts Available		-0.674^{***}		0.154^{***}		0.004
		(0.223)		(0.026)		(0.074)
ZIP Code FE	x	x	x	x	x	x
R^2	0.149	0.150	0.479	0.479	0.404	0.404
# of ZIP Codes	482	482	654	654	482	482
N	7262	7262	18730	18730	7262	7262

7.4 Heterogeneity

Table 7: Differential Effects by Financial Awareness and Economic Conditions

Note: This table presents results from estimating the triple difference specification:

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i \times post_t + \beta_2 CU\_treated_i \times post_t \times characteristic_i + \mathbf{fl}X + \epsilon_i$$

where$cashwithdrawn_{it}$ is the total amount of cash withdrawn at casinos by individuals in county i during month-year, or the fraction of transactions where the patron used a credit card for cash in county i and month-year t, $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, and $constraint_i$ is one of three indicators of short run patron financial constraints and / or self control: (1) fraction of patrons who never use a credit card, (2) fraction of credit card transactions in the county-month, and (3) fraction of not sufficient funds transactions. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. (Z) indicates that the variable has been standardized to have a mean of zero and a standard deviation of one for ease of interpretation. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	(1)	(2)	(3)	(4)
post × # of participating CUs	-0.173^{***}	-0.059	-0.196^{***}	-0.055
	(0.061)	(0.052)	(0.047)	(0.044)
... × % Credit Card (Z)	0.156^{**}	0.133^{**}		
	(0.070)	(0.064)		
... × % Not Sufficient Funds (Z)			0.157^{**}	0.119^{**}
			(0.047)	(0.064)
... × % Emp-Pop Ratio (Z)		-0.206^{***}		-0.281^{***}
		(0.065)		(0.064)
Month-Year FE	x	x	x	x
County FE	x	x	x	x
R^2	0.687	0.689	0.682	0.686
# of Counties	54	54	54	54
# of Months	26	26	26	26
N	1390	1390	1390	1390

Table 8: The Effect of Prize Linked Savings on Local and Non-Local Gambling Demand

Note: This table presents results from estimating the difference-in-difference specification:

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \mathbf{fl}X + \epsilon_i$$

where $cashwithdrawn_{it}$ is one plus the total amount of cash withdrawn at casinos by individuals in county i during month-year t (but focusing on sub-samples of transactions that occur early or late in the month), $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW. For each specification, the $cashwithdrawn_i$ variable is constructed for the sub-sample desired, and then winsorized at the 99th percentile to reduce sensitivities to extreme observations. For the construction of sub-samples, close is the sample of transactions by patrons within 120 miles of their home ZIP code, while far is the sample of transactions where the patron is more than 120 from his home ZIP code. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	Close Transactions		Far Transactions	
	(1)	(2)	(3)	(4)
post × # of participating CUs	-0.222^{**}		-0.063	
	(0.101)		(0.086)	
post × STW Accounts Available		-0.763^{**}		-0.219
		(0.349)		(0.315)
Month-Year FE	x	x	x	x
County FE	x	x	x	x
R^2	0.831	0.831	0.553	0.553
# of Counties	54	54	54	54
# of Months	26	26	26	26
N	1390	1390	1390	1390

Table 9: Calendar Timing of the Effect of Prize Linked Savings on Gambling Demand

Note: This table presents results from estimating the difference-in-difference specification:

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \mathbf{fl} X + \epsilon_i$$

where $cashwithdrawn_{it}$ is one plus the total amount of cash withdrawn at casinos by individuals in county i during month-year t (but focusing on sub-samples of transactions that occur early or late in the month), $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW. For each specification, the $cashwithdrawn_i$ variable is constructed for the sub-sample desired, and then winsorized at the 99th percentile to reduce sensitivities to extreme observations. For the construction of sub-samples, week 1 is days 1 through 7, first half is days 1 through 15, second half is days 16 through the end of the month, and Week 4 is days 22 through the end of the month. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	Week 1	First Half	Second Half	Week 4
post $\times$ # of participating CUs	-0.157	-0.150^{*}	-0.223^{***}	-0.239^{***}
	(0.113)	(0.081)	(0.071)	(0.083)
Month-Year FE	x	x	x	x
County FE	x	x	x	x
R^2	0.401	0.453	0.480	0.439
# of Counties	54	54	54	54
# of Months	26	26	26	26
N	1390	1390	1390	1390

Table 10: Heterogeneity in the Effect of Prize Linked Savings on Gambling Demand

Note: Panel (a) presents results from estimating the difference-in-difference specification using quantile regression while panel (b) presents estimates from the same specification using OLS, but measuring the dependent variable using varying within-county percentiles ($p \in \{0.2, 0.4, 0.5, 0.6.0.8\}$):

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \mathbf{fl}X + \epsilon_i$$

where $cashwithdrawn_{it}$ is one plus the total amount of cash withdrawn at casinos by individuals in county i during month-year t (but focusing on sub-samples of transactions that occur early or late in the month), $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW. In the table, τ denotes the quantile at which the regression is estimated. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	$\tau = 0.2$	$\tau = 0.3$	$\tau = 0.4$	$\tau = 0.5$	$\tau = 0.6$	$\tau = 0.7$	$\tau = 0.8$
post × # of participating CUs	-0.097^{**}	-0.172^{***}	-0.239^{***}	-0.257^{***}	-0.275^{***}	-0.276^{***}	-0.273^{***}
	(0.045)	(0.045)	(0.040)	(0.049)	(0.073)	(0.044)	(0.048)
Month-Year FE	x	x	x	x	x	x	x
# of Counties	54	54	54	54	54	54	54
# of Months	26	26	26	26	26	26	26
N	1390	1390	1390	1390	1390	1390	1390

(a) Quantile Regression on County-Month Aggregates

	$\tau = 0.2$	$\tau = 0.3$	$\tau = 0.4$	$\tau = 0.5$	$\tau = 0.6$	$\tau = 0.7$	$\tau = 0.8$
post × # of participating CUs	-0.148^{**}	-0.159^{***}	-0.176^{***}	-0.195^{***}	-0.202^{***}	-0.209^{***}	-0.187^{***}
	(0.032)	(0.028)	(0.025)	(0.030)	(0.028)	(0.033)	(0.034)
N	7262	7262	7262	7262	7262	7262	7262

(b) Quantile Regression on Patron-Treatment-Level Aggregates

Table 11: Effect of Savings Lotteries on Scratch Ticket Lottery Sales

Note: Using data on game-month-ZIP code lottery ticket sales from the Nebraska Lottery, this table presents results from estimating the difference-in-difference specification:

$$log(sales_{igt}) \quad = \quad \gamma_i + \gamma_{gt} + \beta_1 CU\_treated_i \times post_t + \epsilon_i$$

where $sales_{igt}$ is the dollar amount of scratch ticket lottery sales in ZIP code i, for scratch ticket game g during month-year t, $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts. The lottery ticket sales data are restricted only to games that had sales before and after January 2012 (for the years 2011 and 2012). Each specification includes game by month-year fixed effects to allow for arbitrary game-specific trends over time. The variable $sales_{igt}$ is winsorized at the 99th percentile to reduce sensitivities to extreme observations. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	(1)	(2)
post × # of participating CUs	-0.025^{***}	-0.018^{***}
	(0.009)	(0.006)
Game × Month-Year FE	x	x
County FE	x	
ZIP Code FE		x
R^2	0.556	0.714
# of Counties	35	35
# of Months	24	24
# of Games	13	13
N	2006	2006

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A Appendix Tables: Supplemental Tests, Alternative Specifications and Robustness Checks

Table 12: Summary Statistics for Cash Withdrawal Data

Note: This table presents summary statistics of the proprietary cash withdrawal data set for casino transactions by patrons whose home ZIP codes are in Nebraska or counties in adjacent states within 20 miles of Nebraska counties. In addition to the counties within Nebraska that do not have access to Save-to-Win accounts through participating credit unions, these adjacent counties are used in the empirical analysis as control counties where patrons do not have access to Save-to-Win accounts.

	Nebraska	Adjacent to Nebraska
Casino Gambling Characteristics		
# of Transactions	26,312	28,053
# of Casino Patrons	5722	6033
Dollar Amount Withdrawn		
... Total ($ millions)	19.73	21.66
... Average per Patron ($)	3448.73	3590.95
... Median Patron ($)	799.75	876.65
... Average per Transaction ($)	750.99	772.26
... Median Transaction ($)	252.50	216.99
% Male	58.57	56.72
% Not Sufficient Funds	12.53	12.03
% Use Credit Card for Cash	52.34	34.06
% Weekend Transactions	47.73	49.21
% Daytime Transactions	48.47	35.76
Characteristics of Covered Counties (BEA)		
2010 Population (1000s)	1484.38	833.42
Average Per Capita Income ($1000s)	37.61	37.19

Table 13: Summary of County-Level Data by Treated and Non-Treated Counties, Disaggregated by Type of Control County

Note: This table reports averages of key variables in the pre-treatment period, based on cash withdrawal data using counties in which a participating Save-to-Win (STW) credit union operates to separate treated counties from non-treated counties in Nebraska, as well as the difference and conditional difference. The comparisons in this table are based entirely on within-state differences between treatment and control counties. The conditional difference is computed as the coefficient on a treatment indicator in a regression that also controls for whether the county has population greater than 100,000. Standard errors are two-way clustered by county and month-year. ***, **, and * denote statistical significant differences at the one, five and ten percent levels.

	Treated	Not Treated	Difference	Conditional Difference
Adjacent-State Control Counties				
# of Counties	10	26		
# of Months	26	26		
# of Observations	207	671		
... Before	159	515		
... After	48	156		
Within-Nebraska Control Counties				
# of Counties	10	18		
# of Months	26	26		
# of Observations	207	512		
... Before	159	392		
... After	48	120		
Pre-Treatment Characteristics (Adjacent-State Control Counties)				
Mean Transaction Amount ($)	537.40	436.99	100.51*	92.54*
Mean # of Transactions	63.85	34.60	29.25	-10.78
% Male	58.44	59.47	-0.93	-0.79
% Not Sufficient Funds	14.45	13.19	0.65	0.39
% Use Credit Card for Cash	54.96	29.58	15.37***	15.39***
% Daytime Transactions	34.22	34.82	−0.61	-0.39
% Weekend Transactions	46.41	47.36	−0.94	−1.39
Per Capita Personal Income ($1000s)	41.54	39.88	1.66	2.41
Population (1000s)	122.25	32.41	89.82*	–
% with Population > 100,000	30.15	7.77	22.38	–
Pre-Treatment Characteristics (Within-Nebraska Control Counties)				
Mean Transaction Amount ($)	537.40	478.81	58.68	44.78
Mean # of Transactions	63.85	11.61	52.24*	-0.63
% Male	58.44	48.41	10.14	9.06
% Not Sufficient Funds	14.45	9.10	4.74**	3.965**
% Use Credit Card for Cash	54.96	41.90	13.90***	12.43***
% Daytime Transactions	34.22	37.49	−3.28*	-2.64
% Weekend Transactions	46.41	50.28	−3.86***	−4.12***
Per Capita Personal Income ($1000s)	41.54	39.96	1.58	1.28
Population (1000s)	122.25	15.32	106.91**	–
% with Population > 100,000	30.15	0.00	30.15**	–

Table 14: Availability of Prize Linked Savings and Gambling Demand, Robustness to Different Control Groups

Note: This table presents results from estimating the difference-in-difference specification:

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \mathbf{fl} X + \epsilon_i$$

where $cashwithdrawn_{it}$ is the total amount of cash withdrawn at casinos by individuals in county i during month-year t, $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. The variable $cashwithdrawn_{it}$ is winsorized at the 99th percentile to reduce sensitivities to extreme observations. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels. † indicates p-value less than 0.15

	Unaffected Counties within Nebraska		Adjacent Counties in Neighboring States	
	(1)	(2)	(3)	(4)
post × # of participating CUs	-0.220^{***}	-0.135^{**}	-0.153^{***}	-0.185^{***}
	(0.056)	(0.062)	(0.054)	(0.055)
# of participating CUs	0.134		-0.208^{**}	
	(0.134)		(0.096)	
Month-Year FE	x	x	x	x
County FE		x		x
R^2	0.527	0.689	0.538	0.722
# of Counties	28	28	36	36
# of Months	26	26	26	26
N	719	719	930	930

Table 15: The Effect of the Availability of Prize Linked Savings on Gambling Demand, Timing of Treatment

Note: This table presents results from estimating the difference-in-difference specification:

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_i + \beta_3 pre_i + \beta_4 CU\_treated_i \times post_i + \beta_4 CU\_treated_i \times pre_i + \mathbf{fl}X + \epsilon_i$$

where $cashwithdrawn_{it}$ is the total amount of cash withdrawn at casinos by individuals in county i during month-year t, , $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW, $post_i$ is an indicator that equals one after January 2012, pre_i is an indicator that equals one for the year prior to January 2012 to capture anticipation of the effect. For reference, columns 1 and 3 present the estimate from the analogous specification from Table 3. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. The variable $cashwithdrawn_{it}$ is winsorized at the 99th percentile to reduce sensitivities to extreme observations. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	(1)	(2)	(3)	(4)
post × # of participating CUs	-0.188^{***}	-0.332^{***}	-0.197^{***}	-0.353^{***}
	(0.047)	(0.064)	(0.049)	(0.064)
pre × # of participating CUs		-0.241^{***}		-0.249^{***}
		(0.050)		(0.050)
Difference Between Post and Pre				
... Coefficient	–	-0.091^{**}	–	-0.104^{**}
... P-value	–	0.0349	–	0.0325
Month-Year FE	x	x	x	x
County FE			x	x
R^2	0.488	0.493	0.675	0.680
# of Counties	54	54	54	54
# of Months	26	26	26	26
N	1390	1390	1390	1390

Table 16: The Effect of the Availability of Prize Linked Savings on Gambling Demand, Robustness to Differential Pre-Trends

Note: This table presents results from estimating the difference-in-difference specification:

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \beta_4 year_t \times characteristic_i + \mathbf{fl}X + \epsilon_i$$

where $cashwithdrawn_{it}$ is the total amount of cash withdrawn at casinos by individuals in county i during month-year t, $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW. The variable $cashwithdrawn_{it}$ is winsorized at the 99th percentile to reduce sensitivities to extreme observations. The new variable $characteristic_i$ is either $large\_pop_i$ is either an indicator that equals one if the 2010 population in the county is greater than 50,000 (100,000 in some specifications), or an indicator that equals one if the 2010 average unemployment rate is above median (above 90th percentile in some specifications). For specifications without monthyear and FIPS fixed effects, the appropriate main effects for this interaction are also included. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	50,000 residents			100,000 residents		
	(1)	(2)	(3)	(4)	(5)	(6)
post × # of participating CUs	-0.120^{**}	-0.120^{**}	-0.133^{**}	-0.154^{**}	-0.153^{**}	-0.164^{**}
	(0.054)	(0.055)	(0.058)	(0.060)	(0.061)	(0.064)
Month-Year FE		x	x		x	x
County FE			x			x
R^2	0.472	0.500	0.678	0.491	0.519	0.676
# of Counties	54	54	54	54	54	54
# of Months	26	26	26	26	26	26
N	1390	1390	1390	1390	1390	1390

(a) Differential Pre-Trends by High and Low County Population (different cutoffs)

	Median Unemployment			90th Percentile Unemployment		
	(1)	(2)	(3)	(4)	(5)	(6)
post × # of participating CUs	-0.189^{**}	-0.190^{**}	-0.195^{**}	-0.175^{**}	-0.190^{**}	-0.176^{**}
	(0.053)	(0.054)	(0.058)	(0.047)	(0.047)	(0.050)
Month-Year FE		x	x		x	x
County FE			x			x
R^2	0.479	0.508	0.675	0.466	0.508	0.677
# of Counties	54	54	54	54	54	54
# of Months	26	26	26	26	26	26
N	1390	1390	1390	1390	1390	1390

(b) Differential Pre-Trends by High and Low Unemployment (different cutoffs)

Table 17: The Effect of Prize Linked Savings on Local and Non-Local Gambling Demand (Trends in Post-Period Effects)

Note: This table presents results from estimating the difference-in-difference specification:

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \mathbf{fl} X + \epsilon_i$$

where $cashwithdrawn_{it}$ is one plus the total amount of cash withdrawn at casinos by individuals in county i during month-year t (but focusing on sub-samples of transactions that occur early or late in the month), $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW. For each specification, the $cashwithdrawn_i$ variable is constructed for the sub-sample desired, and then winsorized at the 99th percentile to reduce sensitivities to extreme observations. For the construction of sub-samples, close is the sample of transactions by patrons within 120 miles of their home ZIP code, while far is the sample of transactions where the patron is more than 120 from his home ZIP code. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	Close Transactions		Far Transactions	
	(1)	(2)	(3)	(4)
# of participating CUs				
... × post (Jan - Mar)	-0.228^{**}		-0.082	
	(0.089)		(0.120)	
... × post (Apr - June)	-0.216^{*}		-0.044	
	(0.124)		(0.078)	
STW Accounts Available				
... × post (Jan - Mar)		-0.712^{**}		-0.400
		(0.282)		(-0.428)
... × post (Apr - June)		-0.814^{*}		0.038
		(0.440)		(0.293)
Month-Year FE	x	x	x	x
County FE	x	x	x	x
R^2	0.831	0.831	0.553	0.553
# of Counties	54	54	54	54
# of Months	26	26	26	26
N	1390	1390	1390	1390

Table 18: Availability of Prize Linked Savings and Gambling Demand, Seasonality

Note: This table presents results from estimating the difference-in-difference specification:

$$log(cashwithdrawn_{it}) \quad = \quad \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t + \mathbf{fl} X + \epsilon_i$$

where $cashwithdrawn_{it}$ is the total amount of cash withdrawn at casinos by individuals in county i during month-year t, $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. The variable $cashwithdrawn_{it}$ is winsorized at the 99th percentile to reduce sensitivities to extreme observations. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels. † indicates p-value less than 0.15

	All Control Counties	Within-State Counties	Adjacent-State Counties
post × # of participating CUs	-0.137^{***}	$-0.093^{\dagger}$	-0.128^{**}
	(0.049)	(0.062)	(0.056)
Month-Year FE	x	x	x
County FE	x	x	x
R^2	0.495	0.527	0.689
# of Counties	54	28	36
# of Months	14	14	14
N	775	391	504

Table 19: The Effect of Prize Linked Savings, Controlling for Jackpot Lottery Sales

Note: This table presents results from estimating the difference-in-difference specification:

$$\begin{aligned} log(cashwithdrawn_{it}) \quad = \quad & \gamma_s + \gamma_t + \beta_1 CU\_treated_i + \beta_2 post_t + \beta_3 CU\_treated_i \times post_t \\ & + \beta_4 log\left(1 + jackpot\_sales_{it}\right) + \mathbf{fl}X + \epsilon_i \end{aligned}$$

where $cashwithdrawn_{it}$ is one plus the total amount of cash withdrawn at casinos by individuals in county i during month-year t (but focusing on sub-samples of transactions that occur early or late in the month), $post_i$ is an indicator that equals one for dates after the introduction of Save-to-Win in January 2012, $CU\_treated_i$ is the number of credit unions that offer STW deposits and accounts, or in some specifications, an indicator variable for whether there is a credit union in county i that offers STW. For each specification, the $cashwithdrawn_i$ variable is constructed for the sub-sample desired, and then winsorized at the 99th percentile to reduce sensitivities to extreme observations. For the construction of sub-samples, close is the sample of transactions by patrons within 120 miles of their home ZIP code, while far is the sample of transactions where the patron is more than 120 from his home ZIP code. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis. Standard errors are clustered by county, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	Full Sample		Within-Nebraska Sample	
	(1)	(2)	(3)	(4)
post × # of participating CUs	-0.197^{***}	-0.204^{***}	-0.129^{*}	-0.137^{*}
	(0.049)	(0.048)	(0.067)	(0.074)
$log(jackpot\_sales)$		-0.373		-1.041
		(0.312)		(1.554)
Month-Year FE	x	x	x	x
County FE	x	x	x	x
Dummy for Missing		x		
R^2	0.675	0.676	0.662	0.663
# of Counties	54	54	26	26
# of Months	26	26	26	26
N	1390	1390	629	629

Table 20: Patron-Level Evidence using Distance to Participating Credit Unions as Measure of Treatment

Note: Each observation in this table is a patron × (before, after) treatment. This table presents results from estimating the difference-in-difference specification:

$$log(gambling\_outcome_{kt}) \quad = \quad \gamma_z + \beta_1 post_t + \beta_2 log\left(distance_z\right) \times post_t + \mathbf{fl}X + \epsilon_{kt}$$

where $gambling\_outcome_{it}$ is either one plus the total amount of cash withdrawn at casinos by the patron k during treatment period t (transactions are aggregated before versus after treatment) or an indicator for whether the patron had any withdrawals during the treatment period t, γ_z are ZIP code fixed effects, $post_i$ equals one post-treatment observations that were aggregated for transactions after the introduction of Save-to-Win in January 2012, $distance_z$ is the distance between the centroid of patron k's home ZIP code and either (a) the nearest branch of a patricipating credit union, (b) the nearest headquarters of a patricipating credit union, or (c) the average distance of the five closest participating credit union branches. For each specification, the $cashwithdrawn_k$ variable is winsorized at the 99th percentile to reduce sensitivity to extreme observations. The estimates for logged withdrawal amount are constructed using the persistent sub-sample, which contains only patron × treatment for which we observe pre and post observations. The estimates for the indicator for no withdrawals are constructed using a sample of patron transactions for which the patron was observed in the pre-period. The vector of control variables **X** includes logged population and per capita income measures at the county-year level from the Bureau of Economic Analysis interacted with the post period. Standard errors are clustered by ZIP code, and ***, **, and * indicate statistical significance at the one, five, and ten percent levels.

	Logged Withdrawal Amount			Indicator for No Withdrawals		
	(1)	(2)	(3)	(4)	(5)	(6)
post × log(distance)	0.148^{**}			-0.036^{***}		
...nearest branch	(0.051)			(0.006)		
post × log(distance)		0.141^{*}			-0.043^{***}	
...nearest five branches		(0.071)			(0.008)	
post × log(distance)			0.149^{*}			-0.040^{***}
...nearest headquarters			(0.063)			(0.009)
ZIP Code FE	x	x	x	x	x	x
R^2	0.149	0.147	0.148	0.480	0.480	0.480
# of ZIP Codes	482	482	482	653	653	653
N	7262	7262	7262	18728	18728	18728