Hitting the Jackpot or Hitting the Skids: Entertainment, Poverty, and the Demand for State Lotteries

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Abstract

State-sponsored lotteries are a lucrative source of revenue. Despite their low payout rates, lotteries are extremely popular, particularly among low-income citizens. State officials laud the benefits of lottery proceeds and promote the fun and excitement of participation. This entertainment value is one explanation for lottery demand by the poor: individuals with lower incomes substitute lottery play for other entertainment. Alternatively, low-income consumers may view lotteries as a convenient and otherwise rare opportunity for radically improving their standard of living. Bad times may cause desperation and the desperate may turn to lotteries in an effort to escape hardship. This study tests these competing explanations. We examine lottery sales data from 39 states over 10 years and find a strong and positive relationship between sales and poverty rates. In contrast, we find no relationship between movie ticket sales, another inexpensive form of entertainment, and poverty rates.

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The Maine State Lottery is proud of its commitment to providing the citizens of Maine with fun and exciting entertainment.

First sentence of the Maine State lottery homepage.

1. Introduction

Adam Smith wrote in the Wealth of Nations that the British lottery was patronized by players in "the vain hope of gaining some of the great prizes." Smith was almost correct. The hope of obtaining great prizes is not completely vain, but the probability of gaining such prizes is exceedingly small. But for most lottery players, participation is one of the few means by which they can obtain large prizes from a modest wager with *any* positive probability. The motivation and demographics of players, and the effects of their participation, are a growing concern as more states turn to lotteries and other forms of gambling to address budget shortfalls. The number of states administering lotteries has risen from 14 in 1980 to 39 in 2003. In Massachusetts, the state with the most popular lottery, annual ticket sales amounted to a staggering $663 per citizen in 2003.[1] Even in the state with the least patronized lottery, Montana, ticket sales per capita were $38. Since states typically retain about 45% of total sales, the contribution to budgets is enormous.

While states tout the benefits, typically to education, that are financed by lottery proceeds, the social costs of lotteries are more difficult to assess. There

[1] Sales as reported by the North American Association of State and Provincial Lotteries. Sales are lottery revenues inclusive of monies returned to players as prizes.

is widespread concern that the poor spend a larger fraction of their income on tickets than do the rich, and several studies indicate that lotteries are regressive. The states (and some economists) argue, however, that lotteries are simply a form of entertainment. For example, the New York State Lottery website advertises that, "The Lottery is fun. Entertaining. Exciting." According to this "entertainment hypothesis," lottery tickets are less of an investment, and more like a ticket admitting the purchaser to a short, real-life drama. From this perspective, poorer individuals may purchase more lottery tickets because they cannot afford higher-quality entertainment. However, a competing explanation posits that consumers, especially those in dire economic circumstances, see lotteries as a convenient and accessible tool for radically altering their standard of living, a government-run, financial "hail-mary strategy." In short, bad times may cause desperation and the desperate may turn to lotteries in an effort to escape hardship. Such behavior predicted by the "desperation hypothesis" would have the unfortunate effect of further lowering wealth in households with already declining fortunes.

While anecdotal evidence provides support for both hypotheses, it suggests that the poor are relatively more likely to see the lottery as a financial investment, and relatively less likely to play for entertainment. Survey respondents in California were about equally divided between whether they played the lottery for money or for fun (Los Angeles Times 1986).[2] However, among those with less than $30,000 in income, 25% more respondents cited money rather than fun, while the reverse was true for those with higher incomes. Moreover, a survey by the

[2] As described in Clotfelter and Cook 1990, pg. 109.

Consumer Federation of America and Primerica (1999) indicates that the poor are more likely to view the lottery as an effective financial investment tool. When asked what is your "best chance to obtain half a million dollars or more in your lifetime," 47% said "save and invest a portion of your income," while 27% of all respondents said, "win a lottery or sweepstakes." However, among respondents with incomes of $15,000 to $25,000, 45% chose a lottery while only 31% selected saving as the best opportunity to accumulate half a million dollars.

This study examines how lottery ticket expenditures vary with changes in economic conditions. Unlike previous studies of lottery participation, we focus on those around the poverty line in order to test the desperation hypothesis. Specifically, we regress per-capita ticket sales on the percentage of households below the poverty line using a panel dataset of lottery ticket sales for 39 states over 10 years. To test the competing entertainment hypothesis, we also regress per-capita movie ticket sales on the poverty rate. If poverty causes people to substitute cheaper entertainment for more expensive entertainment, then we might expect to see movie ticket sales rise as the poverty rate increases. Our results provide strong support for the desperation hypothesis and no support for the entertainment hypothesis. Lottery ticket sales rise with increases in the poverty rate, while movie ticket sales are uncorrelated with the poverty rate.

The paper proceeds as follows. The next section reviews prior literature on the demand for lotteries and the models of consumer behavior that motivate our hypotheses. Section 3 describes the data and Section 4 discusses our econometric approach and the results. Section 5 concludes with some policy implications of our findings.

2. Prior Literature on Lottery Demand

Research in economics examining participation in state lotteries has focused on three questions: (1) Who tends to play the lotteries? (2) How does lottery participation vary with income? And (3) why do individuals choose to buy lottery tickets? Regarding the first question, a variety of household surveys provide information about the demographic characteristics of lottery participants. Summarizing data from several of these surveys, Clotfelter and Cook (1990) report that men play more than women, catholics play more than protestants, and blacks and hispanics play more than non-hispanic whites. In addition, they report that lottery participation and age have a non-monotonic relationship, with middle-aged adults playing more than young adults (18-25 years old) or the elderly (those over 65), while lottery play decreases with education. One explanation for the negative relationship between education and lottery participation is that less educated consumers may be less able to evaluate accurately lottery probabilities (Hansen, Miyazaki, and Sprott 2000).

Of particular interest to policymakers is the relationship between income and lottery participation: in particular, whether lotteries are a form of regressive taxation. Clotfelter and Cook (1990) summarize survey data which indicate that for a broad range of incomes, there is no clear relationship between household income and likelihood of lottery play. However, many studies have found that lotteries are regressive because lower-income households spend a higher percentage of their income on lottery tickets. For example, Clotfelter (1979) finds that daily and weekly lotteries are regressive with elasticities of income less than one. Moreover, for daily lotteries, he finds that the elasticity of income is negative, implying that lottery sales are an inferior good. Using self-reported expenditure data on lottery winners in Illinois, Borg and Mason (1988) find that the income elasticity of demand is between 0 and 0.25, providing further evidence of regressivity. Interestingly, they find that the income elasticity is lowest for the lowest-income households in their sample. Hansen, Miyazaki, and Sprott (2000) use several years of county-level data on lottery sales and demographic characteristics in five different states to assess the relationship between income and lottery participation. In four out of five states, they find evidence that the lottery is regressive. Moreover, in Minnesota, they find that the elasticity of income is negative, providing additional evidence that lottery tickets are an inferior good.

While all of the above studies estimate cross-sectional ordinary least squares models, two studies employ more rigorous econometric techniques to control for the decisions of individuals to play the lottery or not. Using microdata on lottery participation from a survey of 676 Kentucky residents, Scott and Garen (1994) find no evidence that the lottery is regressive. In fact, they find no relationship between income and lottery expenditures. They do find, however, that the probability of participation increases with income up to $30,000, and then decreases with income exceeding $30,000. Additionally, they find that unemployment increases the probability of lottery participation, but reduces lottery expenditures conditional on participation.

Of particular interest to this study, Scott and Garen (1994) look at the impact of three variables indicating whether individuals receive public assistance. They find that individuals receiving AFDC and food stamps buy fewer lottery tickets, while those receiving Medicaid spend more on lottery tickets. However, the authors note that they have very few observations on individuals playing the lottery and receiving each of these forms of welfare, therefore they encourage caution in interpreting the results.

Finally, using microdata on participation in the UK National Lottery, Farrell and Walker (1999) also consider the nonlinear effect of income on lottery participation and expenditures. Consistent with Scott and Garen (1994), they find that income initially increases and then reduces lottery participation. However, Farrell and Walker find this same nonlinear relationship with lottery expenditures (both conditional on participation and unconditionally). Moreover, their results provide further evidence that the lottery is regressive, with income elasticities ranging from 0.01 to 0.45.

The regressivity of lotteries would be less troubling were it not for the additional concern that they exploit consumers' inability to rationally evaluate the expected value of a lottery ticket. This concern arises largely because the expected value of purchasing a lottery ticket is roughly one half the price of the ticket. Such a poor payout has prompted many to question why so many people buy lottery tickets, given that they display risk aversion in other settings (Clotfelter and Cook 1990).

There appear to be four primary explanations for why people play the lottery. The first explanation says that people buy lottery tickets for entertainment as well as for the opportunity to win prizes (Kearney 2002). As we show above, lotteries promote their entertainment value, emphasizing that it is fun to play. In addition, they also highlight the fact that the proceeds are used to support public education and other valued public goods (Clotfelter and Cook 1990).

A second explanation emphasizes cognitive biases and lack of information. Langer (1975, 1977) presents evidence for an "illusion of control," in which individuals believe that they can affect their chances of winning the lottery through the numbers that they choose. Kahneman and Tversky (1979) argue that individuals place too much weight on very low-probability events. In a typical lotto game, the odds against hitting the jackpot are several million to one (Clotfelter and Cook 1990). This means individuals may perceive the probability of winning the lottery to be several times larger than the true probability. In fact, the extant literature notes that lottery patrons tend to ignore the probability of winning, focusing instead on the size of the lottery prize (Forrest, Simmons, and Chesters 2002; Walker and Young 2001), and the frequency of drawings (Cook and Clotfelter 1991). Perhaps these cognitive biases are reinforced by lottery marketing mechanisms. In a sample of 151 TV and radio lottery ads in the biggest markets, only 12% mentioned odds of winning, while half mentioned dollar amounts of prizes (Clotfelter and Cook 1990). Of the 52 ads that portrayed a lottery player, two thirds showed at least one player winning (Clotfelter and Cook 1990).

Kearney (2002) considers both of these explanations as she examines the impact of lotteries on consumer behavior. She finds that lottery sales increase with the expected value of the lottery game, suggesting that consumers are able to properly evaluate the nature of the gamble. Additionally, she finds that consumers respond to non-wealth creating characteristics of the lottery games; consumers prefer picking more numbers to fewer numbers, and prefer older to newer games. As she notes, this latter result is consistent with the notion that consumers value the entertainment aspect of lotteries. Alternatively, this may indicate that consumers irrationally believe that these characteristics affect the likelihood of winning.

The third explanation comes from Friedman and Savage (1948), who use expected utility theory to address why people both play the lottery and buy insurance—seemingly inconsistent behaviors. The fourth explanation, which comes from prospect theory, argues that people who have suffered a financial shock may be more likely to play the lottery. The following section develops these last two explanations more fully, and examines how they apply to our particular focus on lottery participation by the poor.

2.1. Modeling Risky Choices

Several formal theories exist on why individuals play lotteries. Most prominently, Friedman and Savage (1948), attempting to explain how an individual may be risk averse enough to buy insurance, yet risk loving enough to purchase lottery tickets, proposed that utility of wealth functions must take on an inverted s-shape. This expected utility approach supposes that over lower levels of wealth a utility function will be concave, reflecting an aversion to risk, yet convex over higher levels of wealth, reflecting risk loving behavior. In the context of our paper, it is important to determine the behavioral implications over average wealth levels, versus those below the poverty level. According to this theory, an individual solves

$$\max_{L} U\left(X^{L}, P^{L}\right) = \sum u\left(x_{i}^{L}\right) p_{i}^{L}, \tag{1}$$

where L is the index of possible risky choices, X^L is a vector of money outcomes for lottery L, and P^L is a vector of probabilities associated with those outcomes. In the case of a lottery, there is typically a very small probability of a very large reward. A small price is charged for the chance to engage in the gamble, but enough that the expected value of the lottery is negative. This has been the dominant theory of risky choice for several decades, and Friedman and Savage's explanation of lottery behavior has received wide ranging support in the literature. A condition necessary for playing the lottery is

$$\Delta U = pu\left(w + x - k\right) + \left(1 - p\right) u\left(w - k\right) - u\left(w\right) > 0, \tag{2}$$

where w is the current level of wealth, x is the jackpot, p the probability of winning, and k is the price of a lottery ticket. If the price of a lottery is small, say one unit of wealth, and the probability of winning is small, we can approximate this inequality using

$$\Delta U \approx pu\left(w + x\right) > u'\left(w\right). \tag{3}$$

Let $w_l < w_h$ represent lower and middle wealth levels respectively. If poor individuals will play the lottery, but middle-income individuals will not, then

$$u'(w_h) > pu(w_h + x) > pu(w_l + x) > u'(w_l). \tag{4}$$

This implies that middle-income individuals have a higher marginal utility of wealth than poor individuals. As a result, demand for lottery tickets increases as wealth declines.

Prospect theory provides a substantially different explanation for the behavior described by Friedman and Savage. Kahneman and Tversky (1979) observed that individuals appear to exaggerate the pain from financial losses, leading them to take great risks to avoid or rebound from losses. On the other hand, the pleasure from financial gains are under emphasized, leading to more conservative behavior following an increase in financial well-being or when attempting to increase wealth. This type of behavior has become known as loss aversion. Loss averse behavior is often modeled using prospect theory, which supposes that individuals compare all outcomes to some reference level of wealth. Thus, no utility of wealth function is defined. Rather, the individual makes decisions according to a utility of gains or losses function as measured against the reference wealth. Kahneman and Tversky (1979) propose that individuals solve the following optimization

$$\max_L V\left(X^L, P^L|r\right) = \sum v\left(x_i^L|r\right)\pi\left(p_i^L\right), \tag{5}$$

where L is the index of possible risky choices, X^L is a vector of money outcomes for lottery L, P^L is a vector of probabilities associated with those outcomes, r is some reference level of wealth, often interpreted as the current wealth. The probability weighting function π is a function mapping the unit interval into the unit interval. This function represents a distortion of the probability distribution. The function is such that $\pi(p) > p$ is $p < \overline{p}$, and $\pi(p) < p$ is $p > \overline{p}$. Further, $\pi(0) = 0, \pi(1) = 1$, and $\pi'(0) < \pi'(1)$. The function v is given by

$$v(x|r) = \begin{cases} u_g(x-r) & \text{if} \quad x \geq r \\ u_l(x-r) & \text{if} \quad x < r, \end{cases} \tag{6}$$

Here, u_g is a concave function with $u_g(0) = 0$, and u_l is a convex function with $\lim_{x\downarrow 0} u_l(x) = 0$. Further, it is assumed that $\lim_{x\uparrow 0} u_l'(x) > \lim_{x\downarrow 0} u_g'(x)$, and thus individuals discount small losses heavily. The probability weighting function π is assumed to be increasing, exaggerating small probabilities and diminishing larger probabilities. In the case of a standard state lottery, a ticket will be purchased if

$$\Delta V = \pi(p) u_g(w-r+x-k) + \pi(1-p) v(w-k|r) - v(w|r) > 0, \tag{7}$$

where w is the current level of wealth, and k is the price of a lottery ticket. Prospect theory makes no real distinction between the behavior of rich and poor. Rather, it suggests that differences in behavior will derive from whether individuals are above or below their reference level of wealth. The reference level of wealth is more stable than wealth itself, and hence when individuals face negative income shocks, we would expect them to be more likely to play the lottery. To see this, if an individual is below his reference level of wealth, then we can replace v with u_l in the left hand side of 7. We can find the effect of a negative shock by taking the derivative of the left hand side of 7 to obtain

$$\frac{\partial \Delta V}{\partial w} = \pi(p)\, u_g'(w - r + x - k) + \pi(1-p)\, u_l'(w - k - r) - u_l'(w - r). \tag{8}$$

Because the price of lottery tickets should be small relative to changes in wealth, we can approximate this as

$$\frac{\partial \Delta V}{\partial w} \approx \pi(p)\, u_g'(w - r + x - k) - (1 - \pi(1-p)) u_l'(w - r). \tag{9}$$

This must be less than zero if the shock in wealth is relatively small compared to the possible lottery winnings, and if p is small. To see this, note that u_g is concave and thus has a declining slope. For the size of prize involved in lotteries, the marginal utility of wealth should be close to zero. Alternatively, the slope of u_l is increasing as w approaches r. Thus, if w is close enough to r, $u_l'(w - r) > u_g'(w - r + x - k)$. Because $\pi'(0) < \pi'(1)$, $\pi(p) < 1 - \pi(1-p)$ if p is small enough. Thus, increasing the distance between current wealth and reference wealth can lead an individual to play a lottery they otherwise would not. If an individual falls below the poverty line (decrease in w), he will be more likely to play the lottery until he either returns to his reference wealth, or adjusts his reference wealth downward.

If individuals behave consistently with prospect theory, we expect to find increases in lottery sales as individuals face negative income or wealth shocks.[3] This means that lotteries should behave as an inferior good, decreasing in ticket sales as income increases. In the following section, we examine the empirical relationship between poverty and lottery participation, and we compare this to the relationship between poverty and entertainment consumption.

3. Data

We employ three data sources. First, we use an annual panel of 39 state lottery ticket sales totals from 1990 to 2002.[4] The figures represent dollars crossing the counter from consumers to lottery sales agents. Some of those dollars are then returned to players as winnings. The difference between sales revenue and winnings is the "handle" in industry terms. Because the payout percentage is typically set by state law and static, total sales figures and the "handle" should be extremely collinear and this is borne out in our data. We obtained the data from Christiansen Capital Advisors (CCA) LLC, a consulting firm specializing in

[3] Ideally, we would like to distinguish between income and wealth. In practice, however, our data include only income measures. Because individuals with very low incomes typically have little savings, we believe income changes to be closely correlated with changes in perceived wealth. Furthermore, we have done our analysis using levels of household receiving welfare, a more direct measure of wealth. We find very similar results. However, because welfare qualification rules changed during the time period of the panel, we believe the poverty rate is a more consistent measure of households facing economic hardship.

[4] Including the District of Columbia, four of the 39 states introduced a lottery during the time period of our panel. No state ended its lottery. We use an unbalanced panel in our analysis. However, our results change very little if we limit our sample to a balanced panel of only states with a lottery throughout the study period.

the gaming industry. CCA gathered the data from primary state lottery board sources.

Second, we use several government datasets to control for demographic and economic changes at the state level. We used state-year household poverty rates and other demographic characteristics (race, marital status, age, education, etc.) from the United States Bureau of Labor Statistic's (BLS) March supplement of the Current Population Survey. Further, we use the BLS annual seasonally adjusted measure of state unemployment. Finally, we employ data on state tax revenues published by the U.S. Census Bureau.[5]

Third, to test the entertainment hypothesis, we obtained annual state movie box office sales from Nielsen EDI, a division of ACNielsen that specializes in motion picture industry data. Nielsen EDI collects box office sales figures through electronic reporting from cinemas nationwide. Data are available from 1991 to 2002.

Table 1 shows our three key variables: lottery sales, the poverty rate, and box office sales, by state for 2002. Table 2 displays descriptive statistics for these variables averaged across all states by year. Table 3 shows the correlation of key demographic variables.

It is important to note that our data are aggregate and do not reveal which individuals purchased lottery tickets. Therefore, we cannot link individuals' eco-

[5]Because of small sampling issues in its annual survey, BLS recommends that researchers use 3-year moving averages when comparing CPS poverty rates across states. We have performed all of our estimations with both annual and 3-year averages and find very little difference in the outcome. The results reported here are based on annual data.

nomic conditions with their lottery consumption. Instead, we relate state-level economic conditions to state-level lottery sales. We discuss the limitations of this approach in the next section.

4. Methods and Results

We first test the desperation hypothesis by regressing state lottery sales on state poverty rates:

$$lottery\_sales\_per\_capita_{it} = \beta_1 poverty\_rate_{it} + X_i \beta_{it} + \alpha_i + \lambda_t + \epsilon_{it} \qquad (10)$$

where X_i represents a vector of state demographic factors, α_i is a fixed effect capturing the static unobservables of state i, λ_t is an indicator for year t, and ϵ_{it} is an error term.

Column 1 of Table 4 displays the results of this estimation. The coefficient on the poverty rate, 230.088, suggests that per-capita lottery sales increase about $2.30 for each one percentage point increase in the poverty rate.

Although the fixed effect α_i controls for time-invariant, unobserved state characteristics, it is likely that time-varying demographic characteristics such as age and education are correlated with both poverty and lottery participation. Similarly, other measures of household economic conditions including income and unemployment are certainly correlated with both poverty and lottery participation. In order to more precisely test the desperation hypothesis, Column 2 of

Table 4 controls for state per-capita disposable income and the state unemployment rate, as well as other demographic characteristics including age, eduction, percent white and black, percent married, percent with children, and percent female headed households. By including income as well as unemployment, we are able to separate the impact of poverty from the overall impact of income on lottery consumption.

The inclusion of these variables has little impact on the effect of the poverty rate. At the same time, lottery sales increase with disposable income and decrease with the unemployment rate. This suggests that while lottery tickets are an inferior good over the whole range of income, lottery tickets generally are a normal good—consumers tend to buy more tickets as their income increases. This is consistent with the desperation hypothesis, which would not be expected to apply to individuals at middle and upper income levels. The negative relationship between unemployment and lottery sales is interesting, as it directly contradicts the prediction generated by prospect theory, that individuals become more risk loving when they suffer a financial shock. Combined with the positive effect of the poverty rate and the positive effect of income, these results suggest that it is a financial shock that pushes an individual into poverty that triggers the desperation, which leads to increased lottery consumption.

Although the results of Table 4 are consistent with the desperation hypothesis, they are also consistent with the entertainment hypothesis. Substitution of lottery tickets for more expensive entertainment suggests a much more benign explanation for our findings: consumers economizing on their entertainment expenditures, rather than desperate individuals pursuing a hail-mary strategy. To test this possibility, we examine the relationship between movie ticket sales and the poverty rate. To the extent that movies also provide affordable entertainment, we should expect box office sales to also increase with poverty if consumers are simply seeking inexpensive entertainment.[6,7] Columns 1 and 2 of Table 5 consider this possibility. Column 1 shows the effect of poverty on box office sales, which is near zero. In other words, we find no evidence that poor consumers increase their consumption of movie tickets when their incomes decline. At the same time, the strong positive effect of disposable income remains, confirming movies to be a normal good. Column 2 conditions the relationship between poverty and lottery sales on movie box office sales. Specifically, we include box offices sales as a regressor capturing variation in entertainment consumption. The inclusion of a movie box office control has little effect on our results, suggesting that the desperation hypothesis is invariant to the entertainment value of lottery play.

Another alternative explanation for our findings could be unobservable efforts by states to promote lotteries during budget shortfalls. If budget shortfalls were driven by negative economic shocks that also increased the poverty rate, our es-

[6]Indeed, there is evidence that low-income households attend movie theaters. For example, the Census Bureau reports that in 1997, when the poverty line for a family of four was about $16,000, 46% of households with incomes between $10,000 and $20,000 attended a movie theater.

[7]The identifying assumption here is that poor individuals substitute both lottery tickets and movies for more expensive forms of entertainment. It does not require that the same individuals purchase both lottery tickets and movie tickets. Lancaster (1966) in his theory of demand proposes that consumers derive utility from the basic characteristics of goods, such as their entertainment value. Goods that provide similar basic characteristics will thus operate as substitutes in consumption. Exogenous factors increasing the consumption of entertainment should affect both lottery and movie ticket sales if both are forms of entertainment.

timation of the effect of poverty would be inconsistent. To check this possibility, Column 3 of Table 5 includes the log of state tax revenues from all sources. Because we expect tax revenues to respond to changes in population, we also include the log of state population.[8] The effect of poverty remains strongly positive. Interestingly, lottery sales decrease with increases in tax revenue. One explanation for this finding could be that states choose to promote lotteries more when tax revenues decline and additional government income is most needed. Although we cannot conclude this from our limited analysis, the possibility warrants further research.

Our results so far show that lottery tickets are generally a normal good, but are an inferior good around the wealth level of the poverty line. Our measure of the poverty rate includes households on the edge of poverty as well as those below the line. Table 6 splits the poverty rate into the percentage below and above 50% of the poverty income level. Column 1 shows the estimation using the standard BLS poverty rate definition for reference, Column 2 displays the effect of just the percentage of the population below 50% of the poverty line, and Column 3 includes both those above and below the 50% mark. The magnitude of the effect of those in "extreme" poverty in isolation is much lower than the overall poverty effect and insignificant. One explanation could be that the number of individuals in extreme poverty is insufficient to generate a measurable effect on

[8]Another approach would be to regress on per-capita tax revenue. Because some state expenses, such as highway maintenance, may respond slowly to population changes, we believe total tax revenue to be the more relevant measure of state financial health. However we have estimated regressions using both measures. The coefficient of per-capita tax revenue is near zero.

overall sales, even if a true relationship between extreme poverty and lottery sales exists. Alternatively, the small measured effect could be due to the strong correlation between the two poverty measures. When both measures are included, the effect of extreme poverty falls by about half, whereas the effect of those above the 50% mark remains consistent with the overall poverty measure. In general, the evidence suggests that it is those in the upper end of poverty who are affecting lottery sales. This explanation is consistent with the constraints of consumers' budgets—if income falls into the realm of extreme poverty, it may be insufficient to permit the purchase of large numbers of lottery tickets. In addition, individuals in extreme poverty are likely to come from the ranks of those already in poverty and already desperate. As a result, moving from the upper half to the lower half of the poverty distribution is unlikely to result in a substantial increase in risk-taking behavior.

As noted above, we use state-level data that does not identify individuals buying lottery tickets. As a result, we cannot directly link household economic conditions with lottery consumption. This limitation allows for an alternative explanation for the positive relationship between poverty and lottery sales: changes in poverty rates could be correlated with changing demographic characteristics that increase in lottery consumption. Although we include most of the demographic characteristics that previous research has shown to predict lottery consumption, it is still possible that unobserved changes in the make-up of poor could affect lottery sales. However, it seems unlikely that the composition of those in poverty would systematically change to yield the results that we observe. Nonetheless, one would need panel microdata on a large random sample with sufficient observations of individuals moving into and out of poverty to conclusively rule out this alternative explanation. Unfortunately, we are not aware of the existence of such a dataset.

5. What have we learned?

Two explanations may account for the widely observed phenomenon that the poor spend a disproportionate amount of their income on lottery tickets. First, lower-income individuals may substitute lottery play for more expensive forms of entertainment. Second, low-income consumers may view lotteries as a convenient and otherwise rare opportunity for radically improving their standard of living. Bad times may cause desperation and the desperate may turn to lotteries in an effort to escape hardship. Our study tests these two competing hypotheses. We find no evidence to support the former entertainment hypothesis. In contrast, we find strong and robust evidence in support of the desperation hypothesis.

In relation to established theories of consumer behavior under uncertainty, our results are consistent with Friedman and Savage and partly consistent with prospect theory. On one hand, the findings support prospect theory because negative income shocks that result in poverty increase lottery ticket sales. On the other hand, the evidence counters prospect theory because negative shocks to employment and average income do not increase lottery sales. In sum, the reference level of wealth at which a shock occurs matters.

Finding that desperation motivates lottery consumption by the poor has some troubling policy implications. Although it is understandable that state officials emphasize benevolent explanations for why people play the lottery, our results suggest that these explanations do not apply to the poor. Rather than seeking fun and exciting entertainment, the poor appear to play because of an ill-conceived belief that participation will improve their financial well being. This cost to the poor must be carefully balanced against the benefits of lottery revenue.

Finally, the results indicate that it is individuals falling just below the poverty line that contribute the largest increase to lottery sales. This observation suggests that lottery participation is strongest among those in poverty who seemingly have the greatest chance of escaping it. With its low expected return, lottery participation may be a factor tending to frustrate policy efforts to lift the poor out of poverty.

References

Borg, Mary O., and Paul M. Mason (1988): "The Budgetary Indidence of a Lottery to Support Education," *National Tax Journal*, 41(1), 75–82.

Clotfelter, Charles T. (1979): "On the Regressivity of State-Operated "Numbers" Games," *National Tax Journal*, 32(4), 543–548.

Clotfelter, Charles T., and Philip J. Cook (1990): "On the Economics of State Lotteries," *The Journal of Economic Perspectives*, 4(4), 105–119.

Consumer Federation of America and Primerica (1999): "New Study: Typical American Household Has Net Financial Assets of $1000," Press release.

Cook, Philip J., and Charles T. Clotfelter (1991): "The Peculiar Scale

Economies of Lotto," Working Paper 3766, National Bureau of Economic Research, Cambridge, MA.

Farrell, Lisa, and Ian Walker (1999): "The Welfare Effects of Lotto: Evidence from the UK," *Journal of Public Economics*, 72(1), 99–120.

Forrest, David, Robert Simmons, and Neil Chesters (2002): "Buying a Dream: Alternative Models of Demand for Lotto," *Economic Inquiry*, 40, 485–496.

Friedman, Milton, and Leonard J. Savage (1948): "The Utility Analysis of Choices Involving Risk," *Journal of Political Economy*, 56, 279–304.

Hansen, Ann, Anthony D. Miyazaki, and David E. Sprott (2000): "The Tax Indidence of Lotteries: Evidence from Five States," *The Journal of Consumer Affairs*, 34(2), 182–203.

Kahneman, Daniel, and Amos Tversky (1979): "Prospect Theory: An Analysis of Decision under Risk," *Econometrica*, 47(2), 263–292.

Kearney, Melissa Schettini (2002): "State Lotteries and Consumer Behavior," Working Paper 9330, National Bureau of Economic Research, Cambridge, MA.

Lancaster, Kelvin J. (1966): "A New Approach to Consumer Theory," *Journal of Political Economy*, 2(74), 132–157.

Langer, Ellen J. (1975): "The Illusion of Control," *Journal of Personality and Social Psychology*, 32, 311–328.

——— (1977): "Psychology of Chance," *Journal for the Theory of Social Behavior*, 7(2), 185–207.

Los Angeles Times (1986): *Poll 104*.

Scott, Frank A., and John E. Garen (1994): "Probability of Purchase, Amount of Purchase, and the Demographic Indidence of the Lottery Tax," *Journal of Public Economics*, 54(1), 121–143.

Walker, Ian, and Juliet Young (2001): "An Economist's Guide to Lottery Design," *Economic Journal*, 111(475), 700–722.

A. Tables

Table 1: Descriptive statistics for 2002

state	lottery sales	poverty rate	box office sales
Arizona	54.03	0.14	31.31
California	86.28	0.13	35.44
Colorado	88.14	0.10	31.31
Connecticut	255.20	0.08	28.12
Delaware	145.22	0.09	27.50
District of Columbia	369.81	0.17	29.45
Florida	162.48	0.13	28.18
Georgia	286.13	0.11	19.83
Idaho	71.12	0.11	21.36
Illinois	124.30	0.13	23.31
Indiana	101.69	0.09	16.75
Iowa	59.12	0.09	13.50
Kansas	74.31	0.10	20.47
Kentucky	160.10	0.14	16.16
Louisiana	68.47	0.17	16.81
Maine	122.03	0.13	15.63
Maryland	244.49	0.07	25.32
Massachusetts	655.47	0.10	32.35
Michigan	170.31	0.12	25.44
Minnesota	75.13	0.06	25.61
Missouri	103.16	0.10	22.36
Montana	33.39	0.14	17.91
Nebraska	146.47	0.11	19.48
New Hampshire	168.51	0.06	17.50
New Jersey	249.72	0.08	27.03
New Mexico	71.96	0.18	23.31
New York	248.13	0.14	29.21
Ohio	174.18	0.10	19.92
Oregon	90.58	0.11	24.61
Pennsylvania	156.80	0.09	20.08
Rhode Island	193.51	0.11	19.55
South Carolina	176.99	0.14	17.61
South Dakota	34.53	0.12	18.11
Texas	138.25	0.16	24.54
Vermont	132.96	0.10	10.47
Virginia	151.92	0.10	26.84
Washington	72.27	0.11	29.66
West Virginia	114.83	0.17	10.74
Wisconsin	78.58	0.09	20.70

Table 2: Descriptive statistics by year, 1990-2002. Box office sales figures are only available from 1991.

Lottery sales

year	freq.	mean	min	max	s.d.
1990	34	95.30	19.09	259.59	59.88
1991	35	95.01	29.13	267.33	58.24
1992	36	104.27	30.36	309.58	60.10
1993	37	118.92	38.05	375.91	70.41
1994	37	132.07	36.93	434.28	81.54
1995	37	138.33	37.27	463.65	85.99
1996	38	136.81	35.00	497.64	91.05
1997	38	137.35	31.42	507.29	93.45
1998	38	139.65	33.01	514.25	94.84
1999	38	140.36	33.43	542.52	99.67
2000	38	142.19	31.29	610.98	107.49
2001	38	143.72	30.51	614.87	108.00
2002	39	151.55	33.39	655.47	111.33

Poverty rate

year	freq.	mean	min	max	s.d.
1990	34	0.12	0.06	0.21	0.03
1991	35	0.13	0.07	0.19	0.03
1992	36	0.14	0.08	0.25	0.04
1993	37	0.14	0.09	0.26	0.04
1994	37	0.13	0.08	0.26	0.04
1995	37	0.12	0.05	0.22	0.04
1996	38	0.13	0.06	0.25	0.04
1997	38	0.13	0.08	0.22	0.04
1998	38	0.12	0.07	0.22	0.04
1999	38	0.11	0.07	0.21	0.03
2000	38	0.11	0.05	0.17	0.03
2001	38	0.11	0.06	0.18	0.03
2002	39	0.11	0.06	0.18	0.03

Box office sales

year	freq.	mean	min	max	s.d.
1991	35	10.84	3.88	26.42	4.55
1992	36	11.37	4.69	24.93	4.10
1993	37	12.44	4.59	27.02	4.49
1994	37	13.13	5.92	25.74	4.19
1995	37	13.81	6.31	27.43	4.44
1996	38	14.41	6.45	27.24	4.48
1997	38	15.65	6.52	29.97	5.18
1998	38	17.94	7.98	27.93	4.93
1999	38	19.47	9.54	30.06	5.21
2000	38	19.25	9.12	30.05	5.27
2001	38	20.23	9.12	32.66	5.79
2002	39	22.65	10.47	35.44	6.03

Table 3: Correlation table.

	lottery sales	box office sales
lottery sales	1.0000	
box office sales	0.4263	1.0000

	poverty rate	above 50% poverty	below 50% poverty	unemployment rate	disposable income
poverty rate	1.0000				
above 50% poverty	0.9616	1.0000			
below 50% poverty	0.8700	0.7014	1.0000		
unemployment rate	0.5792	0.5646	0.4902	1.0000	
disposable income	-0.3432	-0.4643	-0.0572	-0.2951	1.0000

Table 4: Effect of poverty on lottery sales per capita. Year and state indicators are included but not reported.

	lott. sales per capita	lott. sales per capita
	(1)	(2)
Per. below poverty	230.088 (89.037)**	244.959 (92.956)**
Per. white		-184.385 (107.152)
Per. black		187.156 (105.93)
Per. male		166.698 (216.834)
Per. married		-219.19 (151.505)
Per. w/ children		7.695 (28.105)
Per. female head of household		-53.039 (218.792)
Average age		-4.212 (69.808)
Average age squared		.084 (.776)
Per. w/ less than high school education		-53.988 (112.496)
Per. w/ high school education but no college		65.558 (98.726)
Disposable income per capita		17.389 (2.475)**
Unemployment rate		-726.591 (196.339)**
Obs.	483	483
R^2	.319	.446
F statistic	15.501	13.472
No. states	39	39

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 5: Estimations controlling for entertainment value of lottery purchases and state tax revenues. Year and state indicators are included but not reported.

	movie sales per capita	lott.s̃ales per capita	lott.s̃ales per capita
	(1)	(2)	(3)
Per. below poverty	-3.042 (4.81)	192.31 (90.688)*	363.146 (90.82)**
Movie sales per capita		-1.809 (.959)	
Per. white	-27.96 (5.498)**	-244.56 (107.014)*	-156.442 (117.488)
Per. black	-4.227 (5.364)	167.235 (101.16)	92.541 (113.264)
Per. male	-25.044 (11.176)*	171.859 (211.967)	267.951 (221.395)
Per. married	4.364 (7.922)	-238.515 (149.345)	-47.06 (152.146)
Per. w/ children	1.929 (1.444)	28.508 (27.279)	2.131 (23.186)
Per. female head of household	-8.427 (11.29)	-69.45 (212.892)	180.654 (222.567)
Average age	5.613 (3.589)	8.191 (67.843)	15.821 (71.8)
Average age squared	-.066 (.04)	-.069 (.754)	-.183 (.798)
Per. w/ less than high school education	29.714 (5.929)**	13.836 (115.294)	87.88 (107.273)
Per. w/ high school education but no college	3.22 (5.056)	49.731 (95.319)	-14.05 (98.918)
Disposable income per capita	.353 (.13)**	15.699 (2.478)**	6.743 (1.182)**
Unemployment rate	8.977 (10.207)	-822.639 (192.535)**	-819.327 (148.349)**
Log total taxes			-7.883 (4.021)*
Log population			-169.148 (45.572)**
Obs.	449	449	470
R^2	.908	.434	.388
F statistic	157.996	11.819	17.595
No. states	39	39	38

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 6: Effect of extreme poverty on lottery sales. Year and state indicators are included but not reported.

	lott. sales per capita	lott. sales per capita	lott. sales per capita
	(1)	(2)	(3)
Per. below poverty	244.959 (92.956)**		
Per. under 50% of poverty line		110.364 (192.314)	55.458 (191.751)
Per. in upper 50% of poverty range			318.03 (113.217)**
Per. white	-184.385 (107.152)	-221.419 (107.175)*	-184.444 (107.117)
Per. black	187.156 (105.93)	180.218 (106.777)	192.471 (105.999)
Per. male	166.698 (216.834)	188.791 (218.814)	179.565 (217.061)
Per. married	-219.19 (151.505)	-208.769 (152.665)	-224.52 (151.529)
Per. w/ children	7.695 (28.105)	16.949 (28.16)	8.293 (28.1)
Per. female head of household	-53.039 (218.792)	10.864 (219.489)	-49.049 (218.748)
Average age	-4.212 (69.808)	-10.274 (70.328)	-4.616 (69.785)
Average age squared	.084 (.776)	.149 (.782)	.09 (.776)
Per. w/ less than high school education	-53.988 (112.496)	16.851 (111.655)	-43.704 (112.827)
Per. w/ high school education but no college	65.558 (98.726)	86.916 (99.2)	65.33 (98.694)
Disposable income per capita	17.389 (2.475)**	17.515 (2.499)**	17.549 (2.478)**
Unemployment rate	-726.591 (196.339)**	-649.214 (196.952)**	-712.737 (196.657)**
Obs.	483	483	483
R^2	.446	.437	.447
F statistic	13.472	13.002	13.011
No. states	39	39	39

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%