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Are Voting and Buying Behavior Consistent? An Examination of the South Carolina Education Lottery

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This article uses voting and sales data from the South Carolina Education Lottery to test whether the vote for a new lottery is driven by latent demand for lottery products or whether it reflects free-riding behavior or other public finance considerations. Including the predicted component of the lottery vote adds no explanatory power to a lottery sales regression. Given the dissimilarity of coefficients between vote and sales regressions, we conclude that there are significant differences in individuals' voting and buying behaviors. We find that the lottery vote is significantly higher in counties with underperforming schools and in counties along the state's borders, where cross-border shopping is an issue. We conclude that much of the variation in the vote is driven by these public finance issues. Finally, we discover that creation of the South Carolina lottery drew substantial revenues from North Carolina shoppers and stemmed an outflow of revenue to Georgia.

Keywords: *lottery; voting behavior; cross-border shopping*
JEL Classifications: *H71; H75*

1. Introduction

The past twenty years have witnessed the proliferation of state-operated lotteries. Often, the establishment of a licit market for lottery tickets is preceded by a popular vote on the issue. This naturally begs the question of whether the same characteristics that determine persons' voting behavior are reflected ex post in their lottery ticket–purchasing behavior. One way to examine this is to simply question whether the individuals who

vote in favor of the lottery are the same individuals who buy lottery tickets. On one hand, if voters wish to play, then characteristics should be similar across the two groups, and the vote for the lottery occurs because there is a latent demand for the product. On the other hand, individuals may vote for the lottery simply as an alternative to taxes; thus, they may be able to pass some of their own tax burden to individuals who choose to play. Understanding the intentions of voters in the establishment of a lottery is an important part of evaluating the impacts of a state-run lottery on its citizens. If players indeed vote to create the lottery, the state is simply providing a product desired by its citizenry. If, however, voters are using the lottery to pass taxes onto others, the state is assisting in that effort.

This article uses voting and sales data from the South Carolina Education Lottery (SCEL), which was established in 2000, to examine these issues. Using county-level demographic and economic information, the study looks for similarities between voting and buying behavior. Although some aspects of behavior in both political and economic markets display consistency, there exist clear distinctions between the two.

2. Prior Studies of State Lotteries

Early research on the economic effects of lotteries concentrated on the regressive nature of the lottery tax (Clotfelter 1979; Clotfelter and Cook 1987). More current research can be divided into two issues: those examining a state's adoption of a lottery (in particular, the timing of a lottery's adoption) and those interested in determining the factors that determine the demand for lottery products.

2.1. Lottery Adoption

Much of the analysis concerning lottery adoption focuses on the factors that affect legislator incentives. These include economic variables such as the fiscal health of the state government, along with general characteristics that reflect the preferences of their constituents, such as religious beliefs. For example, in an early study by Filer, Moak, and Uze (1988), the authors used a model of rational legislator behavior to examine the pattern

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of lottery adoption across the United States. Specifically, the authors estimate a probit model of lottery adoption and a Tobit model to analyze the timing of lottery adoption. They find that states with a heavy tax burden are more likely to adopt lotteries, and those states adopt them earlier than states with relatively lower tax burdens. In addition, they find that states with a lower percentage of households in poverty are more likely to adopt a lottery. Factors such as the education levels or religious beliefs of the population were not found to significantly alter the likelihood or timing of lottery adoption. Last, unlike later studies, Filer, Moak, and Uze did not find a relationship between one state's decision to adopt a lottery and the presence of a lottery in a bordering state.

In another early study by Martin and Yandle (1990), the authors estimated lottery adoption as a function of per capita income, state debt per capita, tax burden, police costs per capita, and religious beliefs. They find a positive relationship between per capita income and lottery adoption, which they interpret as a desire of those with higher income to redistribute income in their favor. Fiscal health (as measured by the amount of debt in a state) is shown to be inversely related to the adoption of lotteries; however, it also appears that legislators adopt lotteries to keep tax rates low. Finally, the greater the proportion of the state's population with conservative religious beliefs, the lower the likelihood of lottery adoption.

Alm, McKee, and Skidmore (1993), and two studies by the same set of authors (Caudill et al. 1995; Mixon et al. 1997), used discrete-time hazard models to examine the timing of lottery adoption. Each concludes that neighboring state lottery competition appears to play a significant role in lottery adoption, confirming the results of Stover (1990), who concluded that contiguous state lotteries are substitutes for one another. Furthermore, Alm, McKee, and Skidmore determined that a state's fiscal health, namely, its short-term debt per capita, is an important factor that influences the introduction of a state lottery.

Erekson et al. (1999) also focused on the fiscal health of a state in their analysis of lottery adoption. Two separate indicators of fiscal health are used—a one-year lagged variable equal to state revenues minus expenditures divided by expenditures, and several gauges of adjustments in the state's tax base as measured by changes in manufacturing, service, and government services earnings per capita. As expected, the authors found that lottery adoption is inversely related to a state's fiscal health. Other independent variables, such as income per capita, religion, and an indicator variable that a neighboring state has a lottery, all have the predicted signs and are statistically significant.

2.2. Lottery Demand

As mentioned above, another focus of the lottery literature has been the factors that influence lottery play. Scott and Garen (1994) examined both the probability that an individual plays the lottery along with the level of lottery expenditures using a sample of Kentucky households. Using a maximum likelihood estimation two-step procedure developed by Heckman (1979), they found that prior gambling experience, unemployment, and being Catholic all raise the probability of playing the lottery. In general, higher education, being married, or being a Neofundamentalist Protestant reduces the likelihood that an individual is a lottery player. Both age and income have positive but declining effects on the probability of lottery play, reaching maximums at age 25 and an income of $30,000.

Interestingly, Scott and Garen found little impact of these same independent variables on an individual's level of lottery play. Previous gambling experience, marital status, age, income, education, and religion all have statistically insignificant effects on the amount an individual spends on the lottery, controlling for the probability that he or she plays the lottery at all. Although race had no impact on the probability of play, the authors also found that nonwhites have higher lottery expenditures than whites. Thus, according to the results in this study, the factors that determine the demand for lottery play depend on how *demand* is defined. The variables that impact whether an individual is a lottery player are not the same as those that determine how many lottery tickets he or she purchases in a given period of time.

Using data from Texas, Price and Novak (1999, 2000) estimated the demand for three lottery games in 1994 (Lotto, Pick 3, and instant). In these analyses, the authors found that key economic and demographic variables have differing effects on the demands for these three products.[1] For example, per capita income and the proportion of the population with a college degree both have a positive and significant impact on per capita sales of Lotto tickets, but a negative and significant effect on sales of instant tickets. A higher median age raises instant ticket sales, but lowers the sales of Lotto and Pick 3 games. As the male-female ratio rises, sales of Lotto tickets rise, whereas purchases of Pick 3 games fall. There is no effect of gender on the sales of instant games.

Price and Novak also found that race appears to have interesting effects. As the proportion of the population that is African American rises, sales of Pick 3 and instant games rise, whereas the sales of Lotto tickets fall. A larger Hispanic population increases purchases of instant tickets but has no impact on sales of the other two games.

Rubenstein and Scafidi (2002) are also concerned with the distributional effects of the lottery. To examine these effects, however, they considered both household purchases of lottery tickets along with the receipt of educational benefits (in the form of scholarships, prekindergarten, and education infrastructure) from lottery revenues. Like Scott and Garen (1994), Rubenstein and Scafidi used the Heckman two-step approach to estimate household lottery expenditures. They found that income is positively related to the likelihood of playing the lottery but has no statistically significant impact on lottery expenditures. Accordingly, higher education and regular church attendance lower the probability that an individual plays the lottery, but also have no effect on lottery spending. Their results on race match those of Scott and Garen—nonwhites had significantly larger expenditures on the lottery, but race had no significant effect on the probability of play.

2.3. Lottery Adoption and Demand

To date, only Hersch and McDougall (1989) and Giacopassi, Nichols, and Stitt (2006) have studied the adoption of a state lottery jointly with the determinants of lottery demand. Hersch and McDougall used data from the Kansas lottery to measure the extent to which voter preferences for a lottery (through a referendum) are related to the desire to purchase lottery tickets. Using countywide voting and sales data, the authors concluded that the several of the determinants of voting and buying are not the same. Counties with large conservative religious adherents were less likely to vote in favor of the lottery. Although per capita income seemingly had no effect on lottery voting behavior, income distribution did. In fact, Hersch and McDougall (1989, 34) concluded "that, relative to 'lower middle income' households, the other income classes favored the passage of the lottery." In the estimated sales equations, however, religion appears to have no influence, and the income distribution variables provide mixed results.

Using data from the Tennessee Education Lottery, Giacopassi, Nichols, and Stitt (2006) concluded that voting patterns are similar to shopping patterns and that the lottery vote reflects latent demand for the lottery. Furthermore, they found positive and significant cross-border shopping effects for one neighboring state without a lottery, and negative and significant cross-border shopping effects for neighboring states that offer their own lotteries.

Our study takes a similar approach to examine voting behavior and lottery purchases in South Carolina. We attempt, however, to improve on

these studies in three ways. First, because the dependent variable is the percentage of votes in a county in favor of the lottery (which can only vary from zero to 100), we transform the dependent variable to logit form and use two-stage weighted least squares rather than ordinary least squares (OLS) when estimating the determinants of voting behavior. Second, because there may be unobserved factors that systematically influence the behavior of individuals who reside in the same region of the state, we test and control for spatial correlation. Finally, our study incorporates a local school performance measure as an explanatory variable that allows us to test the hypothesis that some individuals vote for a lottery in hopes of reaping rewards from others' play.

3. Background

The SCEL was established by voter referendum in the fall of 2000. At the time of the lottery vote, gambling was not new to South Carolina. From the late 1980s through the end of the 1990s, video poker thrived in the state. Responding to pressure from antigambling groups, however, the state legislature scheduled a November 1999 referendum on eliminating video poker. The referendum never took place; instead, a decision by the South Carolina Supreme Court effectively banned video poker beginning in July 2000. Thus, at the time of the lottery referendum, the only form of legalized gambling in the state had been shut down.

The idea of creating a lottery in South Carolina picked up steam during the 1998 gubernatorial race. Democratic candidate Jim Hodges, a state representative, chose education as the theme of his campaign. In 1997, South Carolina high school students had the lowest SAT average in the country. Hodges blamed this poor showing on his incumbent opponent, Republican David Beasley. The major platform in Hodges's campaign was the creation of a lottery to rescue the state's failing schools. Hodges became the first candidate to beat an incumbent governor in South Carolina since 1876.

After his election, Hodges pushed legislators to create a voter referendum on the lottery. To increase public support, Hodges began calling the proposed lottery the "education lottery."[2] The referendum concerning the SCEL was set for November 2000. Prolottery and antigambling groups collectively targeted a total of $2 million to spend on advertising and promotion prior to the vote. Antilottery advertisements generally focused on morality issues. Prolottery advertisements, however, centered on the need

for funds to improve the state's education system and on the issue of cross-border shopping. One popular set of prolottery ads featured "Bubba," a convenience store clerk in Georgia, thanking South Carolina residents for boosting education funds in the state of Georgia by playing the Georgia Lottery.[3]

4. Empirical Estimation

4.1. The Lottery Vote

The SCEL was approved by constitutional referendum in 2000 and implemented shortly thereafter. In contrast to other education lotteries, the legislation establishing the lottery contains substantive measures to ensure that lottery revenues supplement, rather than replace, general fund tax revenues earmarked for education.[4] As indicated in table 1, the overall lottery vote leaned substantially in favor of passage (56 percent). But South Carolina's forty-six counties differed markedly in their support for the measure, with the vote ranging from 88 percent in favor at the upper limit to only 41 percent in favor at the lower bound. Despite the substantial overall margin in the South Carolina referendum and the general proliferation of state lotteries nationwide, approval of the SCEL was uncertain right up until the date of the lottery vote. In nearby Alabama, voters rejected a lottery just one year before the South Carolina vote, and North Carolina failed to establish a referendum on the same question.[5]

Differences in voter preference for the lottery may reflect both social and economic considerations. At first glance, the decision to vote for a lottery can most easily be attributed to a latent demand to play the lottery; the stronger the aggregate desire to play, the greater the popular approval should be. But other factors may account for a vote in favor: those with no interest in playing the lottery may vote in favor of its establishment in hopes that lottery revenue will supplant property taxes as a revenue source, or out of a desire to increase the allocation of resources to education. Moral and philosophical considerations may also play a role in voter behavior. For example, voters may believe that gambling is inherently sinful, or they may object to the empirically regressive nature of the lottery as a means of raising revenue. These voters may vote "no" to prevent others from playing.

To examine the determinants of voting behavior, a cross-sectional voter approval regression is specified with both demographic and economic measures used as explanatory variables. Demographic variables include

Table 1
Summary Statistics and Data Sources[a]

Variable Name	Variable	Mean	Standard Deviation	Minimum	Maximum
VOTE	Proportion in favor of approving the lottery	0.5618	0.0941	0.4118	0.8824
AGE65	% aged 65 and older	12.70	1.77	7.9	16.5
BLACK	% black	37.38	16.39	6.8	71.0
NOHS	% without a high school degree	28.55	6.72	12.1	40
COLLEGE	% with a college degree	15.57	6.23	8.3	33.2
LOWINC	% with a household income	22.7	6.23	11.7	40.4
UPMIDINC	% with a household income $35,000 − 50,000	17.40	1.60	13.2	20.2
HIGHINC	% with a household income > $50,000	30.76	6.78	17.3	47.0
NCBORDER	% retail employment * NC border	2.26	4.39	0	17.76
GABORDER	% retail employment * GA border	1.39	2.88	0	10.99
SALESPC	Sales per capita	381.60	234.39	64.77	1,587.52
TESTSCORE	Grade 6 composite test score	1,199.33	9.79	1,174.30	1,220.00
RELIGION	% evangelical Protestant	41.60	9.68	21.07	60.65

a. VOTE provided by the South Carolina Election Commission (n.d.). SALESPC provided by the South Carolina Education Lottery (2005). TESTSCORE provided by the South Carolina Department of Education (2006). RELIGION provided by the Association of Religion Data Archives (2006). All remaining data provided by the U.S. Bureau of the Census (n.d.).

AGE65 (the proportion of the county population older than the age of 65), *RELIGION* (the percentage of the county population regularly attending an evangelical protestant or traditional black church), *BLACK* (the proportion of the county's residents who are African American), *NOHS* (the percentage of the county population older than the age of 25 without a high school diploma), and *COLLEGE* (the percentage of the county population older than the age of 25 with at least a bachelor's degree). A complete listing of variables, sources, and summary statistics appears in table 1.

Prior studies (see Caudill et al. [1995] and Ellison and Nybroten [1999], who asserted that religious beliefs are perhaps the most important predictor of lottery opposition) suggest a negative coefficient for *RELIGION*, which reflects moral opposition to gambling. Other studies (see, for example, Rubenstein and Scafidi 2002) indicate a negative relationship between

education and the lottery vote; this suggests a positive sign for *NOHS* and a negative sign for *COLLEGE*. We have no prior for *AGE65*.[6]

Economic variables in the *VOTE* regression account the distribution of income. Following Hersch and McDougall (1989) and Giacopassi, Nichols, and Stitt (2006), income is modeled by the inclusion of *LOWINC* (the proportion of county households earning less than $15,000 per year), *UPMIDINC* (upper-middle-income households earning between $35,000 and $50,000 per year), and *HIGHINC* (high-income households earning more than $50,000 per year).[7] For most ordinary commodities, a positive correlation between income classes and the vote indicates that the good is a normal good; a negative association reveals the good as inferior. But the lottery is not an ordinary good, because lottery proceeds are a source of government revenue. Thus, income variables may also reflect public finance considerations. For example, various groups may vote for the lottery in an effort to shift the financial burden of state programs from taxpayers to lottery players, or because they believe they will benefit from the programs the lottery revenue finances. This hypothesis is at the core of the analyses by Hersch and McDougall (1989) and Giacopassi, Nichols, and Stitt (2006), and has also been suggested by Mixon et al. (1997) and Martin and Yandle (1990). Because upper-middle- and high-income households often bear a disproportionate burden of taxes, it is likely that *UPMIDINC* and *HIGHINC* will be positive if these public finance considerations are important. In contrast, because underperforming schools are often disproportionately found in financially depressed areas, *LOWINC* may be positive if low-income constituents hope to channel additional resources to improving schools.

To control for the latter hypothesis, we include a measure of school district performance in our *VOTE* equation. *TESTSCORE* measures the performance of a county's sixth graders on a statewide, standardized exam assessing performance in language arts and mathematics. *TESTSCORE* is expected to have a negative effect on *VOTE*; the worse one's local schools, the more interest constituents will have in establishing an education lottery.

Finally, we include several variables to account for the distribution of South Carolina's counties along the state's borders. Martin and Yandle (1990) argued that states adopt lotteries to compete with other licit and illicit gambling activities, and suggested that a state's adoption of a lottery is more likely if that state abuts another that has already established a lottery. Although Martin and Yandle did not explicitly test this hypothesis, Alm, McKee, and Skidmore (1993) found that preventing outflows of

lottery dollars has become an increasingly important factor in lottery adoption, a result confirmed by Stover (1990) and Caudill et al. (1995). More recently, Garrett and Marsh (2002) found that cross-border lottery shopping is significant, and that the amount of cross-border shopping depends on the size of the retail sector in the relevant border county. Although each of the aforementioned studies analyzes the effects of cross-border shopping on sales, only Giacopassi, Nichols, and Stitt (2006) examined the impact of location on the vote. Their evidence of the impact of border locale on the vote is both mixed and generally insignificant.

South Carolina abuts North Carolina to the north and Georgia to the southwest. At the time of the South Carolina referendum, Georgia had a state lottery; North Carolina did not. We hypothesize that people in the northern border counties (indicated by *NCBORDER*) may display increased desire to establish a lottery in hope of attracting players from North Carolina. Similarly, southwest counties (indicated by *GABORDER*) may vote defensively in favor of the lottery to keep South Carolina residents from playing the Georgia Lottery. As suggested by Garrett and Marsh (2002), we suspect that border counties with strong retail sectors may be particularly interested in establishing a state lottery. Specifically, they stand to benefit through retail sales to persons who cross borders to play the lottery. Thus, we construct both *NCBORDER* and *GABORDER* as indicator variables, weighted by the percentage of the county population employed in retail. We expect coefficients for both of these variables to be positive and of approximately the same magnitude.

The dependent variable in the *VOTE* regression reflects voter approval. Individual South Carolina voters faced a binary choice of either voting for or voting against establishment of the lottery. These votes were aggregated into grouped data by county, with n_i denoting the number of votes cast and P_i denoting the proportion of votes cast in favor of the lottery. Because proportions data such as P_i are bounded above and below, we follow the econometric procedures outlined in Greene (2000). Grouped data are transformed into logit form, where Y_i is the measure of voter approval, expressed as a function of the independent variables, $\mathbf{X}_i$:

$$Y_i = ln[P_i/(1 - P_i)] = \mathbf{X}_i\beta + \varepsilon_i \quad (1)$$

Estimation of equation (1) using OLS produces heteroscedastic errors. Greene suggested using a two-stage weighted least squares algorithm in which (1) is estimated by OLS in the first stage and the fitted values of Y, denoted y_i, are used to generate estimates of P_i, denoted $\hat{p}_i$. Specifically,

$$\hat{y}_i = \mathbf{X}_i\hat{\boldsymbol{\beta}} \tag{2}$$

and

$$\hat{p}_i = e^{\hat{y}_i}/(1 + e^{\hat{y}_i}) \tag{3}$$

Values from equation (3) are then used to generate appropriate weights, w_i, for reestimation of (1). Specifically,

$$w_i = (n_i\hat{p}_i(1 - \hat{p}_i))^{0.5} \tag{4}$$

The two-stage procedure is completed with estimation of (1), incorporating the weights generated in equation (4). Following Garrett and Marsh (2002), we modify (1) to test for spatially correlated errors. Specifically, we estimate

$$Y_i = \mathbf{X}_i\boldsymbol{\beta} + \rho\mathbf{M}\,Y_i + \varepsilon_i \tag{5}$$

where M is a $(N \times N)$ spatial weights matrix and other variables are as defined above.[8] Rho ρ), the spatial autoregressive coefficient, reflects positive spatial correlation if $\rho > 0$, negative spatial correlation if $\rho < 0$, and no spatial correlation if $\rho = 0$. Results are presented in table 2.

Demographic variables have a mixed influence on the lottery vote. Membership in an evangelical church, as suggested by the bulk of the existing literature, plays a substantial role in determining voting behavior; our *RELIGION* variable is both negative and significant at the 5 percent confidence level. Because we have transformed our proportions data into logit form, which is difficult to interpret, the third column of table 2 provides the marginal effects of each independent variable on the proportion of voters in favor of the lottery. Our results indicate that a 1 percentage point increase in the proportion of county residents affiliated with an evangelical faith reduces the proportion of "yes" votes by 0.261 percentage points. Thus, at the extremes of our data (as indicated in table 1), differences in religious affiliation can account for up to a 10.33 percentage point difference in the lottery vote.

Race has been ignored by most previous studies of lottery adoption (see, for example, Hersch and McDougall 1989), and in others it has been shown irrelevant with respect to approval or disapproval (see Ellison and Nybroten 1999; Giacopassi, Nichols, and Stitt 2006). Our study confirms that the proportion of the population that is African American exerts no effect on the lottery vote. Similarly, we similarly find that neither education nor age distribution has significant influence over the lottery vote;

Table 2
Voter Behavior[a]

Variable	Coefficient (*T*-statistic)	Marginal Effect on P_i
Demographic Characteristics		
AGE65	−0.012 (0.62)	−0.295
RELIGION	−0.011** (−2.22)	−0.261
BLACK	0.007 (1.21)	0.172
NOHS	−0.015 (−0.65)	−0.368
COLLEGE	−0.013 (−1.05)	−0.319
Income Measures		
LOWINC	−0.010 (−0.27)	−0.245
UPMIDINC	−0.029 (−0.54)	−0.713
HIGHINC	−0.001 (−0.03)	−0.024
Other Variables		
TESTSCORE	−0.017** (−2.40)	−0.417
NCBORDER	0.020** (2.43)	0.497
GABORDER	0.040*** (3.12)	0.994
P	0.586*** (4.19)	
CONSTANT	22.145** (2.33)	
N	46	
Adjusted R^2	0.7267	

a. The dependent variable (SALESPC) is equal to lottery sales per capita.
*a < 0.10. **a < 0.05. ***a < 0.01.

coefficients for *NOHS*, *COLLEGE*, and *AGE65* are not significantly different from zero.

We also find that the lottery vote is flat across the income distribution, with none of the income variables significantly different from zero. This result contradicts the findings of Hersch and McDougall (1989), who found that the shape of the income distribution matters, but is consistent with the more recent findings of Giacopassi, Nichols, and Stitt (2006).

One unique dimension of our study is the inclusion of the *TESTSCORE* variable. Given the nature of the lottery constitution, voters can expect the establishment of the lottery to increase education budgets; voters in underperforming districts are more likely to see this additional funding as an important priority. Using school performance as an explanatory variable allows us to test the second dimension of the public finance hypothesis: that people may vote for a lottery they have no interest in playing in hopes of benefiting from the play of others. As anticipated, the sign of *TESTSCORE* is negative and significant, indicating that individuals in underperforming school districts are more likely to vote in favor of the lottery. At the margin,

a one-point decrease in a county's average test performance translates into a 0.46 percentage point increase in the approval margin. As indicated in table 1, across the counties of South Carolina, average test scores range from a low of 1,173 to a high of 1,220; our results indicate that test scores alone can potentially account for up to an 18.86 percentage point difference in the proportion of votes cast in favor of the lottery. As a robustness check, we also tried several alternative specifications of the *VOTE* regression using dollars per pupil and teachers per pupil as explanatory variables. Each produced insignificant coefficients. We hypothesize that the average voter is generally unaware of the magnitude of these variables and how they compare relative to other counties. Educational attainment figures such as our *TESTSCORE* variable, however, are direct measures of student achievement and are highly publicized in both absolute and relative form.

Each of our border variables is consistently signed and highly significant, which indicates that residents of border counties are substantially more likely to vote in favor of the lottery. As suggested in Garrett and Marsh (2002), we suspect that the promise of drawing cross-border shoppers from North Carolina underlies the *NCBORDER* coefficient. Similarly, the chance to defend against an existing outflow of lottery dollars and associated retail expenditures results in a highly significant statistic in the counties that border Georgia. Finally, we find evidence of, and correct for, strong positive spatial correlation in our regression specification.

Ultimately, our analysis of the lottery vote indicates that across a broad spectrum of social, economic, and demographic characteristics, there was little difference in South Carolina voters' willingness to approve the lottery. In the end, what did seem to matter were a few key indicators: people voted against the lottery because they were morally opposed to it, and people voted for the lottery because they wished to partake in its benefits to education. Finally, people voted for the lottery to bring in revenue from out of state or to prevent revenue from leaving the state.

4.2. Lottery Sales

The essence of this study is to determine whether agents exhibit consistent behaviors in their voting and buying behaviors. To that end, we assess whether the factors that determine voter approval also determine per capita *SALES*. As was the case with the lottery vote, we express *SALES* as a function of demographic, income, and other economic variables. We also include the predicted p_i, $\hat{p}_i$ as an additional explanatory variable to examine consistency in voting and buying behavior.[9]

There are two ways that we can confirm a latent-demand hypothesis. The first way is to examine the sign and significance of the $\hat{p}_i$ coefficient in the sales equation. If it is positive and significant, it means that there is information contained in the vote equation that can explain the variation in sales. If, however, the coefficient is negative and significant, it implies that those likely to vote for the lottery are less likely to play and confirms some form of the free-rider hypothesis.

The comparative approach used by Scott and Garen (1994) suggests that even if the coefficient on $\hat{p}_i$ turns out to be insignificant, we can still confirm a voter-buyer link by examining the signs and significance of the regressors. Because both models include the same explanatory variables, if we find similarity between the coefficients from one equation to the other, we have a loose confirmation of latent demand as a reason for the vote. In contrast, different signs for the same regressors across equations may indicate public finance considerations or other behaviors inconsistent with the latent demand hypothesis.

Expressing *SALES* as a function of demographic, income, and other economic variables, as well as the predicted proportion of voters in favor of the lottery, we obtain the following:[10]

$$SALES_i = \mathbf{X}_i\boldsymbol{\alpha} + \delta\hat{p}_i + \eta_i \tag{6}$$

Estimation of equation (6) was performed using OLS; results are presented in table 3. Inspection of δ, the coefficient for predicted p_i, allows us to explicitly compare voting and buying behavior. Given our estimate, it appears that there is little additional information in estimated voting preferences on lottery purchases that is not already captured by the regressors included in the *SALES* estimation.

The results of the *SALES* regression are quite striking when contrasted to those from the *VOTE* regression discussed above. Although the proportion of a county's residents belonging to an evangelical church was one of the strongest determinants of voter behavior, it appears to play little role in shaping buyer behavior; even in counties where moral opposition to the lottery was strong, there was no significant reduction in sales. These results confirm to some extent what is suggested in both Scott and Garen (1994) and Rubenstein and Scafidi (2002), both of whom separated the decision to participate from the *level* of participation. In each of these studies of lottery demand, fundamentalism does not significantly affect either the decision to participate or the level of play. Furthermore, these results partially confirm the findings of Giacopassi, Nichols, and Stitt (2006), who found evangelicals less likely to vote for a lottery but actually more likely to play.

Table 3
Purchasing Behavior[a]

Variable	Coefficient (*T*-statistic)
Demographic Characteristics	
AGE65	24.633 (1.17)
RELIGION	3.244 (0.57)
BLACK	17.207** (2.64)
NOHS	44.956* (1.82)
COLLEGE	19.940 (1.29)
Income Measures	
LOWINC	42.924 (1.19)
UPMIDINC	165.397*** (3.03)
HIGHINC	62.897** (2.42)
Other Variables	
TESTSCORE	12.539 (1.46)
NCBORDER	24.503** (2.42)
GABORDER	−3.087 (−0.18)
CONSTANT	−23825.31* (−1.96)
Predicted p_i	1147.388 (1.13)
N	46
Adjusted R^2	0.2038

a. The dependent variable (SALESPC) is equal to lottery sales per capita.
*a < 0.10. **a < 0.05. ***a < 0.01.

Age makes little difference in either the lottery vote or lottery sales, but race does have an impact in the *SALES* equation. Specifically, we find that the proportion of African Americans in a particular county makes little difference in the lottery vote, but has a positive and significant impact on *SALES*. For each one percentage point increase in the African American population, per capita sales increase by $17. Combined with the insignificant *VOTE* coefficient, the significant *SALES* coefficient allows us to surmise that, relative to their white counterparts, the black vote reflected latent demand.[11]

If interpreted as a latent demand regression, the *VOTE* regression suggests that lottery play is flat across income classes. But inclusion of our income distribution variables in the displayed-demand *SALES* regression indicates otherwise. We find significantly higher sales in counties with a higher proportion of upper-income residents. This may suggest a public finance motive on the part of the poor, or it may be consistent with other motivations for play. For example, Clotfelter and Cook (1990) suggested

that the poor may play to buy a chance at wealth, but the rich play more for entertainment.

As expected, school performance does not affect sales; *TESTSCORE* is insignificant. One might vote for the lottery in hopes of channeling the play of others into one's schools, but it seems less likely that the typical lottery player actually purchases tickets because his or her local school is underfunded. Given that the typical dollar of play yields about 27.8 cents of education revenue, which is subsequently split among South Carolina's forty-six school districts, a player purchasing a $1 ticket can expect his or her local school district to receive approximately six-tenths of a penny.[12] It seems unlikely that such a trivial amount is enough to generate significantly increased sales in underperforming districts.

We conclude our study of lottery sales by inspecting the border variables. *NCBORDER* is positive and significant, indicating that counties along the northern border of the state experience greater than average sales compared to other counties.[13] We hypothesize that this is due to cross-border shopping by North Carolina residents. Just as interesting is the insignificant *GABORDER* coefficient—counties that border Georgia (which already has a lottery) appear to have sales equivalent to those of nonborder counties. From this, we conclude that the South Carolina lottery has successfully stemmed a preexisting outflow of lottery dollars into Georgia or at least offset them with sales to Georgia residents along the border.[14]

5. Conclusions

This article seeks to establish a relationship between political and economic markets. Using county-level voting and sales data from the South Carolina Education Lottery, we are able to conclude that there is little link between a voter's willingness to vote for a lottery and that same voter's willingness to play the lottery once established. We find that including the predicted component of the lottery vote adds no explanatory power to a *SALES* regression. We conclude that there is little relevant information contained in the vote that was not already captured by the other regressors. This result differs from those of both Hersch and McDougall (1989) and Giacopassi, Nichols, and Stitt (2006), who ultimately concluded that to some degree, voters were expressing a latent demand for lottery play.

Second, our study allows us to draw interesting distinctions between voting and buying behavior. For example, moral considerations play a larger role in voter behavior than in buyer behavior; affiliation with an evangelical

religion negatively affects the vote to create a lottery but has no effect on sales. We conclude that, at least in these cases, voting and buying behavior are not strongly linked.

Furthermore, we find that public finance considerations play an important role in lottery adoption. Arguably, the strongest determinant of lottery approval was the performance of schools; individuals appear to have been motivated to vote for the lottery to provide greater opportunities to their children. Thus, they hope to benefit from the play of others. Furthermore, although the poor exhibit voting behavior similar to that of their higher-income neighbors, they play the lottery significantly less often. It may well be the case that the poor stand to benefit the most from improved schools; the inconsistency in voting and buying behaviors of rich and poor suggests the possibility that the poor voted for the lottery in hopes that the rich would play.

On a macro scale, public finance considerations once again play an important role in determining voting behavior. At least part of the impetus for offering a lottery stemmed from the lottery status in neighboring states. In addition to providing additional funding for education (as indicated in the *VOTE* regression), the state government must have also been anxious to stem the flow of dollars being spent on the neighboring Georgia Lottery and equally desirous of drawing in lottery dollars from North Carolina. By all accounts, these desires have been satisfied. Counties bordering Georgia display no less tendency to play the lottery than their inland neighbors, but counties on the northern border have significantly stronger sales that, we hypothesize, result from the play of North Carolina residents. These points, combined with our general test for a voter-buyer link, strongly suggest that public finance considerations may be an important determinant of one's willingness to vote in favor of a lottery's establishment.

Notes

1. Garrett and Sobel (2004) argued that the demand for various lottery games should be estimated separately because game characteristics are also important determinants.

2. Interestingly, Tennessee and North Carolina, whose lotteries were established after the formation of the South Carolina Education Lottery, have also named their programs "education" lotteries.

3. Bubba was such a popular character that he was invited to make an appearance at a University of South Carolina football game.

4. Specifically, the legislation mandates that education receive at least the same share of the general fund post lottery as it did prelottery. Although this protection is not perfect, it

does ensure that tax dollars are not simply replaced with lottery dollars as a source of school funding.

5. A more recent vote by the North Carolina legislature established a state lottery that began at the end of March 2006.

6. Not all studies are in agreement as to the signs of these demographic variables. For example, Filer, Moak, and Uze (1988) found, in the context of a hazard model of lottery adoption, that both religion and education play no significant role. Clotfelter (2000) reported that individuals aged 25 to 64 play more than those aged 65 or older. Jackson (1994), however, found that the proportion of those aged 65 or older reduced Massachusetts lottery sales in 1983 and increased sales in 1990.

7. These income distribution variables omit the percentage of lower-middle-income households earning between $15,000 and $35,000 per year. Inclusion of this category would result in a perfectly collinear matrix of explanatory variables. Thus, the *LOWINC*, *UPMIDINC*, and *HIGHINC* coefficients are interpreted as incremental propensities to approve the lottery relative to the baseline lower-middle-income household.

8. The elements of the spatial weights matrix, $\boldsymbol{M}_{ij}$, initially assume a value of 1 if county i and county j abut. Elsewhere, the elements are assigned a value of zero. Once constructed, the rows of the matrix are normalized such that the entries sum to one.

9. In an alternative specification, the actual proportion of votes was included in place of the predicted proportion. The results are remarkably similar to those in table 3 and are not presented here. Finally, the sales regression was run using the residuals from the vote regression, resulting in no alteration of the sign, magnitude, or significance of any of the regressors. We also reran the *VOTE* regression using actual, predicted, and residual sales as explanatory variables; in no form did sales significantly explain the vote.

10. As was the case with the *VOTE* regression, the *SALES* regression originally included a term to test for spatial correlation. We failed to reject a null hypothesis of no spatial correlation, and the term was dropped.

11. Evaluated at the mean and holding all other factors constant, this implies that the marginal African American lottery participant spent $1,700 on lottery tickets during the fifteen-month span of our data (January 2002 to March 2003). This is substantially higher than the overall *average* sales per capita of just $381.

12. Payout data were obtained from the South Carolina Education Lottery Web site, http://www.sceducationlottery.com (South Carolina Education Lottery 2005).

13. There are two relevant marginal effects to consider. The first is the marginal impact of being located on the North Carolina border. The second is the additional impact from increased retail sector size. We evaluate the first effect at the mean retail size and estimate an additional $208 dollars of per capita sales during the fifteen-month span of our data.

14. Prior to the establishment of the SCEL, estimates of South Carolina expenditures on the Georgia lottery ranged from $80 million to $110 million per year.

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