# *Who Pays and Who Benefits? Examining the Distributional Consequences of the Georgia Lottery for Education*

***Abstract -*** *This paper examines the incidence of the implicit lottery tax and the distribution of benefits from lottery–funded programs in Georgia. Georgia's lottery is unique in that revenues are earmarked for three educational programs—HOPE College Scholarships, universal pre–kindergarten, and education infrastructure. We estimate separate models of household–level lottery purchases and of household benefits from lottery–funded programs. Our estimates suggest that lower income and non–white households tend to have higher purchases of lottery products while receiving lower benefits, as compared to higher income and white households. Benefits of HOPE Scholarships, in particular, accrue disproportionately to higher income and more educated households.*

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## INTRODUCTION

While state–sponsored lotteries have been a part of the U.S. public finance landscape since the nation's birth (Clotfelter and Cook, 1989), perhaps few lotteries have enjoyed the enormous popularity of Georgia's "Lottery for Education." Georgia's lottery is unique in that most lottery revenues are earmarked for HOPE (Helping Outstanding Pupils Educationally) College Scholarships and universal pre–kindergarten, both of which began with the lottery and are funded solely with lottery revenues. Any lottery revenues left over are used for K–12 infrastructure spending. In the 1998 campaign for Georgia governor, both major party candidates pledged to support and continue the state's lottery–funded programs. Moreover, the enthusiasm has spread beyond Georgia's boundaries. At least a dozen states have considered or adopted programs similar to Georgia's most well–known lottery–funded program, HOPE scholarships. Legislators in many of these states make no secret of their debt to Georgia's program, and some have even adopted the HOPE "brand name" (Selingo, 1999).

While it may be clear that Georgia's lottery has been an unequivocal political success (Henry and Gordon, 1999), important questions remain unanswered. This paper addresses two fundamental questions surrounding the Georgia lottery:

- What is the incidence of household purchases of lottery products?
- Who benefits from lottery–funded programs?

To answer the first question, we estimate a model of household–level lottery purchases using the Heckman two–step estimation procedure. We pay particular attention to lottery spending behavior by income, race, and education level. To analyze the distribution of benefits from lottery–funded programs, we estimate lottery–funded program expenditures received by households from the three lottery–funded programs: HOPE scholarships, universal pre–kindergarten, and K–12 infrastructure spending (technology and construction). Finally, we estimate the net budgetary incidence of the lottery by comparing predicted household lottery spending to predicted benefits.

The next section provides background on the Georgia lottery, and the third section briefly reviews previous research on lotteries as public revenue sources. The fourth section describes the data, while the fifth section provides a description of the empirical models and results. Alternative financing methods for the lottery–funded programs and their incidence are described in the sixth section, and the seventh section provides concluding remarks.

## THE GEORGIA LOTTERY FOR EDUCATION

Georgia's lottery owes its widespread recognition not to any unique aspects of the lottery itself—Georgia's lottery operates in a similar manner to other state–run systems. Instead, it comes from the fact that Georgia earmarks net lottery revenues for three expenditure areas: HOPE scholarships, universal pre–kindergarten for four year–olds, and education infrastructure (technology and construction of facilities). Table 1 displays lottery expenditures by program for FY 1994 through FY 1999. Since the lottery's inception, the largest share of proceeds (30 percent) has been spent on pre–kindergarten, followed by HOPE Scholarships (29 percent). The relative share of spending devoted to HOPE and pre–kindergarten has been steadily increasing, with almost 74 percent of total FY 1999 appropriations earmarked for those two programs (Brackett, Henry, and Weathersby, 1999).[1]

As shown in Table 1, the lottery has also provided substantial revenue for K–12 construction and technology investment. While the lottery's early years saw substantial infrastructure investments, these have declined over time as the HOPE and pre–kindergarten programs have grown in size. While Georgia's lottery revenue base has been surprisingly stable, it is likely that sales will begin to decline if surrounding states enact their own lotteries.[2]

[1] The pre–kindergarten program serves over 60,000 children annually in public, private, and not–for–profit child care centers. While the program was originally intended for "at–risk" children, the family income eligibility cap was lifted in 1995. All children are now eligible to attend a state provided or approved pre–kindergarten center at no cost to the child's family, though attendance is not compulsory. The HOPE college scholarship program provides subsidies for students attending both public and private institutions of higher education in Georgia. The Public College Scholarship component of the program provides full tuition, fees, and an allowance for books at any public institution of higher education in Georgia. The Private College Tuition Equalization Grant provides a grant (currently $3,000) to offset tuition at any private college or university in Georgia. To earn either of these scholarships, a student must have a 3.0 cumulative grade point average (GPA) in his or her core high school courses, and must maintain the 3.0 annually in college in order to retain the scholarship. While the program originally had an income cap for eligibility, the restriction was lifted in FY 1996 and any Georgia resident can now receive the scholarship based solely on his or her grades.

[2] In 1999, Alabama voters rejected a lottery referendum, and South Carolina votes approved a lottery referendum in November 2000.

**TABLE 1**
LOTTERY EXPENDITURES, FY 1994–99

| | Amount ($) | Percent |
|---|---|---|
| Scholarships | 874,982,422 | 29 |
| Pre–kindergarten | 928,531,837 | 30 |
| Technology | 637,624,853 | 21 |
| Construction | 627,617,944 | 20 |
| **Total** | 3,068,757,056 | 100 |

Source: Brackett, Henry, and Weathersby, 1999.

Spurred in part by concerns over declining future revenues, Georgians voted in 1998 to amend the state Constitution to formally specify pre–kindergarten and HOPE as the lottery's funding priorities, leaving the future of construction and technology outlays in doubt.

Given the earmarking of lottery proceeds to specific programs, lottery expenditures in Georgia are easily traced to the programs they support. The close link between the lottery–funded programs and their revenue source has allowed the Georgia lottery to escape the common criticism that lottery revenues supplant rather than supplement other resources (Clotfelter and Cook, 1989; Borg and Mason, 1990; Borg, Mason, and Shapiro, 1993; Spindler, 1995). Georgia did not have a state–funded pre–kindergarten program before the lottery. Although many states have limited public funding for pre–kindergarten, only New York state has pledged to implement universal pre–kindergarten like Georgia's program. Nevertheless, New York's pre–kindergarten will not be universal until 2003 at the earliest (National Center for Policy Analysis, 2000).

The available evidence suggests that supplanting of funds has been limited or non–existent in the lottery–funded programs. While Georgia provided no funding for pre–school education prior to the lottery's implementation, the state did fund some higher education student financial aid and K–12 school construction. In the three fiscal years prior to the start of the lottery, budgeted state expenditures for student financial aid from the state General Fund averaged 0.30 percent of total General Fund expenditures and the average increased slightly to 0.31 percent in the four years after the HOPE program began (State of Georgia, 1997; 1996; 1995; 1994; 1993; 1992; 1991). Adjusted by the Consumer Price Index, total real financial aid expenditures in Georgia from lottery proceeds and the General Fund grew by approximately $270 per student between 1993 and 1996, while no other state in the Southeast had an increase of more than $110 per student, and most states had declines (Southern Regional Education Board, 2000). Need–based aid in Georgia (constant dollars) remained relatively flat over this period, while the growth in non–need–based aid from the HOPE Scholarships accounted for the large increase.[3] Data are not available to track school construction and technology expenditures from the pre–lottery period. However, total state General Fund expenditures on K–12 education, which include construction and technology, grew at a faster rate than total General Fund expenditures (36 percent versus 33 percent) in the years after the lottery was introduced.

## RESEARCH ON LOTTERIES IN OTHER STATES

Thirty–seven states including Georgia currently run lotteries and many issues surrounding these enterprises have been well documented by researchers. Revenues raised by lotteries can be viewed as an excise tax on one item—lottery play. Georgia retains 35 cents for every dollar

[3] In the year examined in this paper, HOPE awards were reduced by the amount of any federal Pell Grants available to lower income students. In the 2000–2001 academic year, this policy was changed to allow students to collect both HOPE Scholarships and Pell Grants.

spent on the lottery. These lottery proceeds retained by the state represent an implicit tax on purchases of lottery products. If a competitive market existed for lottery products, it is unlikely that each firm's profits would approach 35 percent of revenues. Although purchases of lottery tickets are "voluntary," the implicit tax on a dollar spent on a lottery product is not voluntary, just as sales taxes paid on purchased goods are not voluntary. Given this implicit taxation, questions related to the incidence of the implicit lottery tax are similar to those surrounding an income, sales, property, or other tax. Although the implicit taxes paid on lottery products are less than the full price of the lottery product, the implicit lottery tax *rates* are much higher than sales tax rates on most other items.

The incidence of the lottery's implicit tax has been one of the most frequently studied aspects of state lotteries. Mikesell (1989), using aggregate data from Illinois, examines county lottery sales over a three–year period and finds income elasticities close to one, suggesting a constant "tax" rate over all income levels and therefore a proportional burden. In contrast, Price and Novak (1999), using zip code aggregated data, find that Texas' lottery games are substantially more regressive than sales taxes, and that the instant and "numbers" games are the most regressive. In their study, the percentage of the population that is African–American is positively related to sales of the most regressive games.

Other studies, which use household–level data, find lotteries to be highly regressive revenue generators. For example, Clotfelter and Cook (1987; 1989; 1990a; 1990b), using data from several states, find that lottery expenditures, net of average expected winnings, decrease as education levels rise, and that African–American consumers spend significantly more than whites. They find little systematic relationship, though, between household income and lottery spending. This relatively flat spending across income groups produces a regressive implicit tax burden, with lower income households spending a larger share of their income on the lottery. Clotfelter, et. al. (1999), in a report to the National Gambling Impact Study Commission, present tabulations from a national survey of household lottery spending and find that males, African Americans, and less educated and lower–income households have large expenditures on lottery products. Borg, Mason, and Shapiro (1991) find that spending increases somewhat with income, and that the small purchasing increases lead to a regressive incidence.

Scott and Garen (1994) use a Heckman two–stage estimator rather than the tobit approach used in the previous studies to separate the effects of demographic variables on the probability of lottery participation from their effects on the level of play, given participation. They find that demographic variables have differential effects on probabilities of play and levels of play. Nevertheless, they also find that the incidence of implicit lottery taxation is regressive. Stranahan and Borg (1998a; 1998b) review Scott and Garen's methodology and suggest that a probit model to estimate the probability of participation and a truncated tobit model to estimate spending (contingent on participation) provide a better approach since lottery spending, net of average expected winnings, is truncated at zero. Using this method they again find a regressive burden, although more so for instant games than for lotto.

An important but often overlooked question regarding lotteries is whether the distribution of benefits from lottery–funded programs reduces or exacerbates the apparent regressivity of lottery purchases by players. That is, while lower–income households may bear a disproportionately large share of the burden from implicit lottery taxation, they may also receive a disproportionately small share of the benefits from lottery–funded programs. Borg and Mason's (1988) and Borg, Mason, and Shapiro's (1991) work is the only research to explore this issue. Using Florida and Illinois data, respectively, they estimate the direct benefits for households (calculated as per–student education spending funded by the lottery) from the lottery in relation to household lottery expenditures. In both states, lottery revenues are used to provide funding for K–12 public education. They estimate the number of children per household receiving public education using characteristics (such as age, marital status, income, and race) that affect household size and the likelihood of public rather than private school attendance. In Florida, the authors find a positive net benefit (direct benefits minus household lottery expenditures) for all groups except those in the lowest income category, and that net benefits generally rise with income. In Illinois they find that the implicit tax outweighs the benefits of education for all income groups, particularly those at the lowest and highest income levels.

Estimates of lottery benefits are complicated by the possibility that earmarked lottery revenues supplant, rather than supplement, other state revenues. Borg and Mason (1991) examine state expenditures for education in lottery and non–lottery states and find no evidence that lotteries led to increases in state spending. Spindler (1995) uses an ARIMA model to explore the fungibility of lottery revenue in seven states that earmark revenues for education and finds that lotteries produced negative cumulative effects on education spending in four states, although the effects varied across states and years.

The dearth of research on the distribution of lottery benefits relative to household purchases may be a result of the relative difficulty of estimating the net benefits of broadly defined public programs such as education, particularly when lottery revenues supplant other state spending. Georgia's earmarking of revenues for newly created programs that are funded exclusively with lottery revenue, though, facilitates our incidence analysis.

## DATA

The data used to estimate equations explaining the probability of playing the lottery, net lottery expenditures conditional on playing, and household benefits from lottery–funded programs come from a variety of sources. Each data set is explained below.

### *Household Survey Data*

To estimate household spending on lottery products we use household survey data collected from a stratified random sample of 803 adult residents of the state of Georgia.[4] The survey data were weighted such that the weighted sample means would mirror Census Bureau estimates for the entire state of Georgia. Among the 803 respondents, we were able to use 548 cases in the analyses in this paper. Hereafter, we refer to these 548 cases as the "usable" sample. Most of the 255 other respondents were dropped due to missing data, primarily household income. Table 2 displays descriptive statistics for the sample.

To check whether our usable sample of 548 cases remains representative of the state, we compare our weighted usable

[4] The survey data come from the quarterly Georgia Poll conducted by the Applied Research Center at Georgia State University. All households with a working telephone are eligible for the poll as the sample includes unlisted as well as listed telephone numbers. Using the American Association for Public Opinion Research's definitions and criteria (APOR, 1999), the response and cooperation rates for the survey were excellent. Of all the working residential telephone numbers called, 49.5 percent resulted in completed interviews (response rate). In addition, among persons who answered the phone, 78.2 percent participated in the survey (cooperation rate).

**TABLE 2**
GEORGIA STATE POLL DESCRIPTIVE STATISTICS (N = 548)

| Variable | Definition | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| NET_SPENDING | household lottery spending minus winnings | 81.53 | 396.72 | –4,000 | 1,632 |
| NONWHITE | equals 1 if respondent non–white | 0.26 | 0.44 | 0 | 1 |
| INC1 | income < $15K | 0.13 | 0.33 | 0 | 1 |
| INC2 | income >= $15K and < $25K | 0.10 | 0.30 | 0 | 1 |
| INC3 | income >= $25K and < $35K | 0.26 | 0.44 | 0 | 1 |
| INC4 | income >= $35K and < $50K | 0.19 | 0.40 | 0 | 1 |
| INC5 | income >= $50K and < $75K | 0.18 | 0.38 | 0 | 1 |
| INC6 | income >= $75K | 0.14 | 0.35 | 0 | 1 |
| EDUCATION | years of education | 13.66 | 2.14 | 10 | 18 |
| AGE | age in years | 42.75 | 16.35 | 18 | 92 |
| VOTER | equals 1 if registered voter | 0.80 | 0.40 | 0 | 1 |
| RELIGION1 | attends religious services every week | 0.42 | 0.49 | 0 | 1 |
| REPUB | equals 1 if republican | 0.24 | 0.43 | 0 | 1 |
| INDEP | equals 1 if independent | 0.39 | 0.49 | 0 | 1 |
| CHILDREN | equals 1 if children under 18 in household | 0.44 | 0.50 | 0 | 1 |
| OWNER | equals 1 if owner–occupant | 0.79 | 0.41 | 0 | 1 |
| EMPLOYED | equals 1 if employed | 0.71 | 0.46 | 0 | 1 |
| ATLANTA | equals 1 if resident of metro Atlanta | 0.32 | 0.47 | 0 | 1 |
| PLAY | equals 1 if plays the lottery | 0.33 | 0.47 | 0 | 1 |

Source: January 1999 Georgia Poll, quarterly poll conducted by the Applied Research Center (ARC) at Georgia State University. Results are weighted by the household weights provided by the ARC.

sample means to the Census Bureau estimates for Georgia. Approximately 74 percent of the usable sample is white and 26 percent non–white, compared to the Census Bureau's estimate of 70 percent white and 30 percent non–white residents in Georgia (U.S. Bureau of the Census, 1998). The mean years of education is 13.66, equivalent to a high school degree with some college education, compared to the Census estimate of 13.12 years (Table 3). The largest group of respondents (26 percent) report household income in the $25,000–$35,000 income range, followed by the $35,000–$50,000 category (19 percent). Overall, the usable sample's characteristics appear very similar to Census Bureau estimates of Georgia's population.

Each respondent was asked about his or her household's lottery spending habits and winnings. Using this information, we constructed the variable NET_SPENDING, which equals household lottery spending minus household lottery winnings.[5]

[1] NET_SPENDING = annual spending on lottery products – annual winnings.

The mean of NET_SPENDING is about $82 per household per year.[6] About 33 percent of respondents report playing the lottery. For these households, mean NET_SPENDING is about $250 per year.

[5] Other studies (Borg and Mason, 1988; Stranahan and Borg, 1998a, 1998b; Clotfelter and Cook, 1989; Scott and Garen, 1994) use spending on lottery products minus average *expected* winnings as their measure of lottery spending. The survey used in this study asked respondents how much the household had won from the lottery in the past year.

[6] We omit from the sample eight households who reported over $2,080 per year in lottery expenditures (spending before winnings). The minimum lottery expenditures of these eight observations is almost $5,000. No households report net spending between $2,080 and $5,000 per year. Given this natural break in the data and the estimation problems they cause, we drop these eight observations from the analysis. The mean NET_SPENDING for our sample ($82) is low, but if respondents systematically underreport lottery purchases, the data should not biased. Herring and Bledsoe (1994) suggest that underreporting of lottery purchases in survey data is common, but that the underreporting may be widespread across sociodemographic groups and therefore would not bias analyses of distributional effects (Herring and Bledsoe, 1994). Including the outliers, the mean of NET_SPENDING rises to a level that is too large to be considered a reasonable estimate.

**TABLE 3**
DESCRIPTIVE STATISTICS, STATE LOTTERY EXPENDITURES AND DEMOGRAPHICS BY COUNTY (N = 159)

| Variable | Definition | Mean | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|---|
| EXP | Total lottery expenditure per household (FY 1998) | $216.32 | 83.49 | 66.80 | 815.42 |
| EXP1 | HOPE expenditures per household | $73.75 | 27.32 | 15.76 | 199.05 |
| EXP2 | Pre–k expenditures per household | $84.10 | 25.52 | 0 | 174.77 |
| EXP3 | K–12 lottery exp. per household | $58.47 | 60.76 | 9.55 | 623.04 |
| MEDU | Mean Years of Education | 13.12 | .67 | 11.80 | 14.16 |
| MINC | Mean household income (000) | $48,982 | 11,580 | $25,124 | $75,016 |
| % NONWHITE | Non–white (%) | 29.98 | 17.16 | .38 | 79.77 |

Note: Data weighted by number of households per county. Data on FY 1998 lottery expenditures come from the state of Georgia. Demographic data come from the 1990 Census of Population and Housing.

### *Lottery–funded Program Data*

Data on lottery–funded program expenditures, hereafter lottery expenditures, were collected from various State of Georgia sources. All lottery expenditure data are county–level aggregates for FY 1998. Technology and construction allocations to school districts are supplied by the Georgia Office of Planning and Budget, HOPE Scholarship allocation data are from the Georgia Student Finance Commission, and pre–kindergarten data are from the Georgia Office of School Readiness. Institutions of higher education receive payments from the state Board of Regents for each enrolled HOPE scholar, and we allocate the HOPE benefit to each student's county of home residence (rather than college location). The pre–kindergarten program serves students in both public and private pre–kindergarten centers, and the Office of School Readiness supplies data on allocations to public school systems and to private providers. In addition, we merge the lottery expenditure data with county–level demographic data from the 1990 U.S. Census (Census Bureau, 1998).

Table 3 displays descriptive statistics for the variables used in the model. As shown, household lottery benefits (expenditures received) average $216.32 per county, with a range of approximately $750 across counties. On average, households receive the largest benefits from the pre–kindergarten program, followed by HOPE Scholarships.

## EMPIRICAL MODELS TO ESTIMATE THE NET BUDGETARY INCIDENCE

We estimate the net budgetary incidence of the Georgia Lottery for Education by the following six steps:

i. Estimate a model that relates household lottery spending (NET_SPENDING) to household characteristics. This model is estimated using the household–level survey data.
ii. Use the estimates from step 1 to predict lottery spending for each household in the survey data.
iii. Estimate a model that relates the lottery–funded program expenditures

In addition, by excluding these eight observations, our usable sample compares favorably to the survey data used in Clotfelter and Cook (1989) and Scott and Garen (1994). Data reported in these two papers allow comparisons with our usable sample: the mean of lottery expenditures conditional on playing the lottery is $393 in Scott and Garen, $347 in Clotfelter and Cook, and $392—spending before winnings—in our usable sample (sample means were adjusted for inflation using the Bureau of Labor Statistics' CPI_U). If we include the eight outliers, this figure rises to $676. In addition, Clotfelter and Cook report that in their sample, the top 10 percent of lottery players accounts for 65 percent of lottery expenditures. In our usable sample, the top 10 percent of lottery players accounts for 67.3 percent of lottery expenditures. If we include the eight outliers, this figure would rise to 84 percent. Four outliers are white, and four are non–white. In addition, four of the outliers report incomes under $50,000, and four report incomes over $50,000.

to household characteristics. This model is estimated with the county level data.

iv. Use the estimates from step 3 to predict "benefits" from lottery–funded programs for each household in the survey data.

v. Subtract the predicted value of NET_SPENDING from the predicted benefits:

$$[2]\quad NET\_BENEFIT = BENEFIT - NET\_SPENDING.$$

vi. Compare *NET_BENEFIT* across income, education, and racial groups to analyze the net budgetary incidence of the Georgia Lottery for Education.

### *Who Pays?*

This section explores who plays the Georgia Lottery and how much they spend. Following Scott and Garen (1994), we estimate a model of household lottery spending using the Heckman two–step estimation procedure (Heckman, 1979). Other studies have used each household's observed level of lottery spending minus a measure of average expected winnings to measure net lottery spending by households—this measure is always positive, which suggests a truncated tobit approach is appropriate (Stranahan and Borg, 1998). In our data, *NET_SPENDING* equals reported annual lottery spending minus reported lottery winnings. Thus, a household can have negative *NET_SPENDING*, when it wins more than it loses. Since *NET_SPENDING* can be negative, the Heckman two–step approach is appropriate for our estimation, rather than a truncated tobit approach.

The average expected winnings equals the mean payout rate for the lottery. As found in other studies, the propensity to play particular lottery games is related to household demographic characteristics and the odds of winning differ considerably across games. Thus, expected winnings will differ systematically across demographic groups. For example, Stranahan and Borg (1998b) found that lower income households were more likely to play instant games relative to higher income households. Since we have the data on household winnings available to us, we use that information—rather than average expected winnings—to compute net household lottery spending.

Lottery spending, net of winnings (*NET_SPENDING*), is decomposed into the probability of playing the lottery multiplied by lottery expenditures conditional on playing the lottery:

$$[3]\quad NET\_SPENDING_j = E[PLAY_j] * E[NET\_SPENDING_j \mid PLAY_j = 1],$$

where $PLAY_j$ equals 1 if household $j$ plays the lottery and 0 otherwise. If $X_j$ and $Z_j$ are vectors of household characteristics, where $X_j \varepsilon Z_j$, and $\alpha$ and $\beta$ are vectors of parameters, then the model explaining net household lottery spending is:

$$[4]\quad PLAY = \alpha Z_j + \pi_{1j}$$
$$NET\_SPENDING = \beta X_j + \sigma\lambda_j + \pi_{2j},$$

where

$$\lambda_j = \phi(\alpha Z_j) \;/\; \Omega(\alpha Z_j),$$

where the $\pi$'s are jointly normally distributed, $\phi(\bullet)$ is the standard normal density function, and $\Omega(\bullet)$ is the standard normal distribution function.

Probit and OLS estimates from this model are listed in Tables 4 and 5, respectively. The *NET_SPENDING* equation is identified by the non–linear probit estimator and measures of attendance at religious services and political affiliation. Following Scott and Garen (1994), this specification assumes that regular attendance at religious services and party affiliation are likely to affect an individual's likelihood of playing the lottery, but do

**TABLE 4**
PROBIT RESULTS FOR LIKELIHOOD OF PLAYING THE LOTTERY

| Variable | Definition | Coefficient | Std. Error | t–statistic |
|---|---|---|---|---|
| Constant | | 0.155 | 0.486 | 0.33 |
| NONWHITE | equals 1 if respondent non–white | 0.948 | 1.440 | 0.66 |
| INC2 | income >= $15K and < $25K | –0.042 | 0.278 | 0.15 |
| INC3 | income >= $25K and < $35K | 0.294 | 0.227 | 1.30 |
| INC4 | income >= $35K and < $50K | 0.504 | 0.236 | 2.13** |
| INC5 | income >= $50K and < $75K | 0.966 | 0.248 | 3.89*** |
| INC6 | income >= $75K | 0.780 | 0.266 | 2.94*** |
| EDUCATION | years of education | –0.054 | 0.030 | 1.76* |
| AGE | age in years | –.005 | .004 | 1.05 |
| VOTER | equals 1 if registered voter | –0.275 | 0.153 | 1.80** |
| RELIGION1 | attends religious services every week | –0.333 | 0.121 | 2.75*** |
| REPUB | equals 1 if republican | –0.146 | 0.164 | 0.89 |
| INDEP | equals 1 if independent | –0.012 | 0.136 | 0.09 |
| CHILDREN | equals 1 if children under 18 in household | –0.113 | 0.125 | 0.90 |
| OWNER | equals 1 if owner–occupant | 0.368 | 0.167 | 2.21** |
| EMPLOYED | equals 1 if employed | 0.035 | 0.152 | 0.23 |
| ATLANTA | equals 1 if resident of metro Atlanta | 0.058 | 0.131 | 0.44 |
| F–statistic | 3.93 | | | |

Note: Dependent variable equals PLAY. N = 548.
***Significant at p < .01
** Significant at p < .05
* Significant at p < .10

**TABLE 5**
SECOND–STAGE OLS RESULTS FOR LOTTERY SPENDING (LOTTERY PLAYERS ONLY)

| Variable | Definition | Coefficient | Std. Error | t–statistic |
|---|---|---|---|---|
| Constant | | –56.37 | 670.43 | 0.08 |
| NONWHITE | equals 1 if respondent non–white | 428.78 | 147.90 | 2.90*** |
| INC2 | income >= $15K and < $25K | –105.13 | 339.37 | 0.31 |
| INC3 | income >= $25K and < $35K | –246.27 | 316.79 | 0.78 |
| INC4 | income >= $35K and < $50K | 81.16 | 375.51 | 0.22 |
| INC5 | income >= $50K and < $75K | –164.43 | 486.52 | 0.34 |
| INC6 | income >= $75K | –109.80 | 439.91 | 0.25 |
| EDUCATION | years of education | –13.46 | 36.77 | 0.37 |
| AGE | age in years | 4.71 | 5.06 | 0.93 |
| VOTER | equals 1 if registered voter | –240.29 | 174.20 | 1.38 |
| CHILDREN | equals 1 if children under 18 in household | 1.47 | 133.25 | 0.01 |
| OWNER | equals 1 if owner–occupant | 267.86 | 232.83 | 1.15 |
| EMPLOYED | equals 1 if employed | 149.58 | 164.62 | 0.91 |
| ATLANTA | equals 1 if resident of metro Atlanta | –115.97 | 136.18 | 0.85 |
| LAMBDA | inverse mills ratio | 241.33 | 522.23 | 0.46 |
| Adjusted $R^2$ | .078 | | | |
| F–statistic | 2.00 | | | |

Dependent variable = *NET_SPENDING*. N = 162.
***Significant at p < .01
** Significant at p < .05
* Significant at p < .10

not affect the size of lottery purchases, conditional on playing.[7]

In the probit results (Table 4), respondents who are non–white, have higher incomes, own their own homes, are employed, and reside in metropolitan Atlanta are more likely to play the lottery, though some results are not significantly different from zero at conventional levels. Respondents who have more years of edu-

[7] We assume that individuals who are more religious may not play the lottery because of moral opposition to gambling, and that Republicans may be less likely to play because of ideological opposition or because the

cation, are older, attend religious services every week, have children, are registered voters, and are not Democrats are less likely to play the lottery, though again, some coefficients are not significantly different from zero.

The estimates from the probit equation are used to create the inverse mills ratio ($\lambda$) used in the second stage OLS. Only lottery players are included in the second–stage equation. Estimates from the OLS regression (Table 5) of lottery players suggest that, conditional on playing the lottery, non–whites spend more than whites and the results are statistically significant. The remaining coefficients are not significantly different from zero.[8] The estimates from the first and second stage equations are used to construct a predicted value of *NET_SPENDING* for households with various demographic characteristics.

### *Who Benefits?*

As described above, Georgia earmarks lottery revenues for narrowly defined educational programs. Ideally, we would estimate benefits using data at the household level measuring the characteristics of beneficiaries and non–beneficiaries. Unfortunately, no such data are available for this study. Therefore, we use aggregate data describing educational attainment, race, and income for county residents, as well as per–household lottery–funded program expenditures by county, to estimate the distribution of lottery benefits across socio–economic groups.

To assess the incidence of lottery benefits, we regress total lottery expenditures per household by county (*EXPENDITURES*) on mean county income (*MINC*), mean educational attainment of county residents (*MEDU*), and race of county residents (*%NONWHITE*):

$$[5]\quad EXPENDITURES_c = \delta_1 MINC_c + \delta_2 MEDU_c + \delta_3(\%NONWHITE_c) + \eta_c,$$

where $c$ indexes counties, the $\delta$'s are parameters to be estimated, and $\eta$ is a normally distributed error term.

Table 6 displays the results of the WLS regression (weighted by county households). In the model using total state lottery expenditures per household as the dependent variable, mean income has a positive sign, indicating that higher levels of lottery expenditures flow to counties with higher income households, *ceteris paribus*. Mean education has a negative sign, indicating that, *ceteris paribus*, higher lottery expenditures flow to counties with less educated residents. Mean income and mean education are, of course, highly collinear. An F–test for the joint significance of mean income and mean education is statistically significant at $p < .05$. The percentage of non–white residents is significant with a negative sign, suggesting that citizens in counties with higher percentages of white residents tend to receive larger benefits from lottery–funded programs. Tests for robustness of the model using non–linear specifications yield virtually identical predictions of net benefits across demographic groups.

Examining each lottery program individually produces similar but slightly different results. Because the HOPE Scholarship program primarily benefits students attending post–secondary institutions, we expect the benefits to accrue disproportionately to students from more educated, higher income families, since

lottery is strongly identified with Democratic former Governor Zell Miller. In the probit regression, the coefficients on both variables are negative as expected, and the religious attendance variable is significantly different from zero. An F–test on the excluded instruments is statistically significant at $p < .03$.

[8] The estimated coefficient on $\lambda$ is positive, as expected, and large in magnitude, but it is not statistically significant. This suggests that although we estimate a positive correlation between $\pi_1$ and $\pi_2$, this estimate is not precisely measured.

**TABLE 6**
WEIGHTED LEAST SQUARES REGRESSION RESULTS

| | DEPENDENT VARIABLES | | | |
|---|---|---|---|---|
| | Total lottery exp. per household (EXP) | HOPE expend. per household (EXP1) | Pre–k expend per household (EXP2) | K–12 Lottery exp. per household (EXP3) |
| Constant | 301.04 | –95.61 | 189.27 | 207.39 |
| | (219.78) | (61.93) | (73.57) | (169.30) |
| MINC | 2.56** | .114 | .436 | 2.01** |
| | (1.20) | (.339) | (.403) | (.927) |
| MEDU | –12.67 | 14.55** | –9.47 | –17.76 |
| | (21.16) | (5.96) | (7.08) | (16.30) |
| %NONWHITE | –145.65*** | –90.79*** | –7.54 | –47.32 |
| | (41.85) | (11.79) | (14.01) | (32.24) |
| Adj. R–square | .171 | .386 | .006 | .072 |
| F statistic | 11.90 | 34.06 | 1.34 | 5.07 |

(Std. error in parentheses)
N = 159.
***Significant at p < .01
** Significant at p < .05
* Significant at p < .10

they may be more likely to attend college. The results of the analysis support this hypothesis; the coefficients estimated on *MINC* and *MEDU* are positive. However, only the coefficient on education is statistically significant. *MINC* and *MEDU* are jointly significant at $p < .05$. The percentage of non–white residents is negative and significant, which is also consistent with expectations.

While the pre–kindergarten program is, like HOPE, an entitlement available to all families, there is no clear *a priori* assumption regarding the incidence of the benefits. The results in Table 6 suggest a weak relationship between pre–kindergarten allocations and county characteristics. Mean household income is positive while education and percentage of non–white residents are negative, but none is statistically significant and the equation's adjusted $R^2$ is only .006. Finally, Table 6 displays the results of the model using K–12 (technology and construction) expenditures as the dependent variable. Mean household income is positive and significant at $p < .05$, while mean education and percent non–white are both negative and are not statistically significant. MINC and MEDU are jointly significant, $p < .05$.

We use the results from the second column of Table 6 (total lottery–funded program expenditures per household) to construct a predicted value of lottery–funded program expenditures (*BENEFIT*) for each household in the survey data.

### *Net Budgetary Incidence*

Using the predicted benefits and the predicted net spending for each household, we can compute net benefits from the Georgia Lottery for Education:

$$[6] \quad NET\_BENEFIT = BENEFIT - NET\_SPENDING.$$

As shown in Table 7, we estimate that the households in Georgia receive an average *NET_BENEFIT* of about $50 from the Georgia Lottery for Education. It is possible that the actual average *NET_BENEFIT* for Georgia residents is positive because residents of other states purchase lottery products, but residents of other states do not receive any direct

**TABLE 7**
DISTRIBUTION OF HOUSEHOLD SPENDING ON LOTTERY PRODUCTS, BENEFITS OF LOTTERY FUNDED PROGRAMS, AND THE NET BUDGETARY INCIDENCE OF THE GEORGIA LOTTERY FOR EDUCATION

| Group | Mean Predicted *NET_SPENDING* | Mean Predicted *BENEFIT* | Mean Predicted *NET_BENEFIT* |
|---|---|---|---|
| All Households | $155.52 | $205.12 | $49.60 |
| Whites | $132.99 | $248.39 | $115.40 |
| Non–Whites | $220.68 | $80.01 | –$140.67 |
| Income < $15K | $270.84 | $110.29 | –$160.55 |
| Income >= $15K and < $25K | $323.16 | $138.35 | –$184.81 |
| Income >= $25K and < $35K | $90.45 | $169.89 | $79.44 |
| Income >= $35K and < $50K | $236.57 | $196.15 | –$40.42 |
| Income >= $50K and < $75K | $143.62 | $257.43 | $113.81 |
| Income >= $75K | –$39.46 | $344.43 | $383.89 |
| Less than high school | $162.29 | $185.43 | $23.14 |
| High school grads | $132.35 | $225.99 | $93.64 |
| Some college | $164.94 | $196.99 | $32.05 |
| College grads | $172.22 | $194.36 | $22.14 |
| Graduate / professional | $136.58 | $231.22 | $94.65 |

benefits from the lottery–funded programs.

Table 7 also shows the weighted mean value of net benefits for households in different socio–demographic groups. The point estimates suggest a clear pattern of net benefits, although differences across groups are not statistically significant. We estimate that whites, on average, receive a substantially higher level of expected expenditures from lottery programs than non–whites—the predicted mean of *BENEFIT* equals $248.39 for whites and $80.01 for non–whites. In addition, non–white households are estimated, on average, to spend more than white households on purchasing lottery products—the predicted mean of *NET_SPENDING* equals $132.99 for whites and $220.68 for non–whites. Thus, for the net budgetary incidence of the lottery, non–white households are predicted, on average, to spend approximately $141 more on lottery products than they receive in benefits while whites, on average, are predicted to receive a positive net transfer of about $115 per year.

Among income groups, households earning more than $35,000 per year are estimated to spend less on lottery products than households earning less than $25,000 per year. Except for the $25,000 to $35,000 income category, spending on lottery products is not only regressive, but higher income groups tend to spend a lower absolute amount on lottery products than do lower income groups. State lottery–funded program expenditures (*BENEFIT*) are estimated to rise with income. Households earning less than $25,000 and between $35,000 and $50,000 are estimated to receive, on average, negative net benefits (higher household lottery spending than benefits received) from the Georgia Lottery. All other income groups have net benefits that are, on average, predicted to be positive. Households earning between $15,000 and $25,000 per year are predicted to receive the lowest net benefits on average per year (–$184.81), primarily because this group is estimated to have the highest mean *NET_SPENDING* ($323.16) and second lowest *BENEFIT* ($138.35). The largest net benefits accrue to the highest income households (income above $75,000).

Surprisingly, *NET_SPENDING* does not decrease as years of education increases. For example, high school graduates are estimated to spend slightly less on lottery products than respondents with higher levels of educational attainment. The earmarking of lottery revenues for HOPE scholarships and pre–kindergarten may make more highly educated Georgia residents more likely to purchase Georgia lottery tickets because of the direct benefits they receive. We do find that more highly educated persons are more likely to purchase lottery products than is typically found in other studies (Borg, Mason, and Shapiro, 1991; Stranahan and Borg, 1998).

Alternative specifications for estimating the *NET_SPENDING* regressions and the patterns of *NET_BENEFITS* suggest that the results are highly robust across specifications. For example, estimating the *NET_SPENDING* equation using lottery purchases minus average expected (rather than actual) winnings produces a similar distribution of *NET_BENEFITS*, though *NET_BENEFITS* rise even more sharply with education levels. Including the *NET_SPENDING* outliers with imputed spending values (equal to the mean of *NET_SPENDING* plus two standard deviations) also produces very similar patterns of *NET_BENEFITS* across demographic groups.[9]

## ALTERNATIVE FINANCING FOR LOTTERY–FUNDED PROGRAMS

Despite the estimated regressivity of implicit lottery taxation, most states have lotteries. Why? Our data, and data used in other household level studies of lotteries, suggest that a minority of households bear *any* burden from the implicit lottery tax, because most households do not play the lottery. In addition, a small minority of lottery players bears the majority of the lottery tax burden. Since a small minority of the population bears much of the burden of implicit lottery taxation and because it is generally illegal for a private entity to run a lottery, both lottery non–players and players may consider themselves better off with a lottery than without one. Non–players may consider themselves better off because they may derive a benefit from lottery–funded government services, and lottery players may consider themselves better off with a lottery because they get to play lottery games they enjoy.

In this political economy environment, Georgia has chosen to finance new educational programs (HOPE, pre–k, and K–12 infrastructure) through dedicated funding from lottery proceeds rather than through increases in broad–based taxes. The estimates in the previous section suggest that the net budgetary incidence of the Georgia Lottery is regressive. Targeting the lottery–funded programs to low income households would help to reduce the overall regressivity of the Georgia Lottery. Other methods to reduce regressivity include eliminating marketing, providing information to potential players (warning labels), and increasing payout rates (Clotfelter, et. al., 1999).

Georgia could also reduce the overall regressivity of the lottery–funded programs by focusing on the revenue source —it could increase state sales and / or income taxes to replace revenues generated by its lottery. To raise an amount of revenue equivalent to what is currently raised by its lottery, we estimate that Georgia could raise its sales tax rate from 4.0 percent to 4.69 percent.[10] This additional sales

[9] For example, using the imputed values of *NET_SPENDING* for the outliers in the analysis leads to a difference of $284 between the estimated *NET_BENEFITS* that accrue to white and non–white households. The two lowest income groups have negative estimated *NET_BENEFITS*, the next three higher income groups have *NET_BENEFITS* between $100 and $200, while the highest income group is estimated to have *NET_BENEFITS* over $300. Finally, net benefits are estimated to rise with education levels, although the highest–education group has net benefits lower than those of the next highest education group. This pattern of *NET_BENEFITS* is very similar to the pattern reported in Table 7.

[10] This computation is based upon an estimate of the elasticity of the sales tax base in Georgia found in Hawkins (1996). Hawkins estimated the elasticity to be –0.3 for Georgia. Estimating such elasticities using current techniques is controversial, and there are important methodological issues to consider (Merriman and Skidmore, 2000).

tax of approximately seven–tenths of a cent on the dollar represents an increase of 17.25 percent over current rates. Some of the burden of a sales tax increase in Georgia would be exported to residents of other states, just as some of the burden of revenues raised by the lottery is exported to other states. Although Georgia's sales tax is particularly regressive because services are exempt from taxation, estimates suggest that the regressivity of sales taxation is less than that of implicit lottery taxation (Clotfelter and Cook, 1989; Price and Novak, 1999).

Another revenue neutral alternative is for Georgia to raise its average state income tax rate from 3.0 percent to 3.385 percent—a 12.8 percent increase in the state income tax burden.[11] An increase in the income tax is likely to be less regressive than an increase in the sales tax, and far less regressive than household spending on lottery products. Given the lower marginal tax rates, both sales and income taxation would be much more efficient revenue sources than implicit lottery taxation (Clotfelter and Cook, 1989).

## CONCLUSIONS

The Georgia Lottery for Education provides a unique opportunity to directly explore not only the conventional questions surrounding the incidence of household lottery spending but to also examine how spending relates to the benefits received by households. While the vast majority of research has found lotteries to be a highly regressive method of raising revenue, it is important to also examine how the benefits of lottery–funded programs are distributed. Consistent with numerous other studies, we find that spending on lottery products is highly regressive. We also find that higher income households tend to receive a higher level of benefits from lottery–funded programs than do lower–income households, though these benefits represent a higher proportion of income to lower–income households. Taken together, we find a highly regressive pattern of net benefits. Lower income households (those reporting under $25,000 annual income) spend more on the lottery than they receive in benefits, while higher income households (those reporting over $50,000 annual income) receive a positive net benefit. White households tend to spend less on playing the lottery than non–white households but receive substantially higher benefits from lottery–funded programs, on average.

Our results suggest that much of the regressivity of net benefits is caused by patterns of spending on lottery products and by the HOPE Scholarship program. Since the program provides subsidies to students pursuing higher education, it is not surprising that more educated, higher income families would receive a disproportionate share of the benefits. The benefits of the other lottery–funded programs —particularly pre–kindergarten—appear to be only weakly related to race, education, and income.

If the publicity surrounding HOPE scholarships spurs more lower income students to apply to and attend college, then our results may underestimate the actual benefits of the program to students from low–income families. It is also worth noting that students are required to apply for Pell Grants at the same time as HOPE and in FY 1998 any Pell awards were used to offset HOPE grants. Beginning in FY 2001, students will be able to collect both HOPE and Pell Grants, and this policy change may reduce the regressivity of net benefits by providing

[11] This calculation assumes an elasticity of the income tax base with respect to income taxation of –0.1. Estimates of labor supply elasticities for adult males are typically around 0, while elasticities for other demographic groups (especially married women) suggest that there will be some erosion of the income tax base with a rise in income taxes. See Pencavel (1999) and Killingsworth and Heckman (1999) for good surveys of the topic.

more state funding to lower–income students.

Voters face choices about alternative revenue sources for public programs. In Georgia, HOPE Scholarships and universal pre–kindergarten have become closely identified with their funding source—the Georgia Lottery—and these programs are extremely popular. It is important, though, that voters have adequate information about the implications of various funding decisions. This paper provides citizens and policymakers (including those in other states seeking to emulate Georgia's experience) with information to assess both the incidence of lottery purchases and the benefits of lottery funded programs.

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