Gambling for Good: Evidence from the Tennessee Education Lottery

Presented by Kara Mitchell
“Brown bag” Research Workshop
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Motivation

- 42 states and the District of Colombia use lotteries to fund public programs
- About 90% proceeds in whole or in part for specific programs (education, seniors, parks)
- An overwhelming body of research suggests that lotteries are regressive
  - Generally, this regressivity is blamed on a correlation between income and education
  - OR, risk-loving consumers
Theoretical evidence suggests that the earmarks are of material importance to players (Morgan 2000).

Morgan suggests that if a public *good* is funded, risk-neutral players may maximize utility by participating in a lottery.

Players get two returns:
- Expected value of the lottery prize
- Return from the Public Good
How many dollars did Elk Creek Country Store contribute to Virginia's public schools in fiscal year 2008?

Answer: $12,799.46

Learn more at VaPopQuiz.com
Tennessee Education Lottery

- TEL has a primary earmark for higher education scholarships
- As of March 30, 2009, scholarships accounted for 86% of all Lottery for Education Account expenditures
- Scholarships are largely merit-based and can be used for public and private schools
- Since inception in 2004, the TEL Scholarship Program has experienced multiple expansions via policy initiatives
Most recent literature approximates lottery demand with sales data aggregated by:

- City (Jackson 1994)
- Zip code (Oster 2004; Clotfelter 1979; Clotfelter and Cook 1987; Price and Novak 1999)
- County (Garrett and Coughlin 2009; Miyazaki et al. 1998; Hansen et al. 2000; Hansen 1995; Mikesell 1989; Brinner and Clotfelter 1975)

Other control variables:
- Powerball Prize (Oster 2004)
- % minority
- % over age 65
- Formal education
Prior Literature – Charitable Goods

- Theoretical foundation is introduced by Morgan (2000) and lab-tested in Morgan and Sefton (2000)
- Morgan views lotteries as a practical means of overcoming the free-rider problem in the provision of public goods
  - “Double Dividend”
- Landry and Price (2007) find that sales are statistically higher in states that earmark for education, relative to General Fund states
An individual faces a linear utility function:

\[ U = w_i - t_i + \frac{t_i}{t_i + t_{-i}} \times P + h_i(G) \]

Where

\[ G = t_i + t_{-i} - P \]
The individual contribution (ticket purchase) is defined by the FOC:

\[ P^* \frac{t_{-i}}{(t_i + t_{-i})^2} + h'(G) = 1 \]

- Individuals are heterogeneous in the marginal per capita return of the public good.
- Assume that \( h_i' \) increases with income, which Stranahan and Borg (2004) show to be true with higher education scholarships.
- When the second term increases, the first term must get smaller for equilibrium to hold.
- Note: the first term decreases faster in \( t_{-i} \) than in \( t_i \).
Identification

- I construct a variable that proxies for the value of the public good – scholarship recipients by county-month
- Hypothesis #1: This variable will be positive and significant when regressed on sales by county-month
- Hypothesis #2: The TEL is less regressive than other lotteries (tested by comparing my estimates with estimates from prior research)
Panel Model:

\[ y_{it} = I_{it} \delta + S_{it} \eta + P_t \lambda + X_{it} \beta + \mu_i + \lambda_m + \nu_{it} \]

- \( y_{it} \) = gross per-capita sales for either instant games or Powerball
- \( I_{it} \) = per-capita income
- \( S_{it} \) = matrix of per-capita scholarship recipients
- \( P_t \) = top Powerball prize for month \( t \)
- \( X_{it} \) = demographic variables
Per capita sales, per capita income, and per capita scholarships are expressed in natural logs to facilitate a constant elasticity measure.
Results

- Instant game purchases respond positively to an increase in scholarships

<table>
<thead>
<tr>
<th>Variable</th>
<th>PBall</th>
<th>instant</th>
</tr>
</thead>
<tbody>
<tr>
<td>In per capita personal income</td>
<td>-1.304***</td>
<td>0.490***</td>
</tr>
<tr>
<td>Max Pball prize (10M)</td>
<td>0.033***</td>
<td>0.001**</td>
</tr>
<tr>
<td>In per capita scholarships</td>
<td>-0.004</td>
<td>0.153***</td>
</tr>
<tr>
<td>% age 65 and up</td>
<td>-2.156***</td>
<td>0.474</td>
</tr>
<tr>
<td>% male</td>
<td>-2.224**</td>
<td>-3.564***</td>
</tr>
<tr>
<td>% black</td>
<td>0.808</td>
<td>0.196</td>
</tr>
<tr>
<td>% hispanic</td>
<td>-2.857***</td>
<td>2.698***</td>
</tr>
<tr>
<td>Overall R-sq</td>
<td>0.065</td>
<td>0.037</td>
</tr>
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Instant games are seem to be less regressive in TN than in Texas (IE=-.405, Price and Novak 1999) or in West Virginia (IE=+.220, Garrett and Coughlin 2009), both of which are general fund states.

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Results

However, Powerball is more regressive than previously reported for Connecticut (IE=-.709 Oster 2004), a general fund state.
Why not Powerball?

- It’s relatively small – On average, only about 6% of total lottery sales in TN
- From the Multi-State Lottery Association Website:
  - “The perception that the money leaves the state is one of the most difficult concepts we have to deal with. Some lottery players actually refuse to play the Powerball game...because they believe that the profits go to the federal government or to some other ‘outside’ group.”
The effect of an increase in scholarships is larger for the top 10 counties in income than the bottom 10, though the effect is economically insignificant.

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<td>In per capita personal income</td>
<td>-1.344***</td>
<td>0.437***</td>
</tr>
<tr>
<td>Max Pball prize (10M)</td>
<td>0.033***</td>
<td>0.001**</td>
</tr>
<tr>
<td>In per capita scholarships</td>
<td>-0.012</td>
<td>0.154***</td>
</tr>
<tr>
<td>Top10Inc*ln(PerCapSchol)</td>
<td>0.082***</td>
<td>0.120***</td>
</tr>
<tr>
<td>Bottom10Inc*ln(*PerCapSchol)</td>
<td>0.043**</td>
<td>-0.029*</td>
</tr>
<tr>
<td>% age 65 and up</td>
<td>-2.045***</td>
<td>0.711</td>
</tr>
<tr>
<td>% male</td>
<td>-2.141*</td>
<td>-3.494***</td>
</tr>
<tr>
<td>% black</td>
<td>0.159</td>
<td>-0.21</td>
</tr>
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<td>% hispanic</td>
<td>-2.896***</td>
<td>2.068***</td>
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<td>0.043</td>
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Robustness Checks

- Exclusion of Knox, Hamilton, Shelby, Davison counties
- Exclusion of counties that border non-lottery states
- Test linear, log-linear, linear-log, and quadratic functional forms
Conclusions

- Consistent with theory, instant game sales in Tennessee, by county, are increasing in “G”
- Also consistent with theory, this results in a less-regressive instant game lottery than found in other states
- These results don’t hold for Powerball, but there are good reasons