



UNIVERSITY OF MASSACHUSETTS SCHOOL OF PUBLIC HEALTH AND HEALTH SCIENCES

Lottery Revenue and Plainridge Park Casino: Analysis After Two Years of Casino Operation

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Executive Summary

Background

The slot parlor at Plainridge Park opened in Plainville, Massachusetts on June 24, 2015. Two additional casinos are scheduled to open in Everett and Springfield and are currently under construction. With the introduction of casino gambling in Massachusetts, the Commonwealth has made protection of the lottery a priority. The Legislature required all prospective casino operators to be a licensed state lottery agent.

In fiscal year 2017, total lottery sales in Massachusetts were just over \$5.0 billion, a decrease of approximately 2.6% compared to fiscal year 2016 when sales were a record-high \$5.2 billion. Lottery revenues are the largest source of unrestricted local aid in Massachusetts and the second largest source of all local aid, after Chapter 70 education aid. Local aid is distributed from a single pool according to a formula devised by the Legislature; local sales do not determine the amount of local aid that a municipality receives. In fiscal year 2017, the lottery's net profit was a \$1.039 billion, an all-time record high, of which \$958 million was distributed to the Commonwealth's municipalities in the form of direct local aid. In fiscal year 2017, Plainville received \$729,447 from the lottery and other direct local aid sources, which represents 16.6% of the Town's total state aid and 2.0% of total receipts.

Casino tax revenue will also contribute to local aid, with 82% of tax revenue from Plainridge Park Casino allocated to local aid. The Category 1 casinos scheduled to open in Everett and Springfield will contribute 20% of tax revenue to local aid. As of December 2017, a total of \$199,948,775 has been collected in state taxes and race horse assessments, of which \$163,223,490 consists of state taxes.¹

Methods

The Massachusetts Lottery has provided fiscal year and agent-specific lottery sales data to the SEIGMA Economics team at the UMass Donahue Institute. Fiscal year data dates from 2003 to 2017. Agent-specific lottery revenue dates from June 2014 to July 2017. Changes in revenue are analyzed at several levels, including statewide, in the host and designated surrounding communities near the casino, for agents at different driving distances from the casino, and for communities and regions most represented in the patron survey data. Plainville is the host community and Attleboro, North Attleborough, Foxborough, Mansfield, and Wrentham are the officially designated surrounding communities.

Key Findings

- No large, significant decline in lottery revenue can be attributed to Plainridge Park Casino.
- No obvious pattern between lottery sales growth and proximity to the casino was detected. Sales have not uniformly increased at greater distances from the casino.
- In the first year after the opening of Plainridge Park Casino, lottery revenue in Plainville increased approximately 25%. It has remained at that level in the second year of operation.
- Sales for other agents in Plainville have not notably declined since the opening of Plainridge Park casino.
- Compared to the year prior to the casino opening, gains in lottery revenue in Plainville have been sufficient to offset declines in the surrounding communities, leaving sales essentially unchanged, but not matching gains in rest of the state.

¹ <https://massgaming.com/wp-content/uploads/Revenue-Report-12-2017.pdf>

- Over the two year period since the opening of the casino, changes in average bi-weekly sales for agents in the surrounding communities of Attleboro, Foxborough, Mansfield, North Attleborough, and Wrentham vary, but collectively decline compared to the year prior to the casino opening.
- Over the two-year period since the opening of the casino, average bi-weekly sales in Plainville and the surrounding communities combined are essentially unchanged compared to the year prior to opening.
- Relative to the rest of the state, lottery sales for agents within a 15-minute drive of Plainridge Park Casino grew more slowly (year 1) or decreased (year 2) compared to the year prior to the casino opening.
- Relative to the rest of the state, lottery sales for agents within a 16-30 minute drive of Plainridge Park Casino grew more rapidly compared to the year prior to the casino opening.
- Massachusetts is one of the largest lotteries in the country, both in per capita terms and in absolute terms. As late as fiscal year 2012 and 2013, lottery revenue in Massachusetts exceeded lottery revenue in Florida and California, respectively.
- Growth in lottery revenue in Massachusetts has been slower than growth in lottery revenue nationwide and in other New England states.
- Lottery sales in Massachusetts in fiscal year 2017 decreased 2.6% over fiscal year 2016 (a record sales year), when sales increased 4.3% over fiscal year 2015.
- Between fiscal year 2003 and fiscal year 2017, lottery revenue has grown at an annualized rate of 1.38%. Inflation over the same period has grown at an annualized rate of 2.04%.
- In Plainville and the surrounding communities of Attleboro, Foxborough, Mansfield, North Attleborough, and Wrentham, lottery revenue grew more slowly in fiscal year 2016 than the state wide average (2.1% vs. 4.3%) and decreased more in fiscal year 2017 (-3.8% vs. -2.6%).
- With the exception of the Berkshires region, sales growth in the Metro Boston and Southeast Region (the source of 85% of recaptured gambling dollars) lagged behind other regions in the state in the two years following the opening of the casino.

Discussion

Statewide lottery revenue grew 4.3% in fiscal year 2016, a time period that nearly corresponds to the first full year of operation of Plainridge Park Casino, which opened June 24, 2015. In fiscal year 2016, lottery sales established an all-time sales record. In fiscal year 2017, however, statewide lottery revenue declined 2.6%. Lottery sales for the Town of Plainville increased 25% in the year after the casino opened relative to the prior year and remained at that level in the second year. This increase is due to increased lottery sales at Plainridge Park Casino.

Sales for lottery agents in the surrounding communities of Attleboro, Foxborough, Mansfield, North Attleborough, and Wrentham, *combined*, did not decline in the first year following the opening of the new casino, but grew more slowly, increasing 3.6% over the year prior to the casino opening compared to 5.2% for lottery sales statewide. In the second year of operation, sales in the *combined* surrounding communities decreased by 1.5% relative to the year prior to the casino opening compared to a 2.8% increase statewide relative to the base period prior to the casino opening. Even when including Plainridge Park Casino, sales for agents within a 15-minute drive of the casino follow a similar pattern, growing more slowly in the first year (3.78%) and decreasing (0.37%) in the second year. However, it should also be noted that sales for agents within a 16-30 minute drive of the casino performed better than the state as a whole, increasing in both years following the opening of the casino, by 5.70% in year 1 and 3.12% in year 2 compared to the year prior to opening.

Overall, the gains in lottery revenue in Plainville have been sufficient to offset declines in the surrounding and nearby communities, but not enough to match gains in the rest of the state over the two year period since the opening of Plainridge Park Casino. However, the difference is not statistically significant and it is not possible to conclude any directional change in lottery revenues. In other words, statistically, lottery sales in the host and nearby communities (designated surrounding communities and those within a 15-minute drive) remain unchanged.

Introduction

The Massachusetts State Lottery has been operating since 1972. In fiscal year 2017, lottery tickets could be purchased at over 8,000 licensed lottery vendors throughout the Commonwealth and total sales were just over \$5.0 billion, a decrease of approximately 2.6% compared to fiscal year 2016 when sales were a record-high \$5.2 billion. For fiscal year 2017, instant games accounted for nearly 70% of lottery sales. Keno, the next most popular game, contributed approximately 18% of total sales in fiscal year 2017.

With the introduction of expanded gambling in Massachusetts, the Commonwealth has made the protection of the Lottery and its vendors a priority. Chapter 23K, Section 1 of the 2011 Expanded Gaming Act states that “enhancing and supporting the performance of the state lottery and continuing the commonwealth’s dedication to local aid is imperative to the policy objectives of this chapter.”² Section 4 gives the newly created Massachusetts Gaming Commission the power to “coordinate with the office of the treasurer and receiver general on implementing any measures necessary to protect the commonwealth’s lottery and gaming interests.”

The Legislature also placed conditions on all prospective casino operators, aimed at protecting the Lottery. Section 15 (1) of the Expanded Gaming Act states that any applicant for a gaming license must “agree to be a licensed state lottery sales agent under chapter 10 to sell or operate the lottery, multi-jurisdictional and keno games; demonstrate that the lottery and keno games shall be readily accessible to the guests of the gaming establishment and agree that, as a condition of its license to operate a gaming establishment, it will not create, promote, operate or sell games that are similar to or in direct competition, as determined by the commission, with games offered by the state lottery commission, including the lottery instant games or its lotto style games such as keno or its multi-jurisdictional games.” Section 15 (6) requires any applicant to “demonstrate to the commission how the applicant proposes to address lottery mitigation.”

The lottery is a major source of revenue for the Commonwealth and in particular for its 351 cities and towns. Lottery revenues are the largest source of unrestricted local aid in Massachusetts and the second largest source of all local aid, after Chapter 70 education aid. Revenue from Massachusetts lottery sales are combined and distributed by the state legislature to municipalities, along with other funds collected for unrestricted local aid, according to a formula which takes into account the incomes, property wealth, and population of each municipality. Since most revenue for municipal governments comes from property taxes, many communities in Massachusetts without substantial property wealth rely on this source of aid to fund their local government services.

In fiscal year 2017, the lottery’s net profit increased compared to fiscal year 2016, reaching an all-time record of \$1.039 billion, of which \$958 million was distributed to the Commonwealth’s municipalities in the form of direct local aid.³ The significance of these funds varies across communities based on the magnitude of their other sources of revenue – from 0.03% of total receipts in Chilmark to 14.5% in

² The Expanded Gaming Act can be found at <https://malegislature.gov/Laws/SessionLaws/Acts/2011/Chapter194>.

³ Funds also go to the Massachusetts Arts Lottery, the Massachusetts Cultural Council, and the Massachusetts Council on Compulsive Gambling. See <http://www.masslottery.com/about/communities/> for detail.

Adams. As reported on the Lottery website, among the casino host communities, Everett received \$6,642,634 from the lottery in fiscal year 2017, 8.8% of Everett's total state aid and 3.1% of its total receipts, while Plainville received \$729,447 (16.6% of the Town's total state aid and 2.0% of total receipts) and Springfield received \$36,399,631 (9.7% of total state aid and 5.8% of total receipts).⁴

As Massachusetts moves forward with the introduction of casino gambling, one priority of the Massachusetts Gaming Commission and the SEIGMA project is to determine how lottery-product-buying behavior may be affected by the introduction of casino gambling in Massachusetts. Studies have been conducted on the impacts of expanded gambling on lottery revenue in other states, but it is difficult to say how similar the impacts will be in Massachusetts. In 2016, at \$767, Massachusetts has the highest per capita lottery sales in the nation amongst states without video lottery terminals (VLTs), with the next highest non-VLT state being Georgia at \$412 per capita).⁵ This may be in part because of the odds offered by the Massachusetts Lottery. According to the U.S. Census' 2015 Annual Survey of State Government (the most current as of the time of writing), for every dollar spent on the lottery in Massachusetts, 73 cents are paid out to players, the most of any state (approximately the same proportion as Arizona) and considerably higher than the U.S. average of 63 cents. The relative popularity of the Massachusetts Lottery, to some extent, may insulate it from potential negative impacts as casino gambling continues to expand. Yet, the lottery's prominent role in Massachusetts also means that the consequences of a reallocation of spending towards the casinos and away from the lottery are potentially greater.

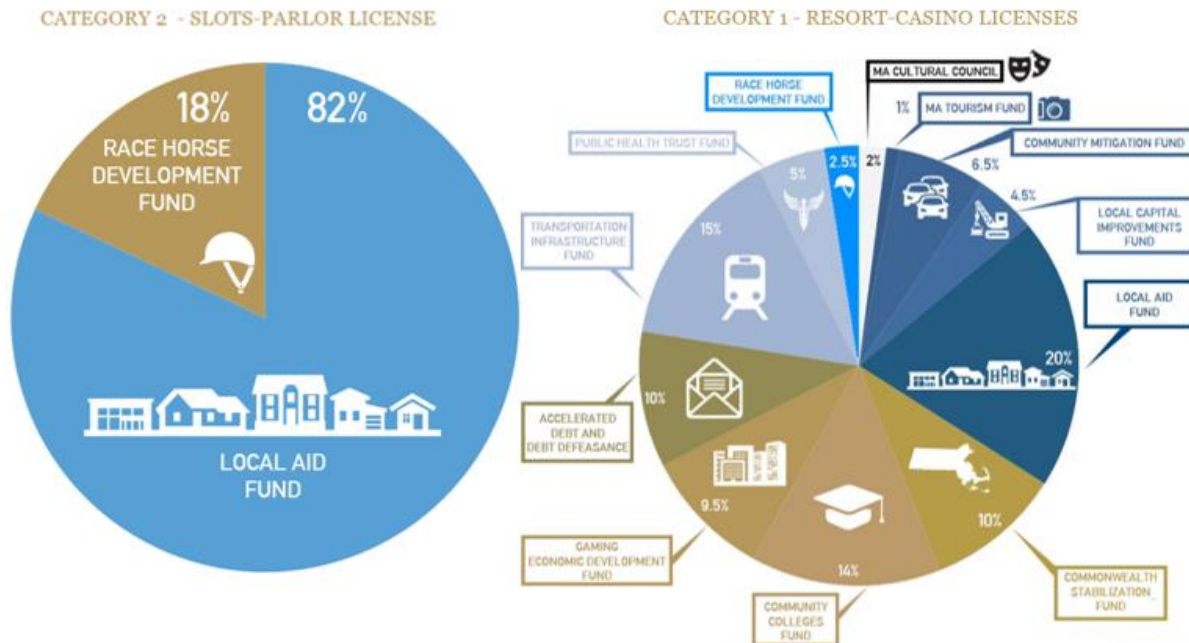
In the event that the expansion of casino gambling in Massachusetts leads individuals to spend less money on lottery and more money at the casinos, this will not necessarily lead to a reduction in local aid funds. As detailed in Figure 1 below, the Category 2 slots parlor that opened in Plainville in the summer of 2015 allocates 82% of its tax revenue to local aid, while the Category 1 resort casinos will allocate 20% of their tax revenue to local aid when they open.⁶ Thus the net impact on local aid will depend on changes in both casino and lottery revenue. In order to determine the impact of expanded gambling on Massachusetts, monitoring of lottery performance, statewide and in the communities near the new casinos, is a priority of the SEIGMA team. With the context of its significance to the Commonwealth in mind, this report details the work that the SEIGMA team has done to date to monitor the impact of expanded gambling on the Massachusetts Lottery.

⁴ Data on State lottery disbursements comes from the Massachusetts Lottery and can be found at <http://www.masslottery.com/about/communities/complete-list.html>. Data on state aid and total receipts for Massachusetts communities comes from the Massachusetts Department of Revenue, Division of Local Services and can be found at <http://www.mass.gov/dor/local-officials/municipal-databank-and-local-aid-unit/data-bank-reports/municipal-budgeted-revenues.html>.

⁵ La Fleur's 2017 World Lottery Almanac. In 2016, only Rhode Island had higher per capita sales of \$829, but nearly 65% of lottery revenue in Rhode Island is generated by VLTs (<http://rilot.com/financial.asp>). Other than Rhode Island, no other state, including those with VLTs, had higher per capita sales than Massachusetts.

⁶ From the Massachusetts Gaming Commission. More information can be found at <http://massgaming.com/the-commission/budget/>

Figure 1: Allocation of Tax Revenue for Category 1 and 2 Casinos



Source: The Massachusetts Gaming Commission.

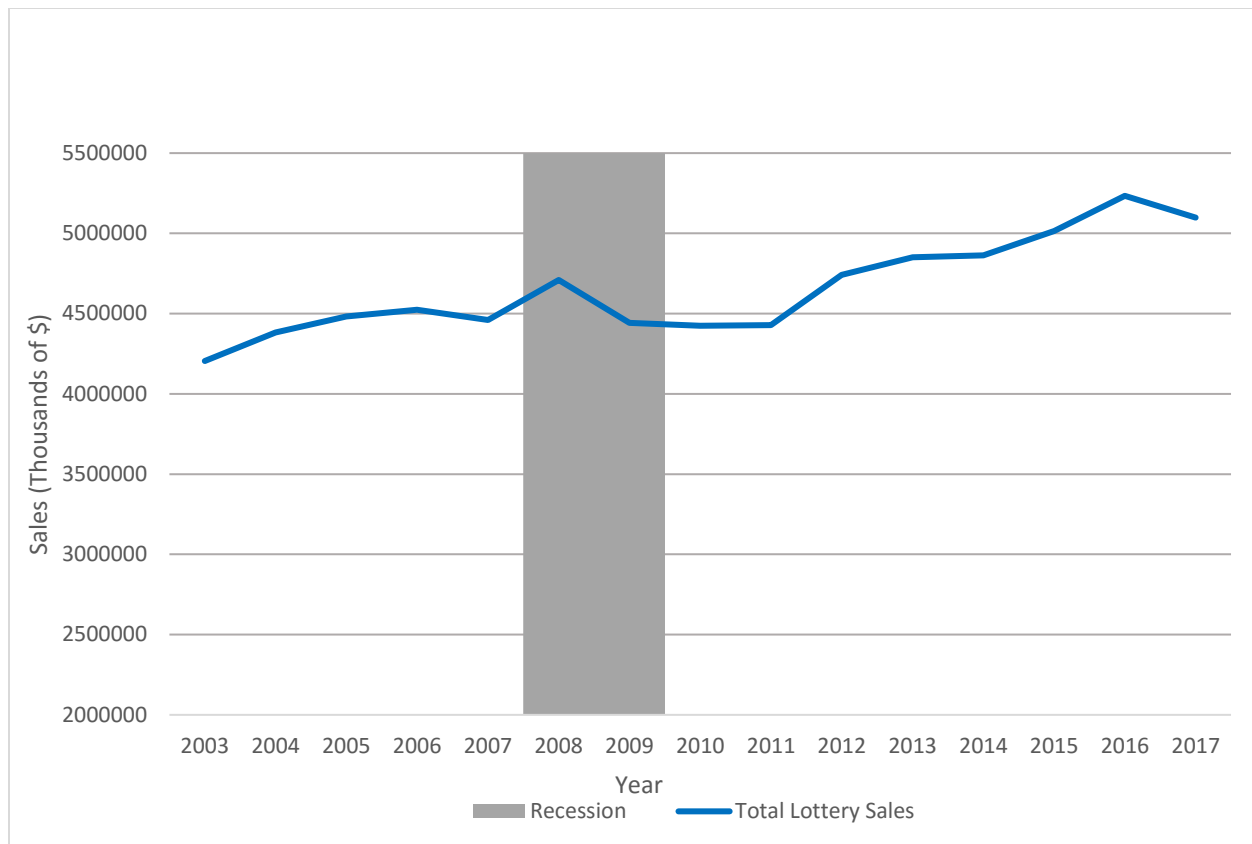
Massachusetts Lottery Sales 2003-2017

Statewide Sales

Lottery sales in Massachusetts over the 2003-2017 fiscal year period have generally grown slowly, but steadily (see Figure 2). Average annual sales growth over this period is 1.38%.⁷ Like many state lotteries, sales during the recession flattened or decreased. Beginning in 2012 sales growth increased, but in fiscal year 2017, year-over-year lottery sales decreased by approximately 2.6%.

⁷ Sales are in nominal dollars and not adjusted for inflation, which averaged 2.04% over the sample period. In inflation adjusted dollars, revenue for fiscal year 2017 was approximately the same as revenue for fiscal year 2008 and is below revenue for fiscal year 2003. In inflation adjusted dollars, the annualized growth rate from 2003-2017 was -0.64%. See Appendix A, Figure A-1, for inflation-adjusted (real dollar) lottery sales.

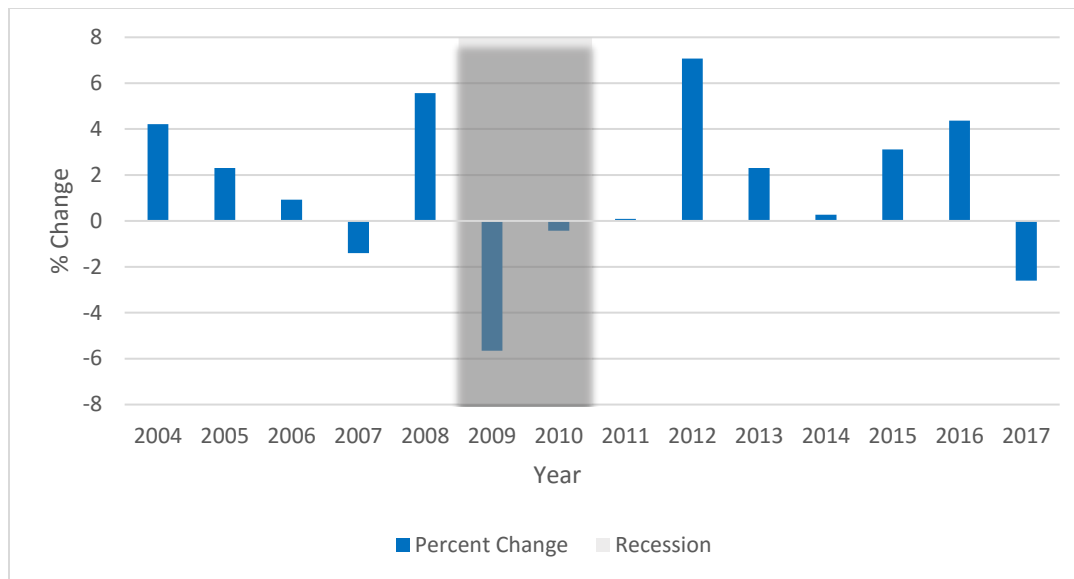
Figure 2: MA Lottery Sales, FY 2003-2017, Not Adjusted for Inflation



Source: MA Lottery, FY 2003-2017, nominal dollars. Lottery revenues declined during the recession, increased between 2012 and 2016, but declined in 2017. The average annual growth in nominal lottery revenue between 2003 and 2017 was 1.38%

Figure 3 presents the annual percentage change in lottery revenues between 2004 and 2017 in more detail (see Appendix A for annual percentage changes of inflation-adjusted dollars). Massachusetts lottery sales decreased 5.5% between 2008 and 2009, followed by several years of little to no growth. In 2012, sales growth increased over 7%, followed by two years of slower growth before rebounding again in fiscal years 2015 and 2016. Sales in fiscal year 2017 decreased by 2.6%. Figure 3 also demonstrates the year-to-year variation that occurs in lottery revenue growth, even in non-recession years, reinforcing the prudence in not placing too much emphasis on a single year of increased or decreased revenue.

Figure 3: Percent Change in Lottery Sales, FY 2003-2017

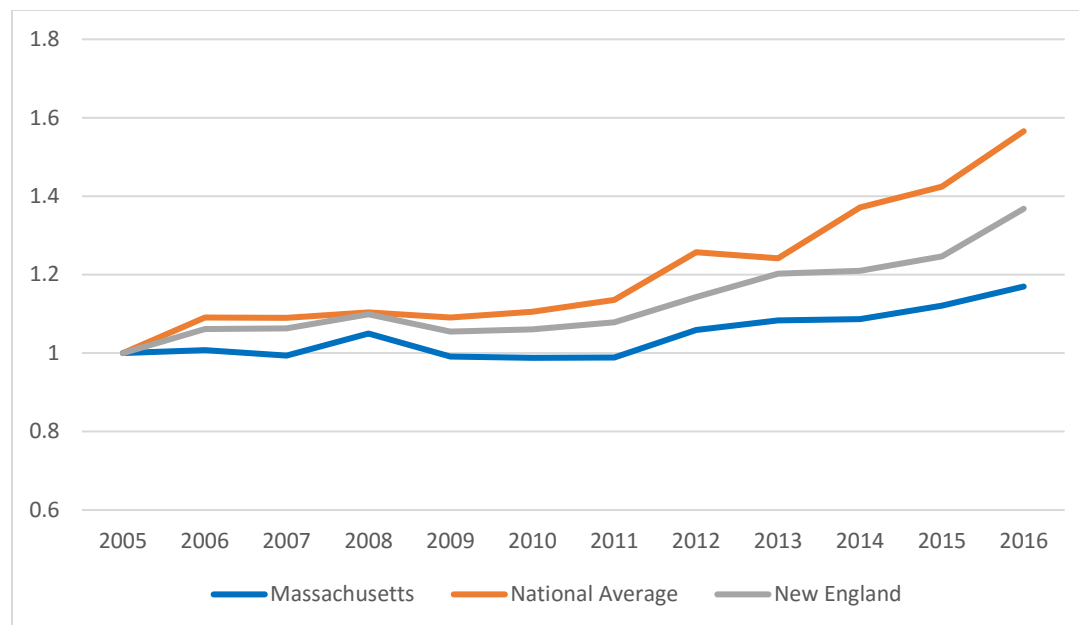


Source: MA Lottery, FY 2003-2017, nominal dollars. This figure shows annual growth rates. The declines in revenue during the recession are evident. Since the recession, the increase in lottery revenue was greatest in 2012 and 2016.

Massachusetts Lottery Sales by Region and Relative to Other States

Figure 4 shows fiscal year lottery sales for Massachusetts relative to other states in the US and New England for the period from 2005-2016 (see Appendix A for lottery sales adjusted for inflation over the period). All sales are relative to sales in fiscal year 2005. Only states that had lotteries in existence since 2005 and states without VLTs are included. VLTs are a different product more similar to slot machines than traditional lottery games that comprise the Massachusetts Lottery. For this reason, New England states in Figure 4 are represented by Maine, Vermont, New Hampshire, and Connecticut. Rhode Island, which has VLTs, is excluded.

Figure 4: Relative Lottery Sales, Massachusetts, National Average, and New England, FY 2005-2017

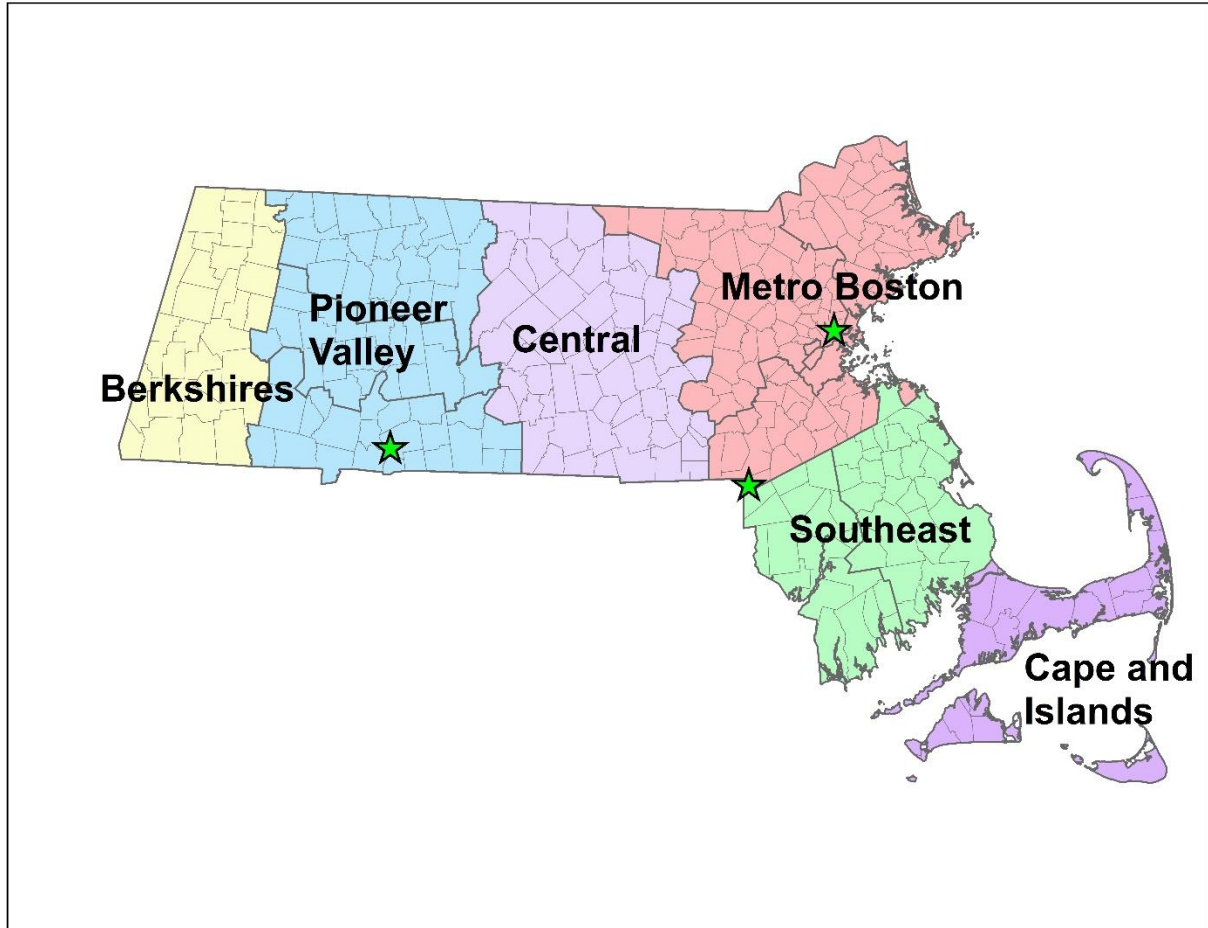


Source: LaFleur's World Lottery Almanac, 2005-2017. Sales relative to sales in 2005 (2005=1). States recover following recession. Growth in Massachusetts less than national average and other New England states.

Figure 4 demonstrates that sales in other states have recovered and grown faster than Massachusetts since fiscal year 2012. The exact reasons for this are not clear, but it should be noted that states with the fastest growth include Arizona, California, and Florida. These states have experienced significant population growth, including a growing retirement population. However, growth in Massachusetts has also lagged behind the other New England states, although the gap is less pronounced. In real terms (see Appendix A, Figure A3), lottery revenue in Massachusetts has yet to surpass the level of sales in fiscal year 2005. Finally, it should be noted that while revenue growth in Massachusetts has lagged the nation as a whole and other New England states, the Massachusetts Lottery is one of the largest in the nation in terms of total sales, not just per capita sales. As late as fiscal years 2012 and 2013, total annual sales in Massachusetts exceeded those in Florida and California. So, while sales growth has been slow to recover, the lottery is still one of the largest and most mature in the nation, both in per capita and absolute terms.

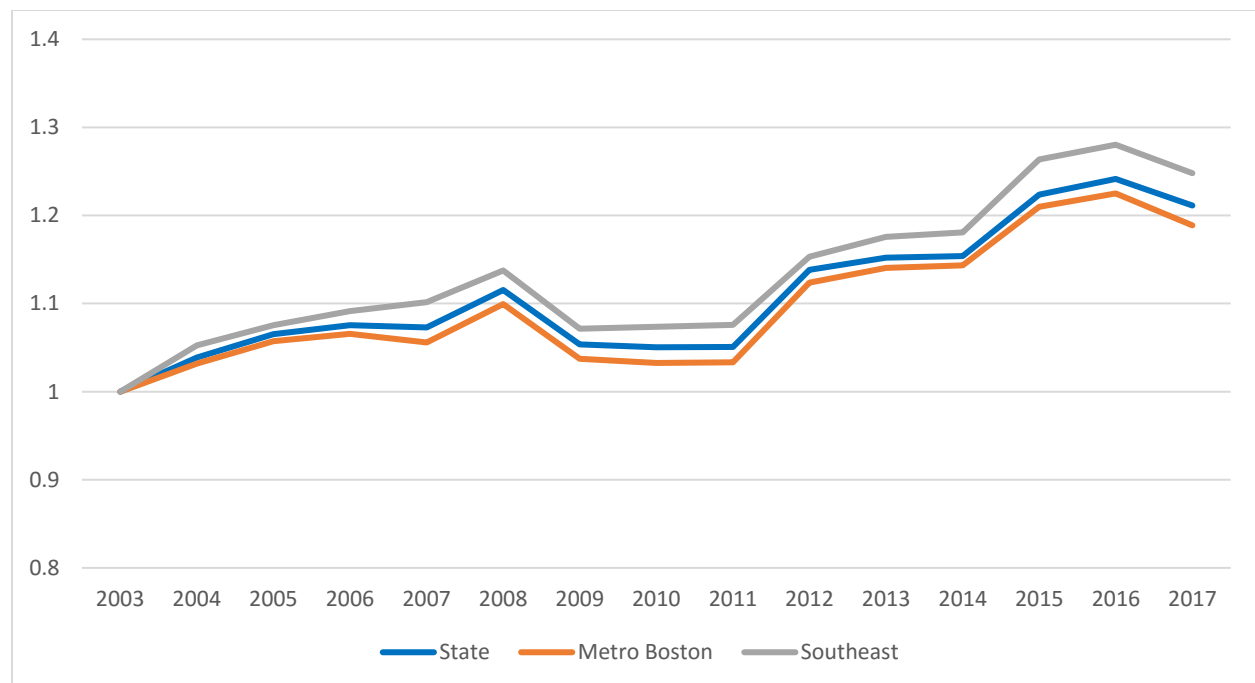
The *Patron and License Plate Survey Report: Plainridge Park Casino 2016* (Salame et al., 2017) estimates that nearly 85% of the recaptured gambling dollars (dollars that would have been spent gambling outside of the state) at Plainridge Park Casino came from the Metro Boston and Southeast regions. Consequently, we examine lottery sales in these regions. Other regions are also explored for comparison. Figure 5 shows a map of the regions.

Figure 5: Map of the Regions used in the Patron Survey and Operations Reports



Lottery sales for fiscal years 2003 to 2017 for the entire state and for the Southeast (Bristol and Plymouth counties) and Metro Boston (Essex, Middlesex, Norfolk, and Suffolk counties) regions are presented in Figure 6. The Southeast and Metro Boston regions have experienced growth in the lottery similar to the state as a whole. Lottery revenue in the Southeast region has grown slightly faster than the state as a whole (averaging approximately 1.6% over the entire period versus approximately 1.4% for the state as a whole), whereas growth in Metro Boston, at approximately 1.3%, has been slightly below the state average. Both the Southeast and Metro Boston region experienced an increase in sales in fiscal year 2016, the first year after the opening of Plainridge Park Casino, and a decrease in sales in fiscal year 2017, the second year after the casino opening, mirroring the performance of the state as a whole.

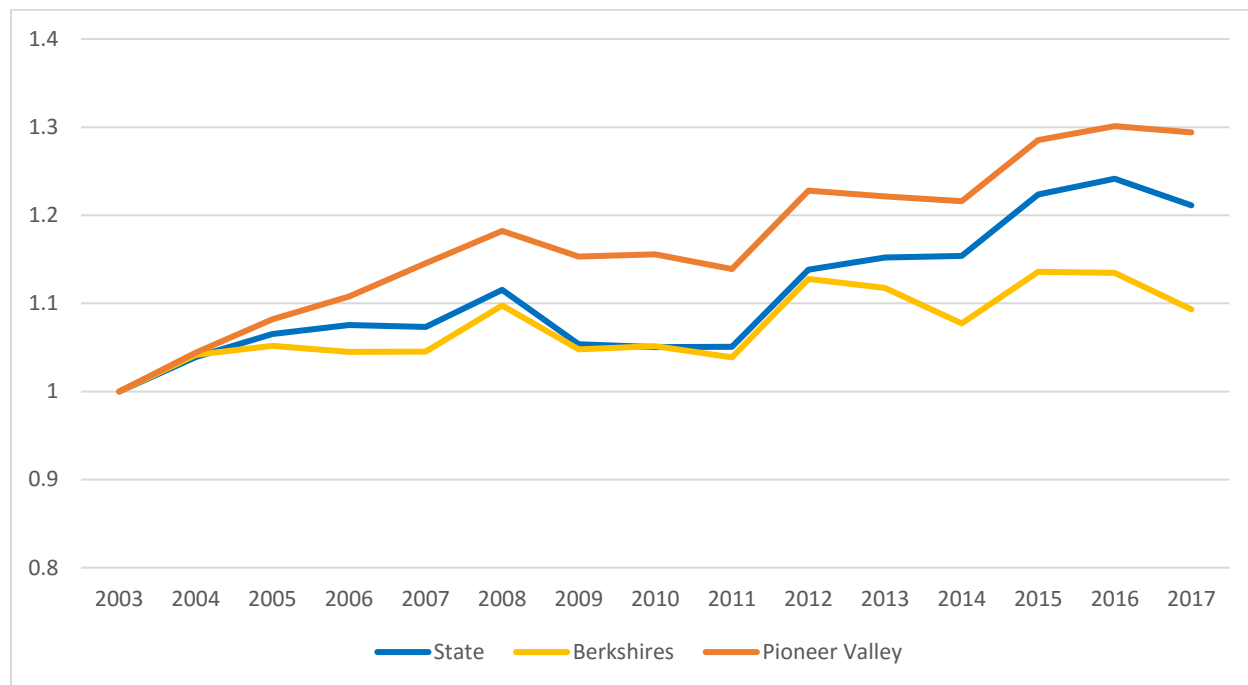
Figure 6: Relative Lottery Sales, Massachusetts, Metro Boston Region, and Southeast Region, FY 2003-2017



Source: MA Lottery, FY 2003-2017, nominal dollars. Sales are relative to sales in 2003 (2003=1). This figure shows relative lottery sales for Massachusetts and the Southeast and Metro Boston regions, the regions where the majority of visitors to Plainridge Park Casino originated.

Lottery sales for the Pioneer Valley region (Franklin, Hampden, and Hampshire Counties) and the Berkshires region (Berkshire County) are presented in Figure 7. The performance of these two regions is notably different over the period. Lottery sales in the Pioneer Valley region have grown faster than the state as a whole, averaging nearly 1.9% over the period. Only the Cape and Islands region performed better, growing approximately 2% over the period. Moreover, while sales declined during the recession of 2008 and 2009, the decline in the Pioneer Valley was less pronounced. The growth of lottery revenue in the Berkshires region, in contrast, has been below the state average. This is most pronounced beginning in fiscal years 2013 and 2014, where growth in lottery revenues in the Berkshires region declined compared to modest increases in the state as a whole. Revenue growth in the Berkshires region over the 2003-2017 period averages approximately 0.7%.

Figure 7: Relative Lottery Sales, Massachusetts, Pioneer Valley Region, and Berkshires Region, FY 2003-2017



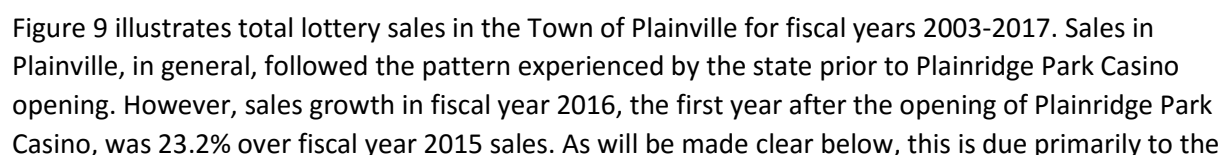
Source: MA Lottery, FY 2003-2017, nominal dollars. Sales are relative to sales in 2003 (2003=1). This figure shows relative lottery sales for Massachusetts and the Pioneer Valley and Berkshires regions. Lottery revenue in the Pioneer Valley grew faster than the state as a whole, whereas the Berkshires region grew more slowly, particularly beginning in fiscal year 2013.

In summary, lottery revenue in Massachusetts has generally grown slowly since 2003. On average, this growth has been below the rate of inflation, resulting in a decrease in real or inflation-adjusted lottery revenue. Lottery sales in fiscal year 2016, the first fiscal year following the opening of Plainridge Park Casino, increased approximately 4.3% compared to the prior year. Sales in fiscal year 2017, however, declined approximately 2.6% compared to fiscal year 2016. Lottery revenue growth in the Metro Boston and Southeast regions has mirrored the variability in sales for the state as a whole, with the Southeast region growing slightly faster and Metro Boston slightly slower than the state as a whole. The Berkshires region has generally performed worse than the state as a whole, whereas the Pioneer Valley region, which will host a casino in Springfield in the near future, has outperformed the state as a whole.

The above analysis provided a broader statewide and regional comparison of lottery sales over time in Massachusetts and compared sales in Massachusetts relative to the national and New England average. We now turn our attention to areas near Plainridge Park Casino using both fiscal year sales and agent-specific weekly sales.

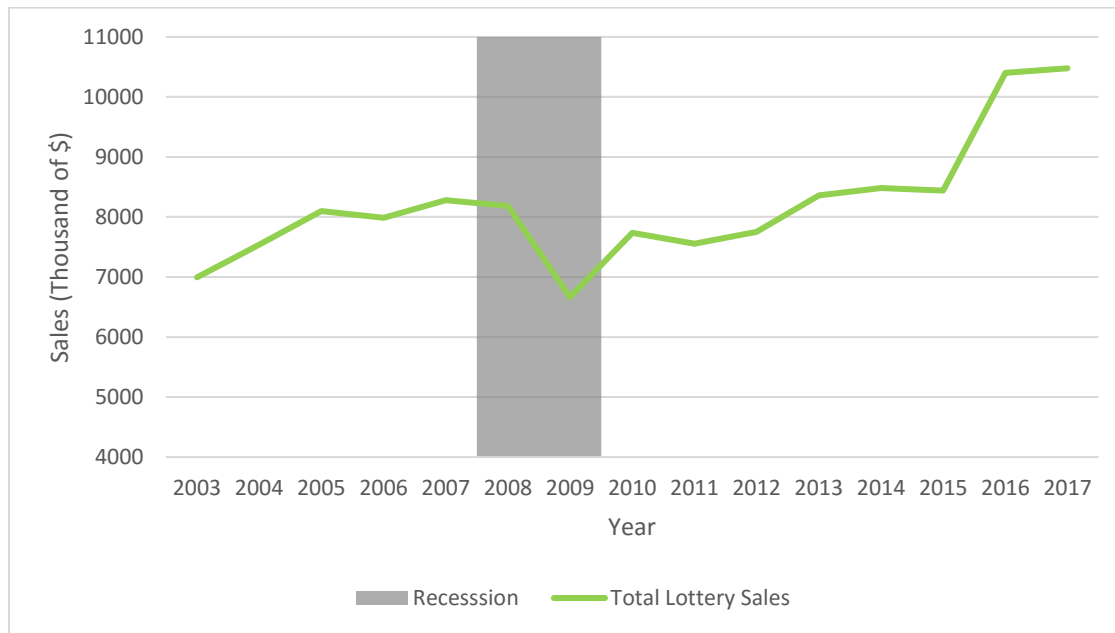
Plainville and Surrounding Region Sales: Fiscal Year Revenue Analysis

Figure 8: Plainville and MGC-designated Surrounding Communities



increase in lottery sales at Plainridge Park Casino. In fiscal year 2017, sales growth in Plainville was approximately 0.7% over fiscal year 2016.

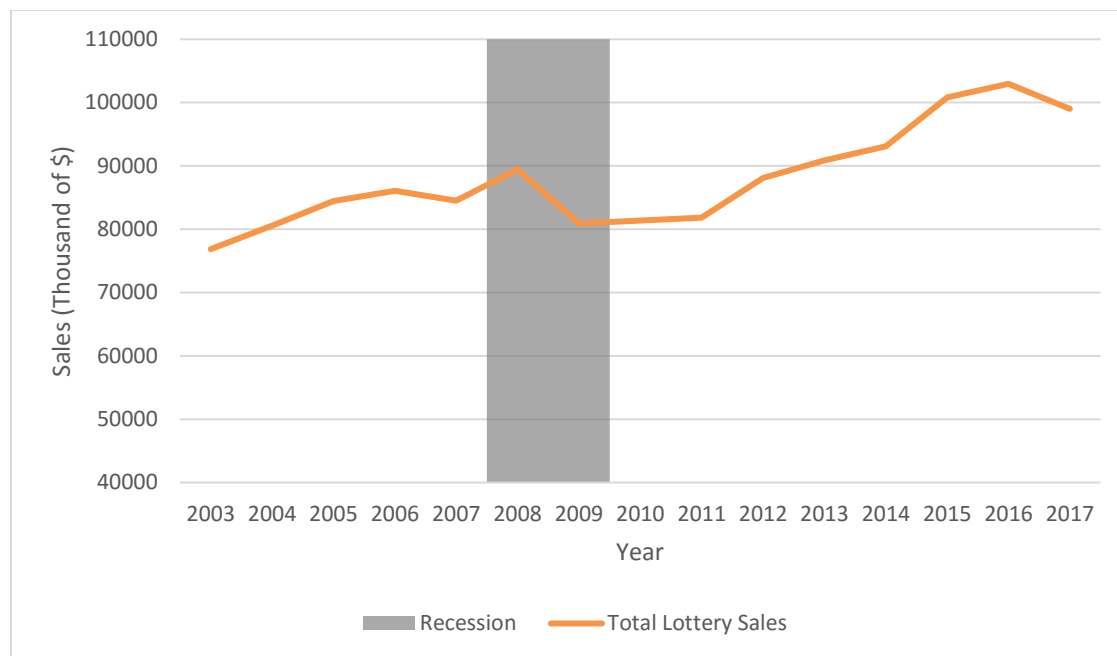
Figure 9: Nominal Plainville Lottery Sales, FY 2003-2017



Source: MA Lottery, FY 2003-2017, nominal dollars. Lottery sales in Plainville, like the state as a whole, decreased during the recession but have grown since 2012, with a noticeable increase in FY 2016, followed by slower growth in FY 2017.

Sales growth for fiscal years 2003-2017 for the combined area of Plainville and the MGC-designated surrounding communities is shown in Figure 10. For the combined area, fiscal year 2016 revenue increased 2.12% over fiscal year 2015 revenue, but, similar to the state as a whole, declined in fiscal year 2017 by 3.8% compared to fiscal year 2016.

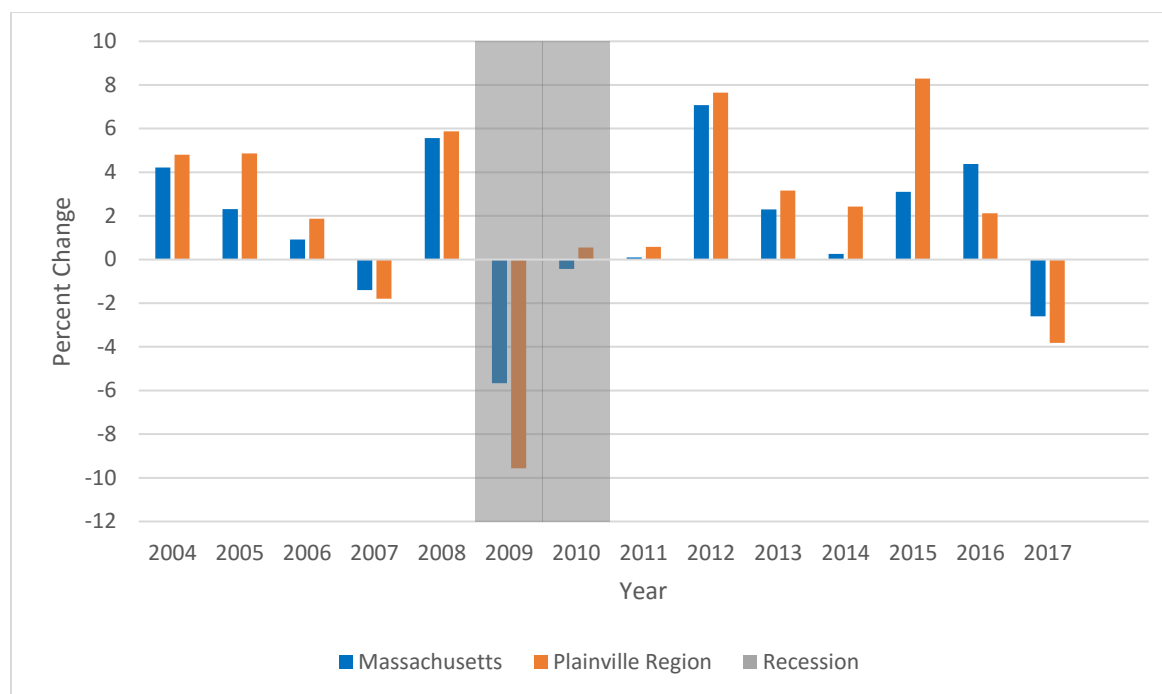
Figure 10: Nominal Lottery Sales for Plainville and MGC-designated Surrounding Communities, FY 2003-2017



Source: MA Lottery, FY 2003-2017, nominal dollars. Plainville and the surrounding communities of Attleboro, Foxborough, Mansfield, North Attleborough, and Wrentham. Lottery revenues increased in FY 2016 compared to year before, but decline in FY 2017.

A comparison of the annual percentage change in total lottery sales for the combined area of Plainville and the surrounding communities relative to the percent change statewide is provided in Figure 11. Between 2011 and 2015, the growth in lottery sales in Plainville and the surrounding communities of Attleboro, Foxborough, Mansfield, North Attleborough, and Wrentham has generally increased faster than the rest of the state. In fiscal year 2016, lottery sales grew less in the Plainville region (2.1%) compared to growth statewide (4.4%) and in fiscal year 2017, revenue declined further in the region (-3.8%) compared with the state as a whole (-2.6%).

Figure 11: Percent Change in Nominal Lottery Sales, Plainville & Surrounding Communities vs. Massachusetts, FY 2004-2017



Source: MA Lottery, FY 2003-2017, nominal dollars. Since the recession, the growth in lottery sales in Plainville and the surrounding communities of Attleboro, Foxborough, Mansfield, North Attleborough, and Wrentham have generally increased faster than the rest of the state. In FY 2016, lottery sales grew less in the Plainville region compared to growth statewide and decreased more in FY 2017.

The next section analyzes agent-specific sales, thereby allowing a more detailed examination of sales at and near Plainridge Park Casino relative to other areas in the state.

Lottery Sales After Plainridge Park Casino Opening: A Two Year Comparison

Host and Surrounding Communities

The Massachusetts Lottery has provided agent-specific lottery sales data to the SEIGMA Economics team at the Donahue Institute. These data contain weekly lottery sales, by game, for every lottery sales agent in the state. These data are provided for the period of the week ending June 21, 2014 to July 29, 2017, allowing an analysis of the immediate impact, if any, on lottery sales resulting from the opening of the Plainville slot parlor on June 24, 2015.

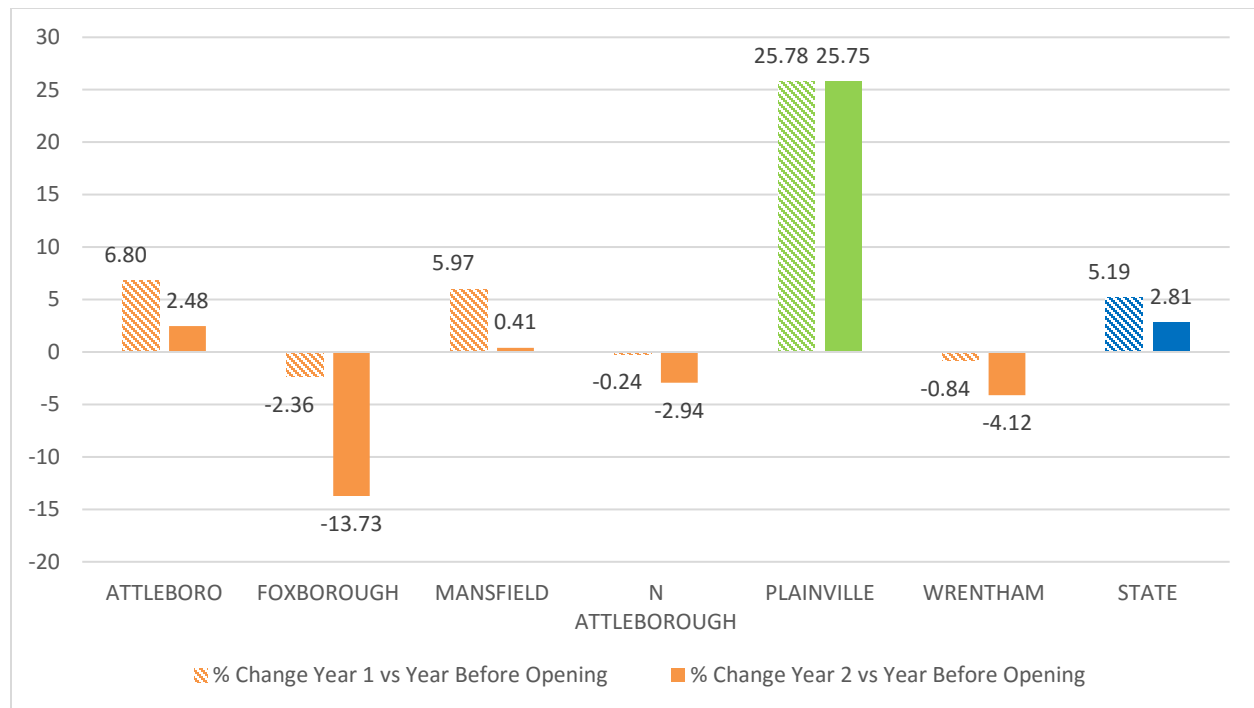
As a result of volatility in weekly sales, in part due to when sales are reported as well as jackpot rollovers, we aggregate the sales data into two-week periods. While confidentiality prevents us from reporting agent-specific sales, it is important to recall that a lottery agent began operating at Plainridge Park Racecourse in 1999.

Before presenting bi-weekly results, we focus on annual changes, comparing total sales prior to the casino opening during the period of June 15, 2014 to June 20, 2015 with total sales after the casino opening from June 21, 2015 to June 25, 2016 (designated year 1) and from June 26, 2016 to July 1, 2017

(designated year 2). Figure 12 presents percentage changes in total lottery sales for the host community of Plainville and the MGC designated surrounding communities. **The period from June 15, 2014 to June 20, 2015 is the period prior to the casino opening and serves as the base period. In the figures below, sales in year 1 and year 2 are relative to that base period. They are not year-over-year comparisons.** For example, statewide total sales for the year after opening were 5.19% higher than the year prior to opening. In year 2, statewide sales were 2.81% higher *than the year prior to opening*. The year-over-year change in sales between years 2 and 1 can be approximated by taking the difference between the year 2 and year 1 changes. For example, between year 2 and year 1, statewide sales declined approximately 2.4% ($2.81 - 5.19 = -2.38$).

Wrentham, Foxborough, and North Attleborough all experienced small declines in lottery sales in both years relative to the year prior to opening. Sales decreased most in Foxborough in the second year after opening, declining 13.73% compared to the year prior to opening. In the first year of casino operation, sales in Attleboro, Mansfield, and Plainville increased at a rate that exceeded statewide growth. In the second year, with the exception of Plainville, sales in the region either grew more slowly or declined compared to the state average. In the first year after opening, the highest rate of growth occurred in Plainville, where total sales increased 25.78%. In the second year of operation, sales in Plainville were still over 25% higher *than the year prior to opening*, but were 0.03% ($25.75 - 25.78 = -0.03$) below the first year.

Figure 12: Percent Change in Nominal Lottery Sales in Plainville & Surrounding Communities, Pre- and Post-Casino Opening



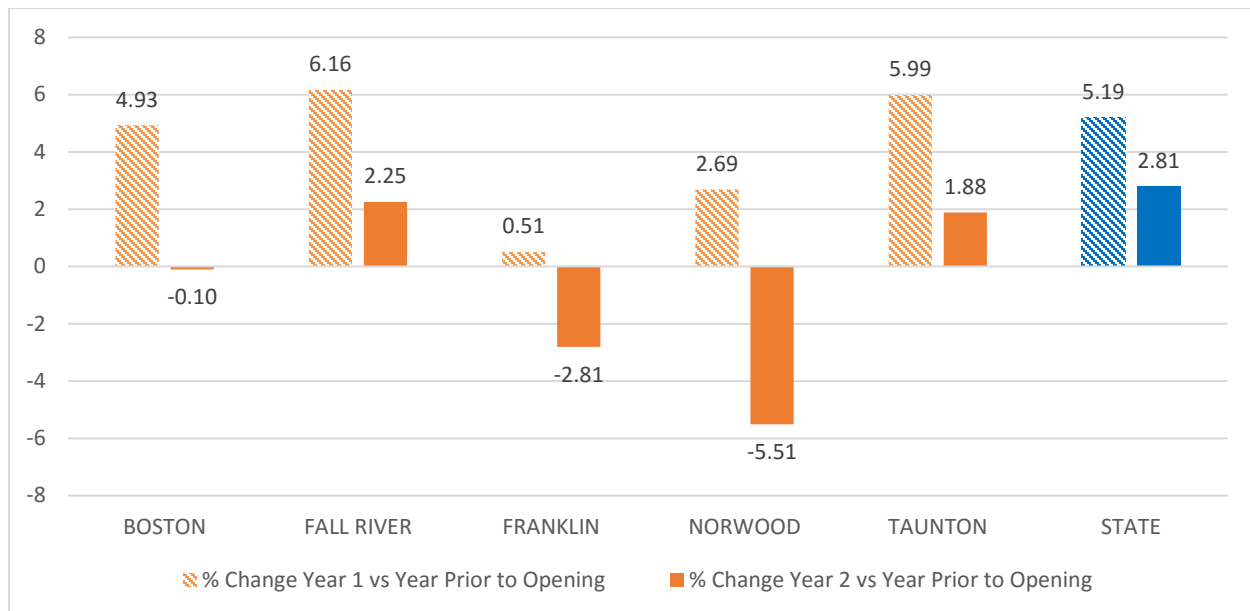
Source: MA Lottery, bi-weekly sales June 15, 2014-June 20, 2015 compared to bi-weekly sales June 21, 2015-June 25, 2016 and June 26, 2016-July 1, 2017, nominal dollars. Sales in Plainville increased dramatically (25.78%) in the first year but are essentially unchanged in the second year.

The results in Figure 12 are ambiguous as to the casino decreasing lottery sales in the region. In the second year of operation, sales in the surrounding communities of Attleboro and Mansfield increased, albeit below the state average. Second year sales in Foxborough, North Attleborough, and Wrentham decreased relative to the year prior to opening. Sales in Plainville notably increased compared to the year prior to the casino opening.

Lottery Sales by Patron Origination

The *Patron and License Plate Survey Report: Plainridge Park Casino 2016* (Salame et al., 2017) interviewed patrons and, among other questions, asked in which city or town they lived. North Attleborough, Attleboro, and Foxborough were among the most represented communities of the MGC-designated surrounding communities. Outside of those locales, the cities of Boston, Franklin, Taunton, and Fall River and the Town of Norwood were the top five most represented locales. Figure 13 compares lottery sales in these communities in the first and second year of casino operation with the year prior to the casino opening.

Figure 13: Percent Change in Nominal Lottery Sales in Patron Origination Cities, Pre- and Post-Casino Opening

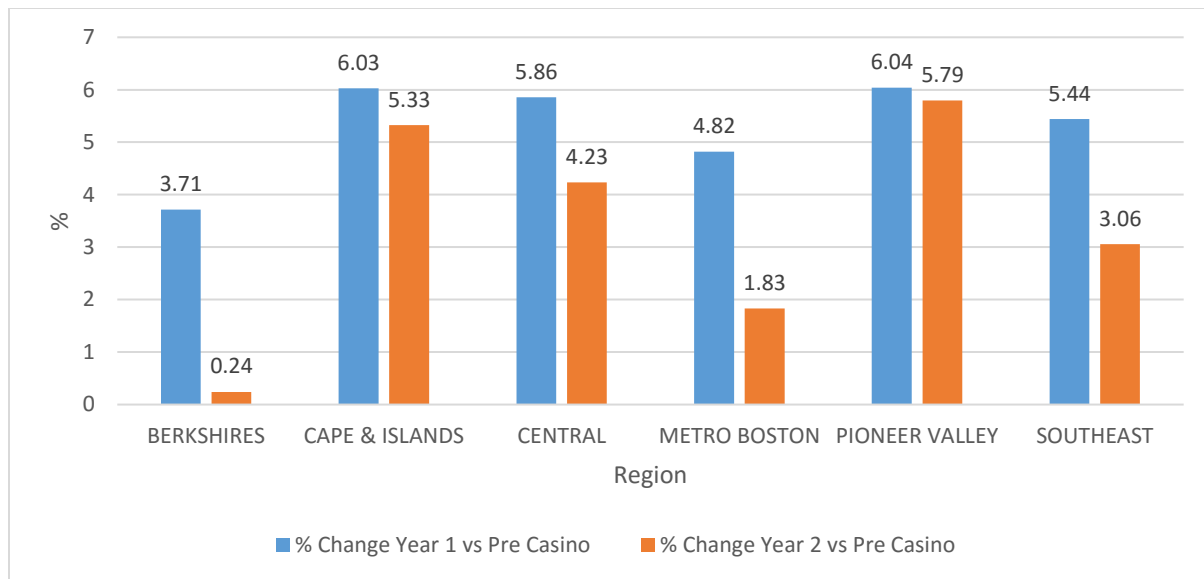


Source: MA Lottery, bi-weekly sales June 15, 2014-June 20, 2015 compared to bi-weekly sales June 21, 2015-June 25, 2016 and June 26, 2016-July 1, 2017, nominal dollars. Cities that were most represented in a patron survey and that are not a host or surrounding community.

The results in Figure 13 are in many ways analogous to those in Figure 12, specifically in regards to the underperformance of lottery sales in the second year of casino operation relative to the state as a whole. For example, sales in Fall River in the second year of casino operation were 2.25% higher than the year prior to the casino opening, whereas statewide sales over the same period were 2.81% higher. Sales in Taunton, while higher in the second year relative to the year prior to opening, were also below the state average. Sales in Boston, Franklin, and Norwood all decreased. Yet, as with the MGC-designated surrounding communities, year 1 sales growth is occasionally greater in some communities than the state as a whole, creating an ambiguous picture. Specifically, sales growth in Fall River and Taunton in year 1 exceeded the state average and sales growth in Boston was nearly identical.

Figure 14 illustrates the change in sales in the two years following the opening of Plainridge Park Casino by region. The Southeast region (Bristol and Plymouth counties) and Metro Boston region (Essex, Middlesex, Norfolk, and Suffolk counties) were the source of nearly 85% of the recaptured gambling dollars at Plainridge Park Casino. Figure 14 shows that in no cases were lottery sales in the region lower than the year prior to the opening of the casino. However, with the exception of the Berkshires region, there was less sales growth in the Metro Boston and Southeast regions than in other regions in the Commonwealth.

Figure 14: Percent Change in Nominal Lottery Sales by Region, Pre- and Post-Casino Opening



Source: MA Lottery, bi-weekly sales June 15, 2014-June 20, 2015 compared to bi-weekly sales June 21, 2015-June 25, 2016 and June 26, 2016-July 1, 2017, nominal dollars. Regions.

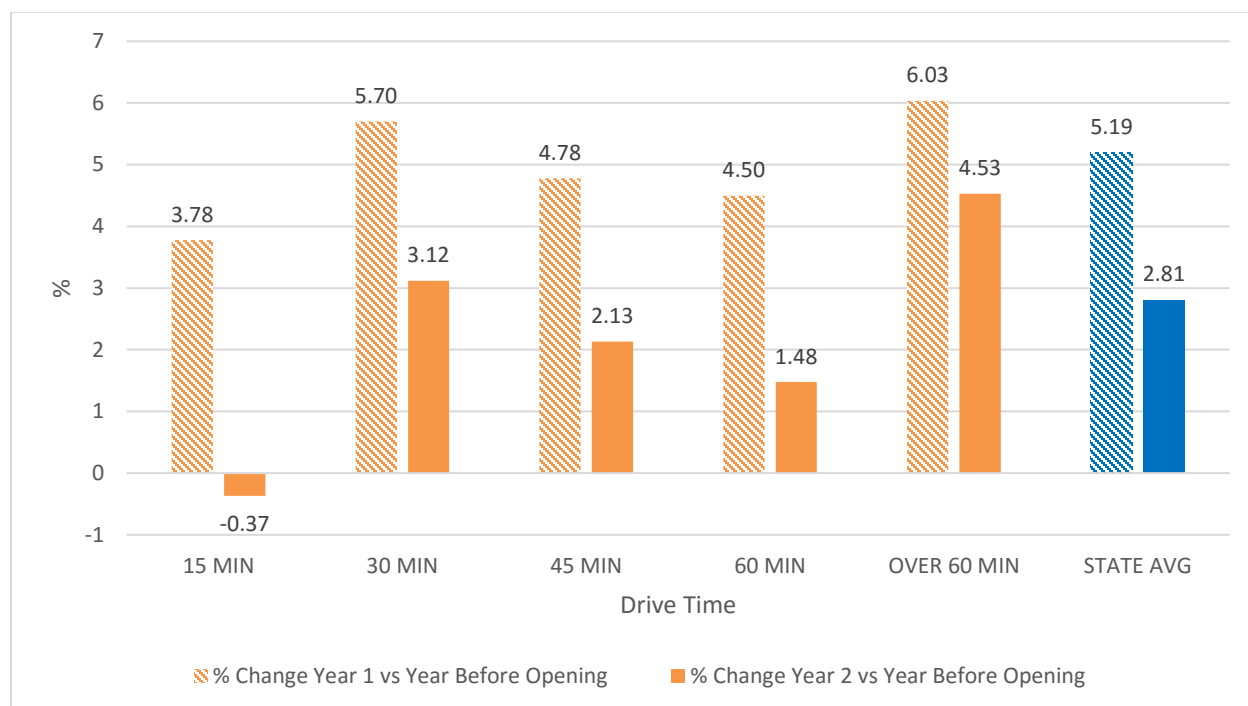
Lottery Sales by Driving Time from Plainridge Park Casino

In this section, we analyze sales by driving distance to the casino. This allows us to examine an alternate definition of surrounding community, thereby complementing the above analyses of the MGC-designated surrounding communities, patron origin, and region of the state.

The change in sales in years 1 and 2 compared to the year prior to the casino opening is presented in Figure 15. The category labeled 15 MIN includes all lottery agents 15 or fewer minutes' drive time from Plainridge Park Casino, including sales at the casino. The 30 MIN category includes all lottery agents 16 to 30 minutes' drive time from Plainridge Park Casino, and so on. The average percent change for the state is also included.

Outlets within a 15-minute drive of the casino experienced an increase in sales in the first year of 3.78% relative to the year prior to the casino opening. In the second year, sales for agents within a 15-minute drive were 0.37% below the year prior to the casino opening. In both years, therefore, agents within a 15-minute drive experienced slower revenue growth (year 1) or a decline (year 2) compared to other agents at greater distances and the state as a whole. However, sales at outlets 16 to 30 minutes from the casino grew more rapidly than sales statewide in both the first and second year of operation relative to the year prior to opening. As was the case with the first year analysis, there is no obvious pattern between lottery sales growth and proximity to the casino in that sales are not uniformly increasing at greater distances from the casino.

Figure 15: Percent Change in Lottery Sales by Driving Distance from Plainridge Park Casino



Source: MA Lottery, bi-weekly sales June 15, 2014-June 20, 2015 compared to bi-weekly sales June 21, 2015-June 25, 2016 and June 26, 2016-July 1, 2017, nominal dollars. 15 MIN category includes Plainridge Park Casino.

To summarize, the above analysis suggests that lottery sales near the casino in the second year after the opening of Plainridge Park Casino generally lagged the state as a whole, increasing less than the state as a whole and in some cases decreasing relative to the year prior to the casino opening. This occurs in the MGC-designated surrounding communities, for agents within a 15-minute drive of Plainridge Park Casino, and for the cities and regions most representing casino visitation as identified in the patron survey report (Salame et al., 2017). Whether the casino or other unobserved factors are responsible is not clear. The fact that some areas in the first year of post-casino operation outperformed the state further adds to the ambiguity. Certainly, however, there is no large, consistent, and significant decline in lottery revenue that can be clearly attributed to the casino.

Lottery Sales After Plainridge Park Casino Opening: Biweekly Agent-Level Analysis over Time

Host and Surrounding Community Analysis

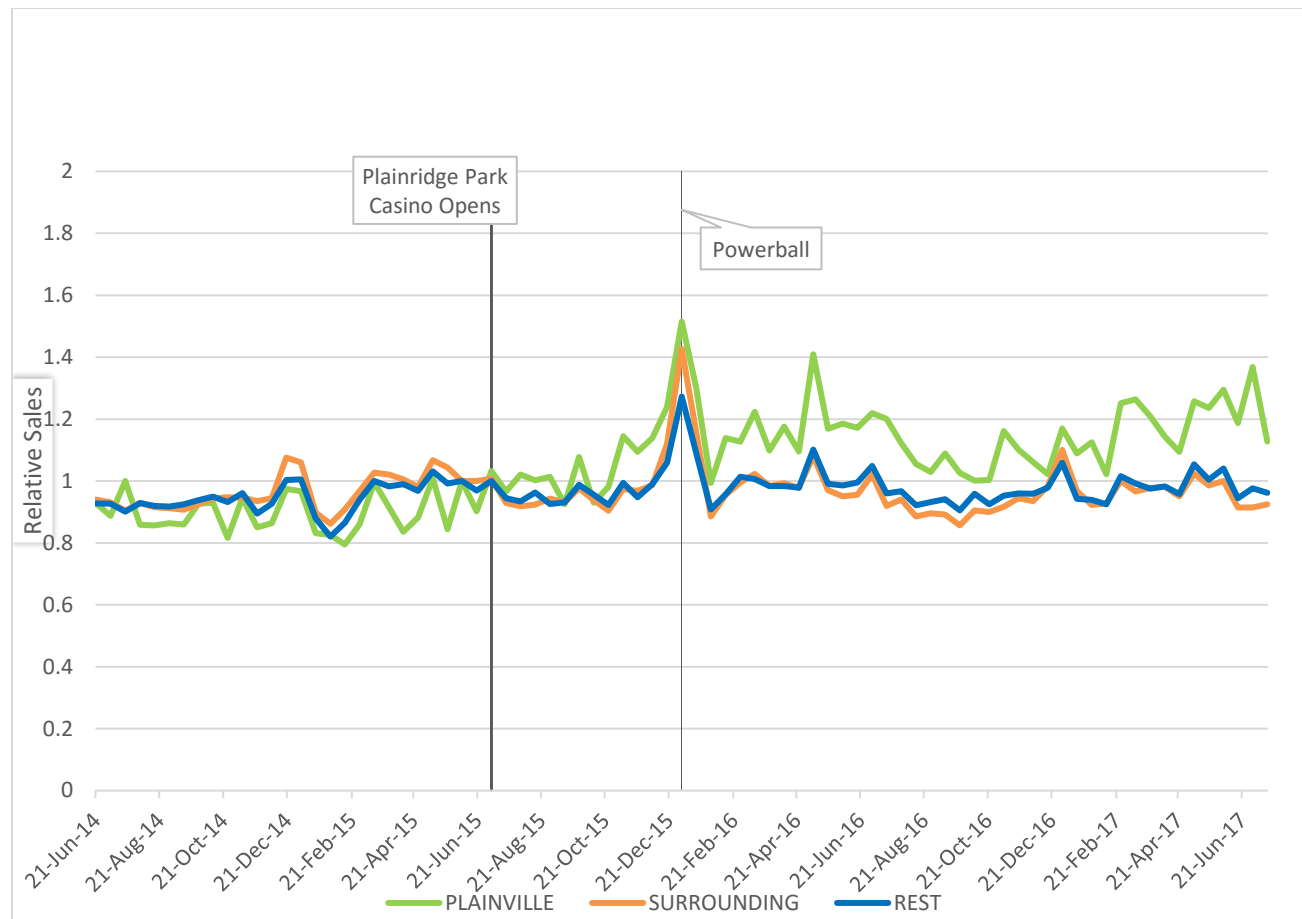
The analysis so far has examined fiscal year data or annual changes relative to the year prior to opening. The analysis below focuses on bi-weekly sales over the year before and two years after the opening of Plainridge Park Casino, thereby providing detail on the dynamics of lottery sales over time. We examine bi-weekly sales over the entire sample, from June 2014 to July 2017. The objective is to visualize and statistically test whether significant changes in lottery expenditures occurred after the opening of Plainridge Park Casino. This analysis is performed for the host and surrounding communities and various driving distances from Plainridge Park Casino.

Figure 16 shows bi-weekly total lottery sales over the period June 15, 2014 to July 29, 2017 for the communities of Plainville, the MGC-designated surrounding communities, and the rest of Massachusetts. Because lottery sales in these areas are vastly different (total lottery sales in the rest of Massachusetts are much greater than total sales in Plainville, for example), all sales data are reported relative to total sales during the two-week period prior to the casino opening (June 7, 2015-June 20, 2015). Thus, relative bi-weekly sales equal 1 for all areas for the June 7-June 20, 2015 period. Values greater than 1 signify bi-weekly sales data that exceed sales during the June 7-20 period, whereas values less than 1 signify lower bi-weekly sales compared to the June 7-20 period.

Figure 16 includes many interesting results. Relative sales in Plainville, which include the lottery agent in Plainridge Park Casino, are generally below the surrounding communities and the rest of Massachusetts prior to the casino opening. After the opening of Plainridge Park Casino, relative sales in Plainville equal or exceed relative sales in the surrounding communities and the rest of the state. This is true over the entire period with relative sales in year 2 essentially unchanged from year 1.

The surrounding communities are not noticeably affected. Prior to the casino opening, relative sales in the surrounding communities were slightly higher than relative sales in the rest of the state. After the casino opening, relative sales in the surrounding communities are more similar to the rest of Massachusetts or, in some instances, slightly below. This is consistent with the fiscal year analysis that found either slower growth or declines in revenue for various surrounding communities. The trends and variation exhibited by all areas are very similar. If the opening of the casino had a large negative impact on sales in, for example, the surrounding communities, we would expect to see relative sales decline and divergence from the rest of the state. Figure 16 shows no evidence of a large and significant negative impact on sales.

Figure 16: Relative Bi-Weekly Lottery Revenue over Time in Plainville, Surrounding Communities & Rest of Massachusetts



Source: MA Lottery, bi-weekly sales relative to two-week period prior to opening (June 7-June 20, 2015), nominal dollars. A value of 1 implies that sales during that period were equal to sales during June 7-20. A value greater than one represents higher sales, less than 1 lower sales. Relative sales in Plainville, including Plainridge Park Casino, were lower in Plainville prior to the casino opening and generally equal or exceed sales in the surrounding communities and state after opening. Relative sales for surrounding communities generally follow the sales pattern exhibited in the rest of Massachusetts. A significant negative impact on lottery sales in surrounding communities would be represented by relative sales being lower and falling faster than the rest of Massachusetts.

Difference-in-Differences Analysis of Host and Surrounding Communities

Figure 16 demonstrates the pattern of lottery sales in the host and surrounding communities before and after the casino opening and compares that pattern with the rest of the state. Difference-in-Differences (DID) analysis allows us to analyze lottery sales before and after the opening of the casino and determine if any observed changes are statistically significant (i.e., statistically different from no change). DID analysis involves comparing a “treatment” group with a “control” group. Changes in lottery sales for the treatment group before and after the casino opening are compared with changes in the control group before and after the casino opening. The difference between these changes (i.e., differences) is also compared, hence the name difference-in-differences. Intuitively, we want to know whether lottery sales in the treatment group changed differently than the control group, which represents what might have happened had the casino not opened.

In our analysis, the treatment group is defined by community type (host and surrounding) and driving distance from Plainridge Park Casino. Table 1 provides results from a DID analysis when the treatment group is defined to be all agents in Plainville, including the agent at Plainridge Park Casino. Table 1 shows that prior to the casino opening, average bi-weekly sales per agent in Plainville were \$22,797. After the casino opened, average bi-weekly sales per agent increased to \$29,018, a statistically significant increase of \$6,221. Table 1 also demonstrates that average bi-weekly sales per agent in the rest of Massachusetts increased approximately \$746, from \$25,514 before the casino opened to \$26,260 after the casino opened. The difference between the change in Plainville and the change in the rest of Massachusetts is \$5,474, an increase that is statistically significant (i.e., different than zero) at the 1% level of significance. This difference tells us that average bi-weekly sales for agents in Plainville increased \$5,474 more than average bi-weekly sales for other agents in state.

Note that the results in Table 1 quantify and reaffirm Figure 16. Prior to the casino opening, average bi-weekly lottery sales per agent in Plainville were below the state average, but after the casino opened, they exceeded the state average. This is evident in Figure 16.

Table 1: Difference-in-Differences Analysis of Average Bi-Weekly Lottery Sales by Agent, Plainville vs. Rest of Massachusetts

| | Before Plainridge Park Casino | After Plainridge Park Casino | Difference^a |
|------------------------------|--|---|-------------------------------|
| Plainville ^b | 22,797.05 (1,090.02) | 29,018.56 (1,166.54) | 6,221.50*** (1,614.49) |
| Rest of State | 25,514.05 (62.71) | 26,260.59 (45.33) | 746.53*** (78.08) |
| Difference in Differences | | | 5474.97*** (1,804.64) |

^aA *, **, and *** represent statistical significance at the 10, 5, and 1 % level, respectively. Standard errors in parentheses.

^bIncluding Plainridge Park Casino

Source: MA Lottery, average bi-weekly sales per agent, June 15, 2014-June 20, 2015 compared to average bi-weekly sales per agent June 21, 2015-July 22, 2017. Average bi-weekly lottery sales per agent in Plainville increased \$6,221 compared to the rest of the state where average bi-weekly sales per agent increased \$746. Thus, average bi-weekly sales in Plainville increased a statistically significant \$5,474 more than agents in the rest of the state.

Table 2 presents results for a DID analysis comparing the MGC-designated surrounding communities with the rest of Massachusetts. The results show that average bi-weekly sales per agent in surrounding communities decreased by \$626 on average over the two-year period after the casino opened. This decrease, however, is not statistically significant, implying that we cannot confidently reject this decrease from a change of zero. Average bi-weekly sales per agent for the rest of Massachusetts, however, increased by \$782. The difference of \$-1,409 is statistically significant. These results quantify what is presented in Figure 16. Prior to the opening of the casino, the surrounding communities had

average sales that slightly exceeded average sales for the rest of the state. After the casino opened the surrounding communities have average sales slightly below the rest of the state.

Table 2: Difference-in-Differences Analysis of Average Bi-Weekly Lottery Sales by Agent, Surrounding Communities vs. Rest of Massachusetts

| | Before Plainridge Park Casino Opened | After Plainridge Park Casino Opened | Difference^a |
|---|---|--|-------------------------------|
| Surrounding Communities ^b | 25,618.47 (540.96) | 24,991.77 (373.54) | -626.69 (655.74) |
| Rest of State | 25,506.92 (63.00) | 26,289.68 (45.61) | 782.76*** (78.51) |
| Difference in Differences | | | -1409.45** (583.64) |

^aA *, **, and *** represent statistical significance at the 10, 5, and 1 % level, respectively. Standard errors in parentheses.

^bAttleboro, Foxborough, Mansfield, North Attleborough, Wrentham

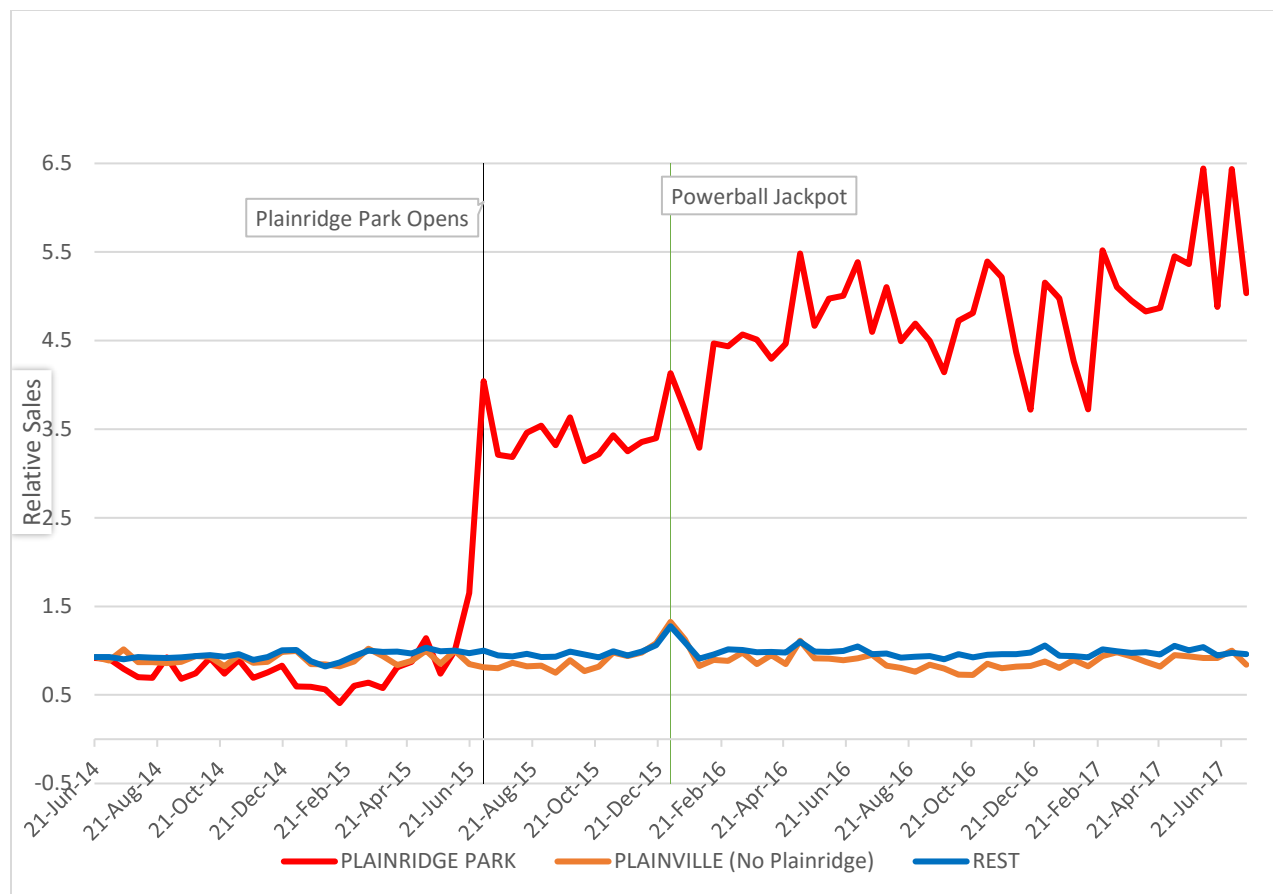
Source: MA Lottery, average bi-weekly sales per agent, June 15, 2014-June 20, 2015 compared to average bi-weekly sales per agent June 21, 2015-July 22, 2017. Average bi-weekly lottery sales for agents in surrounding communities decrease by \$626 after the casino opened. This is below the average bi-weekly increase for agents in the rest of the state of \$782.

Plainridge Park and Other Agents in Plainville

Figure 17 analyzes Plainville more closely. Specifically, relative sales at Plainridge Park Casino are separated from relative sales for other agents in Plainville. Recall that these are sales over time relative to total sales during the two-week period prior to the casino opening.

The most obvious feature of Figure 17 is the large increase in relative sales at Plainridge Park Casino corresponding with the casino's opening. The volume of sales at Plainridge Park Casino increases dramatically shortly after the casino's opening before levelling off.

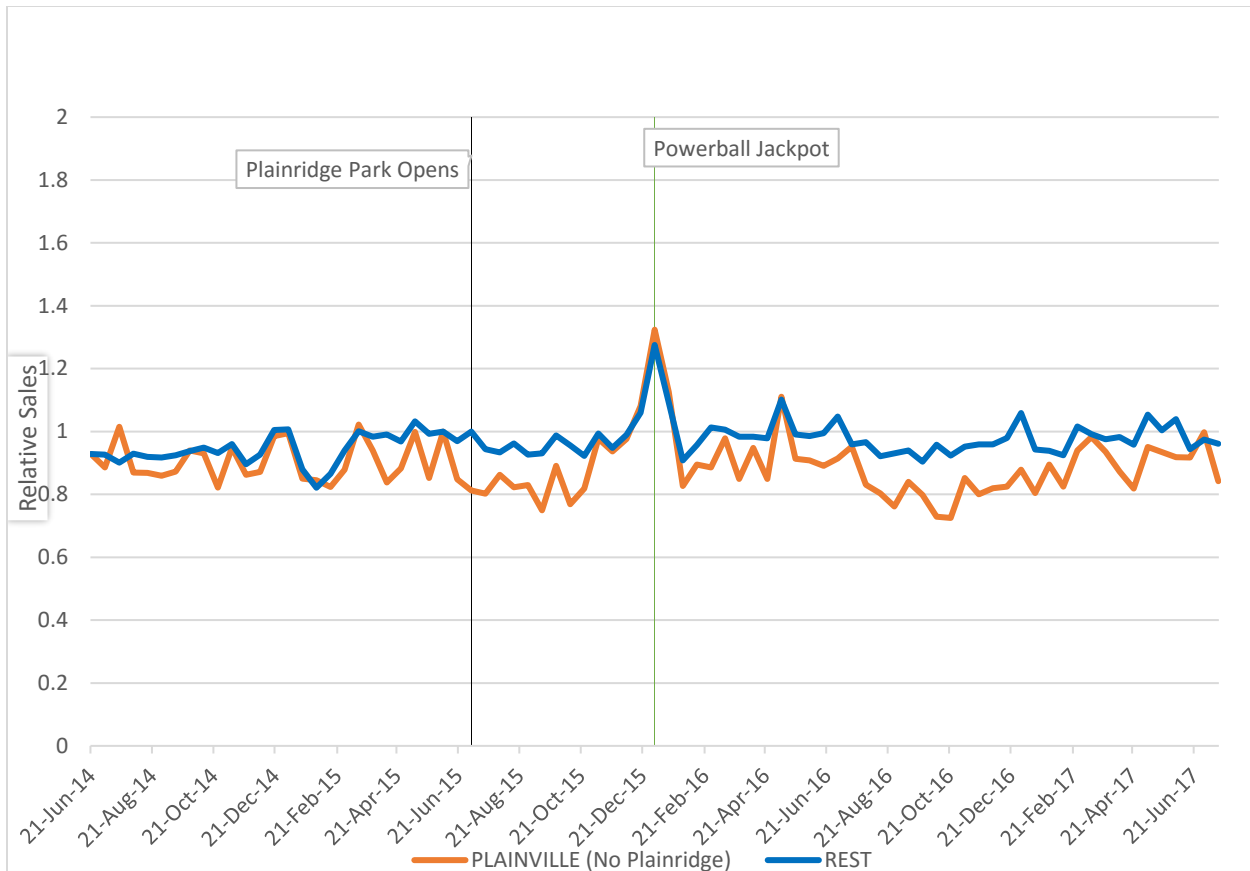
Figure 17: Relative Bi-Weekly Lottery Revenue over Time by PPC, Other Agents in Plainville, and Rest of Massachusetts.



Source: MA Lottery, bi-weekly sales relative to two-week period prior to opening (June 7-June 20, 2015), nominal dollars. Thus, a value of 1 implies that sales during that period were equal to sales during June 7-20. A value greater than 1 represents higher sales and less than 1 represents lower sales. Sales at Plainridge Park Casino notably increased. Sales at other agents in Plainville have relative sales slightly below the state average.

This increase in sales, however, does not appear to have been exclusively at the expense of other agents in Plainville. Prior to the casino opening, relative sales at other agents were similar to, or slightly below, the rest of Massachusetts. After the opening of the casino, relative sales remain slightly below the state as a whole. Figure 18 excludes the relative sales of Plainridge Park Casino from Figure 17, allowing for a more detailed examination of relative sales for other agents in Plainville compared to relative sales for the rest of the state. There is no evidence of a notable decline in sales at other agents in Plainville. A DID analysis, not reported here in order to ensure the confidentiality of sales at Plainridge Park Casino, confirms that average bi-weekly sales for other agents in Plainville decreased after the opening of the casino, but this decrease is approximately 1% of average biweekly sales and is not statistically significant.

Figure 18: Relative Bi-Weekly Lottery Revenue over Time for Other Agents in Plainville and the Rest of Massachusetts



Source: MA Lottery, bi-weekly sales relative to the two-week period prior to the casino opening (June 7-June 20, 2015), nominal dollars. Relative sales at other agents in Plainville are at or slightly below the state average both before and after the casino opening.

Lastly, Table 3 reports results when examining Plainville and the designated surrounding communities combined, including Plainridge Park Casino. This allows an analysis of the net effect from the increase in Plainville and the decrease in the surrounding communities. Over the two-year period, average bi-weekly sales slightly increased compared to the period before the casino opening by approximately \$6. Agents in the rest of the state fared better, on average, experiencing an increase in sales of approximately \$772. The difference between agents in Plainville and the surrounding communities compared to agents in the rest of the state is not statistically significant. This suggests that there has not been a statistically significant change in lottery sales, on average, in the host and surrounding communities combined, both separately and relative to the state as a whole.

Table 3: Difference-in-Differences Analysis of Average Bi-Weekly Lottery Sales by Agent, Plainville and Surrounding Communities vs. Rest of Massachusetts

| | Before Plainridge Park Casino | After Plainridge Park Casino | Difference ^a |
|--|----------------------------------|------------------------------------|-------------------------|
| Plainville + Surrounding Communities ^b | 25,351.91 (500.70) | 25,357.89 (355.96) | 5.97 (618.59) |
| Rest of State | 25,512.13 (63.08) | 26,284.53 (45.64) | 772.40*** (78.59) |
| Difference in Differences | | | -766.43 (556.27) |

^aA *, **, and *** represent statistical significance at the 10, 5, and 1 % level, respectively. Standard errors in parentheses.

^bAttleboro, Foxborough, Mansfield, North Attleborough, Plainville, and Wrentham

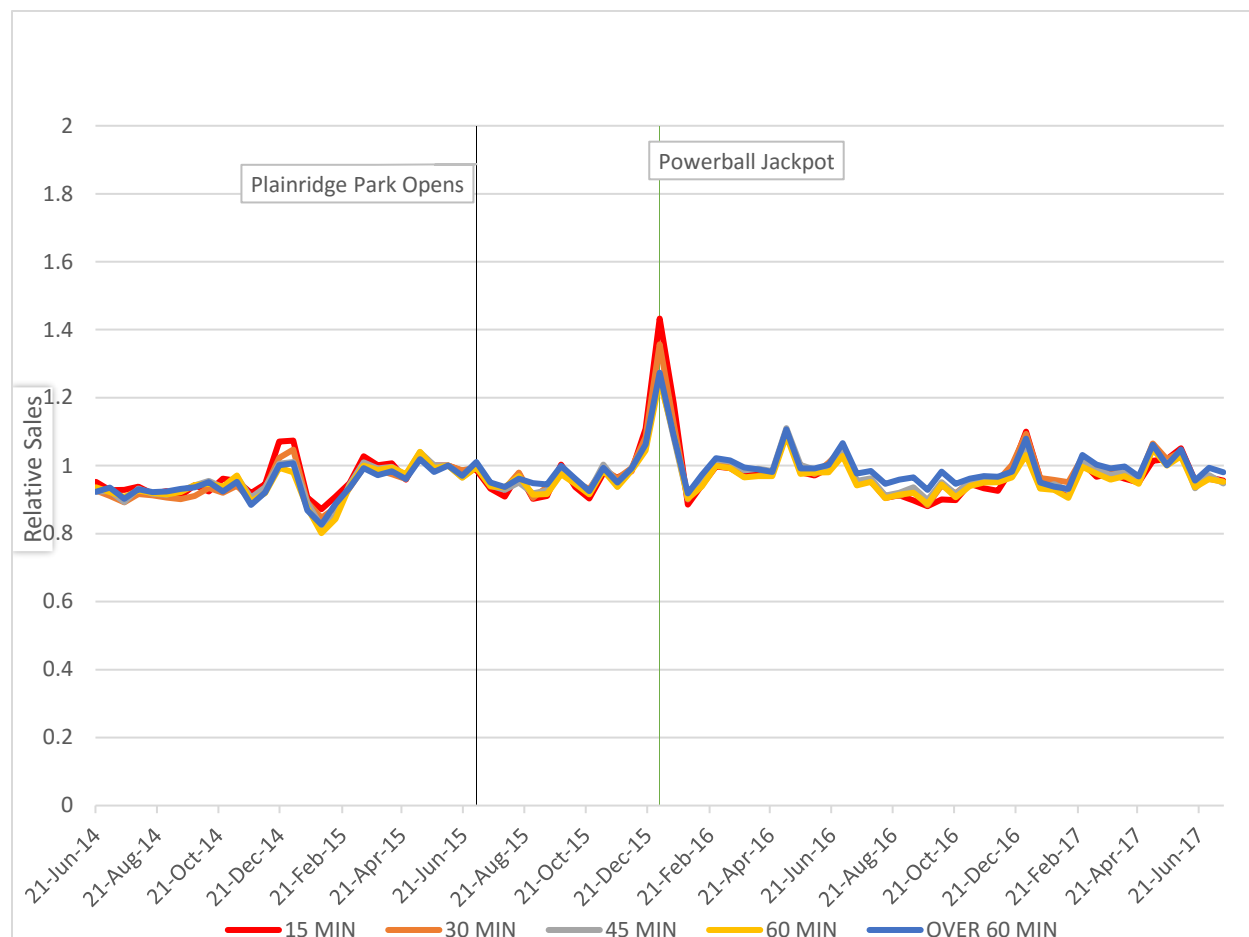
Source: MA Lottery, average bi-weekly sales per agent, June 15, 2014-June 20, 2015 compared to average bi-weekly sales per agent June 21, 2015-July 22, 2017. Average bi-weekly lottery sales for agents in Plainville and surrounding communities increase by approximately \$6, on average, after the casino opened. This is below the average bi-weekly increase for agents in the rest of the state of \$772.

Drive Time Analysis

The analysis for host and surrounding communities suggests that lottery sales at Plainridge Park Casino significantly increased. This increase was most pronounced in the first year following the opening of the casino with sales levelling off in year 2. Sales at other agents in Plainville and agents in the MGC-designated surrounding communities, on average, decreased slightly.

Figure 19 illustrates relative bi-weekly sales for agents within various drive time distances of Plainridge Park Casino. Plainridge Park Casino is included in the 15 MIN category, which includes all agents between a 0 to 15-minute drive time from Plainridge Park Casino. The 30 MIN category includes all agents that are a 16 to 30-minute drive time from Plainridge Park Casino, etc. Relative bi-weekly sales patterns are very similar by drive distance. Relative sales (sales relative to the two-week period prior to opening) for all drive distances have similar trends and variation, both before and after the casino opening. An adverse impact on lottery sales from the opening of Plainridge Park Casino would likely occur among agents closer to the casino. There is no evidence of this in Figure 19.

Figure 19: Relative Bi-Weekly Lottery Revenue over Time for Agents at Various Distances from PPC



Source: MA Lottery, bi-weekly sales relative to two-week period prior to opening (June 7-June 20, 2015), nominal dollars. The category 15 MIN includes all agents within 15 minutes of Plainridge Park Casino, including Plainridge Park Casino. 30 MIN represents agents 16-30 minutes away from Plainridge Park Casino, etc. Relative sales for all distances follow a similar trend, showing no sign of a different or adverse impact after the casino opened.

Difference-in-Differences Analysis by Drive Time

Tables 4 and 5 present DID analysis for agents within a 15-minute drive of Plainridge Park Casino and agents 16-30 minutes from Plainridge Park Casino. For this analysis, we exclude Plainridge Park Casino. This analysis was performed because we have already seen that sales at Plainridge Park Casino increased significantly and we are interested in whether any adverse impact was felt by other agents. Similar to the results for the surrounding communities, Table 3 demonstrates that average bi-weekly sales for agents within a 15-minute drive of the casino decreased slightly relative to agents more distant from the casino. Specifically, average bi-weekly sales for agents within 15 minutes decreased by \$305, a decrease that is not statistically significant. Average bi-weekly sales for other agents in the state increased by a statistically significant \$775. The difference in the average bi-weekly sales, \$-1,081, is statistically significant. While statistically significant, the difference of \$1,081 represents approximately 5% of

average bi-weekly sales. When including Plainridge Park Casino (results not reported to ensure confidentiality of lottery sales), sales for agents within a 15-minute drive increase slightly, but the increase is less than the rest of Massachusetts and not statistically significant. The difference between all agents within a 15-minute drive, including the casino, and agents in the rest of the state remains negative, suggesting slower growth for agents within a 15 mile radius. This, however, is not statistically significant. Thus, as was the case when examining Plainville and the surrounding communities combined, when including lottery sales at Plainridge Park Casino with the agents within a 15-minute drive, there is no statistical change in lottery sales.

Table 4: Difference-in-Differences Analysis of Average Bi-Weekly Lottery Sales by Agent within 15-Minute Drive of PPC vs. Rest of Massachusetts

| | Before Plainridge Park Casino | After Plainridge Park Casino | Difference^a |
|---|--|---|-------------------------------|
| Agents within 15 Minute Drive of Plainridge Park ^b | 22,933.8 (277.10) | 22,628.59 (194.44) | -305.21 (338.35) |
| Rest of State | 25,584.65 (63.94) | 26,360.54 (46.24) | 775.89*** (79.63) |
| Difference in Differences | | | -1081.09** (470.46) |

^aA *, **, and *** represent statistical significance at the 10, 5, and 1 % level, respectively.

^bExcluding Plainridge Park Casino

Source: MA Lottery, average bi-weekly sales per agent, June 15, 2014-June 20, 2015 compared to average bi-weekly sales per agent June 21, 2015-July 22, 2017. Sales for Plainridge Park Casino are excluded from this analysis in order to examine whether other agents experienced adverse impacts. Average bi-weekly sales for agents within 15 minutes of Plainridge Park Casino decreased approximately \$305, a decrease that is not statistically significant. Average bi-weekly sales for agents further from the casino increased, on average, by \$775. The difference, of \$1,081 is statistically significant at the 5% level.

Table 5 compares agents within a 16 to 30-minute drive of the casino with agents at a greater distance. Thus, agents within a 0 to 15-minute drive are not included in the rest of Massachusetts. This analysis was performed to be consistent with Table 3 where agents within 15 minutes of the casino were compared with agents more distant.

After the casino opened, average bi-weekly sales for agents within a 16 to 30-minute drive of Plainridge Park Casino increased a statistically significant \$664. Agents more distant from the casino also experienced a statistically significant increase, on average, of \$788. The difference in the change, \$-123, is not statistically significant, again signifying no statistical difference in average bi-weekly sales growth between the two groups.

Table 5: Difference-in-Differences Analysis of Average Bi-Weekly Lottery Sales by Agent within 16-30 Minute Drive of PPC vs. Rest of Massachusetts

| | Before Plainridge Park Casino | After Plainridge Park Casino | Difference ^a |
|--|----------------------------------|------------------------------------|-------------------------|
| Agents within 30 Minute Drive of Plainridge Park | 24,938.12 (204.28) | 25,602.31 (148.24) | 664.18*** (255.44) |
| Rest of State ^b | 25,650.5 (67.32) | 26,438.53 (48.66) | 788.03*** (83.80) |
| Difference in Differences | | | -123.85 (274.57) |

^aA *, **, and *** represent statistical significance at the 10, 5, and 1 % level, respectively. Only agents open over the whole sample period.

^bDoes not include agents within 15-minute drive.

Source: MA Lottery, average bi-weekly sales per agent, June 15, 2014-June 20, 2015 compared to average bi-weekly sales per agent June 21, 2015-July 22, 2017. Agents within a 15-minute drive are not included in the Rest of State category. Average bi-weekly sales for agents that are a 16 to 30-minute drive from Plainridge Park Casino increased, on average by \$664, whereas more distant agents increased by \$788. Both increases are statistically significant, but the difference between the changes is not statistically significant.

Results for agents within a 31 to 45-minute drive, not separately reported, indicate that average bi-weekly sales increased \$508 versus \$914 for agents that are more distant. The difference, approximately \$-405, is statistically significant.

The analyses by community status (host versus surrounding) and drive time indicate that lottery sales at agents in the surrounding communities and those within a 15-minute drive lagged behind lottery sales for the rest of Massachusetts. Lottery sales in the surrounding communities and within 15 minutes all declined, although the decreases are small relative to average sales and are not statistically significant. When compared to the increase in the rest of the state, those declines are statistically significant but remain a relatively small percentage of average bi-weekly sales. Whether this underperformance of sales for agents near Plainridge Park Casino is due to the casino itself or other unobserved factors that may have impacted sales (e.g., a change in ownership, road construction, changes in management or staff, closures due to remodeling, corporate buyouts) is not clear. Average sales per agent for agents within a 16 to 30-minute drive of the casino -- which many might also consider close to the casino -- increased. This increase, however, was less than the state. Moreover, sales for other agents in Plainville only decreased modestly (approximately 1%) and not significantly. Finally, when including Plainville and the agent at Plainridge Park Casino, sales slightly increased over the two-year period, but less than the state as a whole. The difference with other agents in the state is also not statistically significant. Thus, there is no clear evidence that the casino has negatively affected lottery sales overall. What is clear is that lottery sales for agents in the designated surrounding communities and within a 15-minute drive have underperformed, on average, relative to more distant agents, but not dramatically so.

Summary and Future Work

The results presented above demonstrate that nominal lottery sales (i.e., not adjusted for inflation) annually increased between FY 2012 and FY 2016, but declined in FY 2017. The introduction of casino gambling in Massachusetts may adversely affect lottery sales if casinos are a substitutable form of gambling.

Statewide lottery sales grew 4.3% in fiscal year 2016, a period of time that nearly corresponds to the first full year of operation of Plainridge Park Casino, which opened June 24, 2015. In fiscal year 2017, however, statewide lottery sales declined by approximately 2.6%. The rate of growth in fiscal year 2016 exceeded the historical average of 1.4% and was the second highest rate of growth since 2012. The decline in fiscal year 2017 lottery sales reverses the annual increases in sales experienced since 2012. Lottery sales for the Town of Plainville increased 25% in the year after the casino opened relative to the prior year and practically remained at that level in the second year. Much of this increase in the first year of casino operation occurred at Plainridge Park Casino where sales increased nearly four-fold compared to sales prior to the casino opening.

Sales for lottery agents in the surrounding communities of Attleboro, Foxborough, Mansfield, North Attleborough, and Wrentham, *combined*, did not decline in the first year following the opening of the new casino, but did grow more slowly, increasing 3.6% over the year prior to opening compared to 5.2% for lottery sales statewide. In the second year of operation, sales in the *combined* surrounding communities decreased by 1.5% relative to the year prior to opening compared to a 2.8% increase statewide. Total sales for agents within a 15-minute drive of the casino, even when including Plainridge Park Casino, follow a similar pattern, growing more slowly in the first year (3.78%) and decreasing (0.37%) in the second year. However, total sales for agents within a 16 to 30-minute drive of the casino performed better than the state as a whole, increasing in both years following the opening of the casino, by 5.70% in year 1 and 3.12% in year 2 relative to the year prior to opening.

There are several qualifiers to the above results. One, as demonstrated above, average bi-weekly lottery sales for agents in the designated surrounding communities and those within a 15-minute drive of the casino over the two years since the casino opened are lower than before the casino opened. This is an average and does not imply that all agents had lower sales. While the reduction in sales is not statistically significant, the difference between these agents and other agents in the state, which on average had modest gains in sales over the two-year period, is statistically significant. The difference represents about 5% of average bi-weekly sales. However, when the increase in sales in Plainville and Plainridge Park Casino is considered, total lottery sales in the host and surrounding communities and those agents within a 15-minute drive of the casino are higher on average in the two years following the casino opening, but not as high as other agents in the state. In short, the gains in Plainville have been sufficient to offset declines in the surrounding and nearby communities, but not enough to match gains in the rest of the state over the two-year period. However, the difference is not statistically significant, so it is not possible to statistically conclude any directional change in lottery revenues. In other words, statistically, lottery sales in the host and nearby communities (MGC-designated surrounding communities and within a 15-minute drive) remains unchanged.

It is important to keep in mind that the post-casino period of July 2015 to July 2017 is relatively short and should not be interpreted as representative of longer-term impacts. This is especially true given the year-to-year variation in lottery sales exhibited over time. The declines in sales in the designated

surrounding communities and for agents within a 15-minute drive may be due to other unobserved factors. Moreover, the casino at Plainridge Park is a different scale compared to the other casinos scheduled to open in Massachusetts, which will be larger and include more non-casino amenities. The above results may not foreshadow results for the casino openings in Springfield or Everett.

Going forward, the Massachusetts Lottery has graciously agreed to continue to provide us agent-specific data. This will allow us to analyze the impact of Plainridge Park Casino over time and provide extended baseline data for Springfield and Everett and their surrounding communities. This will include the MGC-designated surrounding communities, communities within various distances from the casinos, and communities identified in the patron survey. We will also continue to analyze data on a calendar year and fiscal year basis by town. Determining the longer-term impact that casinos have on lottery revenues, by definition, will take time.

Charity Gambling

Charity gambling consists of bingo games, raffles, charity game tickets, and casino functions. Calendar year 2016 gross receipts were \$59,533,184, an increase from 2015 when gross receipts were \$57,976,236. Charity gambling is comprised of bingo games (45.3%), raffles (32.3%), charity game tickets (21.8%), and casino functions (0.6%).⁸ Charity gambling has generally been declining every year in Massachusetts. For example, bingo gross receipts were \$88,208,825 for calendar year 2003, but had declined to \$26,987,266 by calendar year 2016. Attleboro is the only MGC-designated surrounding community with any charity gambling, so an analysis of the impact of the casino on charity gambling is not practical at this time. Bingo receipts in Attleboro increased 5.5% in calendar year 2016, but have declined at an average annual rate of approximately 11% since 2003. Given the limited time the casino has been open and that Attleboro is the only surrounding community to have charity gambling, it is not possible to determine any casino-related impacts. We will continue to gather charity gambling data and will analyze those impacts as casinos open in the future.

⁸ Charity Games, 2015 Annual Report, Massachusetts State Lottery Commission.
<http://www.masslottery.com/lib/downloads/games/Charitable%20Gaming%20AR%202016%20FINAL.pdf>

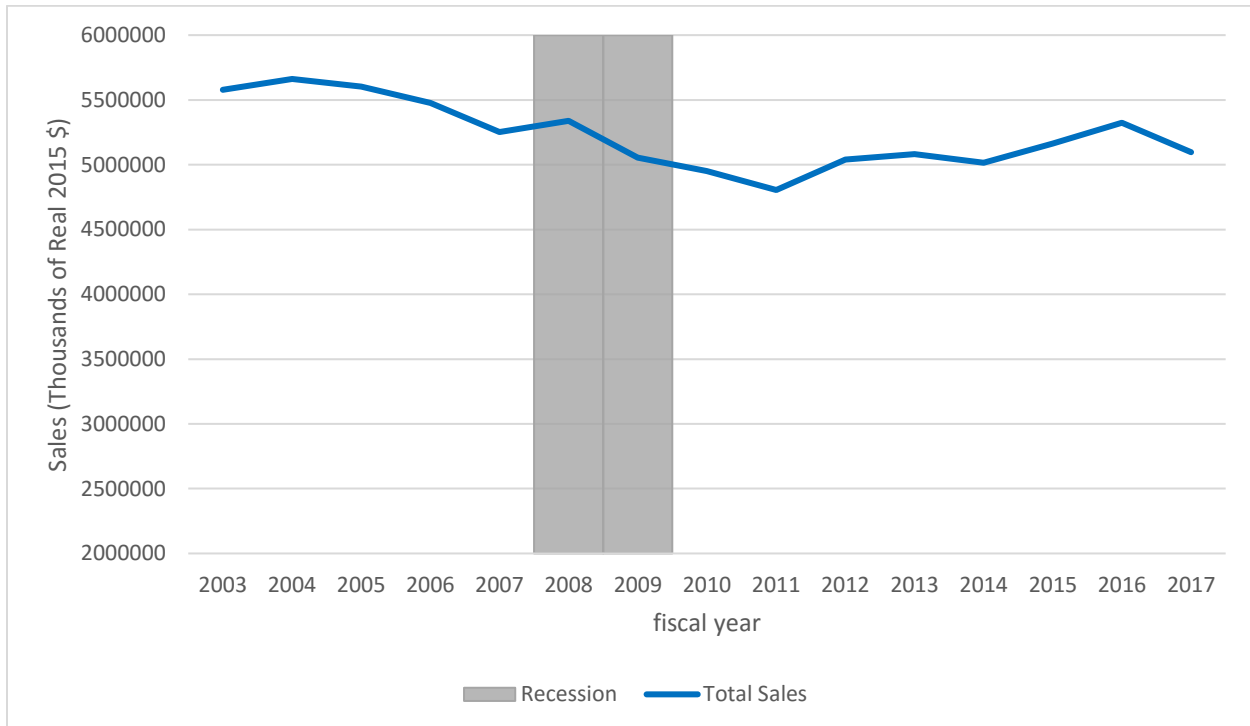
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Appendix A: Inflation Adjusted Lottery Sales

Figure A1 shows total lottery sales expressed in real 2017 dollars. Nominal dollars have been adjusted for inflation using the Bureau of Labor Statistics CPI-U, the Consumer Price Index for all Urban Consumers.

Figure A1: Total Lottery Sales, 2003-2017 (in 2017 Dollars)

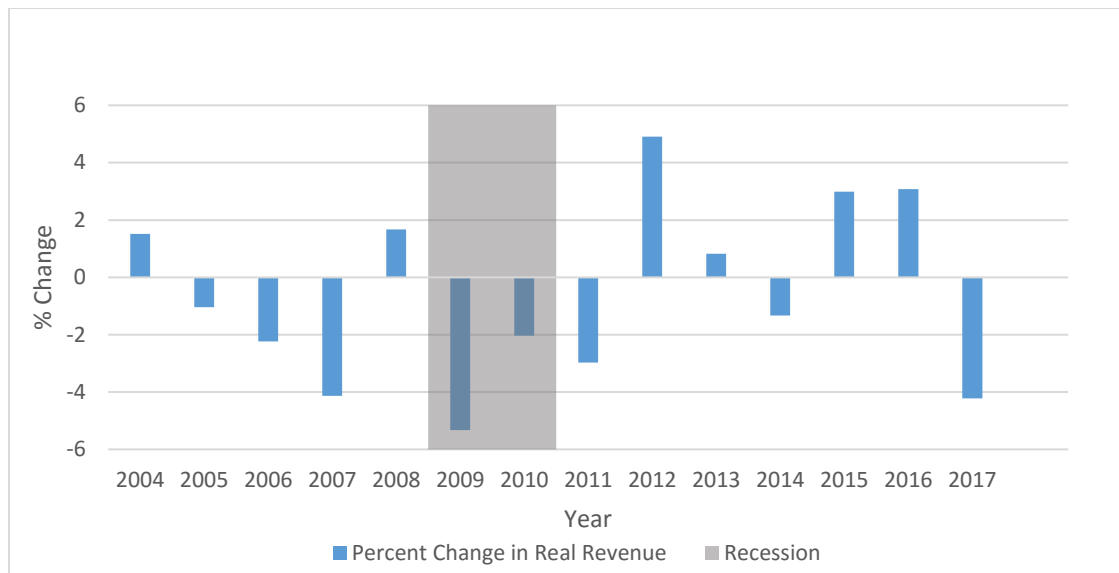


Source: MA Lottery and Bureau of Labor Statistics

Figure A1 shows that nominal lottery sales growth over the period of 2003 to 2017 has not kept up with inflation. The annualized inflation rate over this period was 2.04%, which exceeded the 1.37% annualized growth in nominal revenues. Figure A1 demonstrates the notable decline in sales resulting from the recession and economic slowdown as well as the recovery in lottery sales beginning in fiscal year 2011. In real terms, lottery sales have recovered from the Great Recession and are approximately equivalent to real expenditures in fiscal year 2009 but remain below expenditures prior to 2008.

Figure A2 illustrates the annual percentage change in inflation adjusted (2017) dollars. Adjusting for inflation, total lottery sales declined 4.2% in fiscal year 2017. Real sales increased approximately 3% in fiscal years 2015 and 2016.

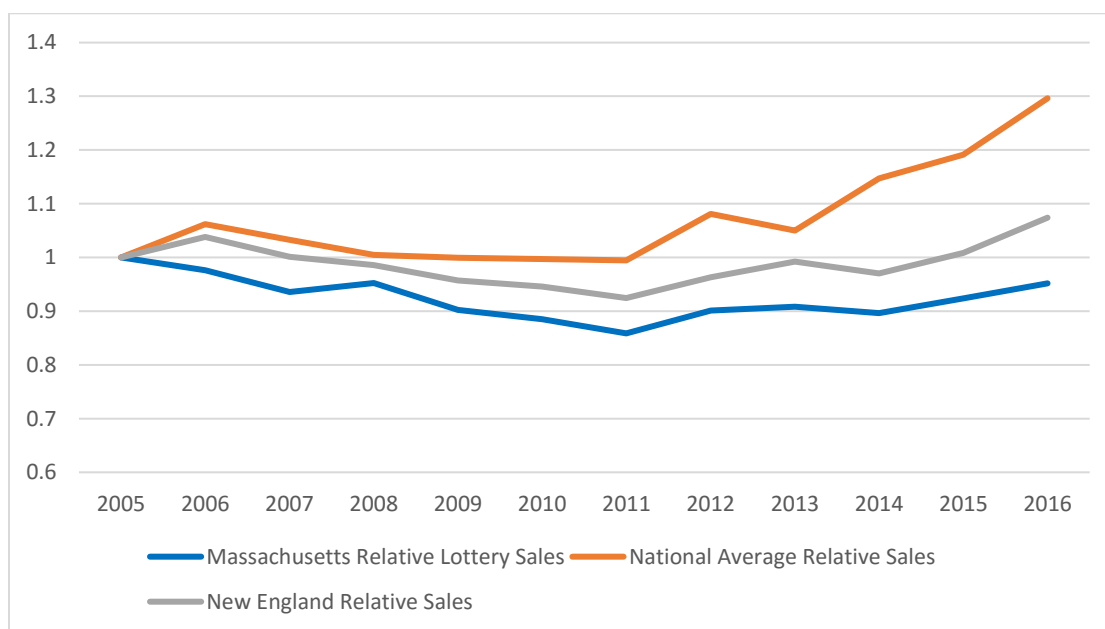
Figure A2: Annual Percent Change in Total Lottery Sales, 2003-2017 (in 2017 Dollars)



Source: MA Lottery and Bureau of Labor Statistics

Figure A3 provides information represented in Figure 4 expressed in real dollars. Sales for Massachusetts, New England, and other states without VLTs that had a lottery in existence since 2005 are included. All sales are relative to sales in fiscal year 2005. Growth in the Massachusetts Lottery has been below that of the other New England States (excluding Rhode Island, which has VLTs) and the national average. Confirming the decline in real lottery sales in Figure A1, relative sales in fiscal year 2016 are below 1 (0.95), indicating real sales below those in fiscal year 2005.

Figure A3: Relative Total Lottery Sales, 2005-2016 (in 2016 Dollars)



Source: LaFleur's World Lottery Almanac, 2005-2017, and Bureau of Labor Statistics. Sales relative to sales in 2005 (2005=1).