Economic Factors Affecting Lottery Sales: An Examination of Maine State Lottery Sales

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Introduction

Lotteries have grown significantly in prevalence since their introduction in 1964 by New Hampshire (Vrooman 1976). Currently, 44 states offer state lotteries (NASPL 2015). Lottery sales provide a significant revenue source for state governments which own most of the lotteries offered in the U.S, accounting for as much as 6.6% of a state's revenues (Chokshi 2016). In 2014 lottery sales totaled to $70.15 billion in the U.S. (NASPL 2015). Revenue from lottery sales are discussed as an implicit tax (Brown and Rork 2005) and called a painless tax by some (Clotfelter and Cook 1989; Alm, McKee and Skidmore 1993) since they are voluntary and many consumers do not consider the government revenue resulting from their purchase.

Both declining state revenues and personal income level have a positive impact on lottery enactment in the state (Alm, McKee and Skidmore 1993) and potentially the proliferation of games. Thus, when we find in the literature that the same factors are associated with a positive impact on the state's lottery sales (Vrooman 1976), there is a question of reverse causality. This may also explain some of the conflicting results. For example, DeBoer (1986), Mikesell and Zorn (1987) and Mikesell (1994) find a positive relationship between personal income and lottery sales.

States are often criticized for lottery enactment and promotion given the apparent negative average benefit accruing to consumers. Kearney (2005) concludes that the money spent on lottery tickets in the household represents a substitution from other non-gambling household expenditures, increasing overall expenditures on gambling. Lotteries are thought to provide both monetary utility, as well as some type of entertainment to consumers. Matheson and Grote (2004) argue that consumers get utility not only from winning but also from the excitement and having a chance of winning a big prize. However, Miyazaki, Langenderfer and Sprott (1999) find that enjoyment, feelings of being lucky do not have any significant impact on consumers' lottery purchase behavior. Blalock , Just and Simon (2007) show that there is a positive and significant relationship between poverty rates and lottery sales in the U.S. They argue that poor people spend a disproportionally higher percentage of their income to purchase lotteries as perhaps the only perceived means to escape poverty, considering it an investment and not simply entertainment. Indeed, most of the research identifies lotteries as a regressive form of taxation (Clotfelter and Cook 1991; Miyazaki, Langenderfer and Sprott 1999; Walker 1998). Scott and Garen (1994) conclude that individuals' income and age have U-shaped impact on lottery sales reaching maximums at $30,000 and age 25, respectively. Farrell and Walker (1999) find that income elasticities of lotteries are high, supporting regressivity. Price-elasticity of demand for lotteries, however, is close to unitary (Mason, Steagall, and Fabritius 1997; Farrell et al. 2000). Marketing practices targeting poorer consumers potentially exacerbate the regressivity of lotteries (Miyazaki, Hansen, and Sprott 1998).

Given the "hail Mary" nature of some lottery purchases, a poor economic environment may stimulate the consumption of lottery tickets. Smith (2014) finds that elderly, less educated individuals and minorities (except Asians) tend to buy more lotteries than their respective counterparts. Mikesell (1994) concludes that the elasticity of unemployment rates on lottery sales equals 0.17. Unemployment is correlated with the purchase of lottery tickets (Vrooman 1976; Mikesell and Zorn 1987; Scott and Garen 1994; Smith 2014). However, Blalock , Just and Simon (2007) find a negative relationship between the overall unemployment rate and lottery sales across states. The relationship between unemployment and lottery sales has typically been examined only through the use of cross sectional, or highly aggregated, data, making it difficult to discern the impact of transitory shifts in employment.

Our study employs a comprehensive data of store-level lottery sales in the state of Maine, which differentiates it from the previous work. The data includes five years of lottery sales for every location where they were sold in the state of Maine from 2010 to 2014. The most relevant studies to date have used panel data for their analysis with sales aggregated at the state level (Blalock, Just, and Simon 2007, Kearney 2005; Mikesell 1944). Using the data from smaller geographic areas allows us to perform a much more statistically powerful economic analysis by zip code area in Maine, identifying and measuring the impact of various socio-economic characteristics on lottery sales. In particular, our data and estimation procedure identifies the impact of these background economic factors on lottery sales by using zip-code level changes in such economic characteristics within state. This eliminates any state level reverse causality.

We use extremely detailed data allowing for much greater nuance in analysis. Prior work examines the impact of unemployment and other socio-economic characteristics on total lottery sales. By contrast, the data in this study allow us to distinguish between draw and instant lotteries. Instant lotteries provide an immediate winning opportunity and, depending on the ticket type, can rarely have a winning amount close to $1,000,000 (Maine lotteries 2015). Draw lotteries, on the other hand, provide an opportunity to win huge jackpots reaching up to hundreds of millions of dollars, though there is typically a wait (of up to several days) between purchase of the ticket and determination of winners. These lotteries likely attract consumers with different socio-economic characteristics due to the different way they could impact those in desperate need.

There are a variety of reasons for a state to introduce a lottery. States may be pressured to adopt lotteries if neighboring states had already adopted some type of lottery to avoid revenue exports (Garrett and Marsh 2002; Erekson et al. 1999). The political environment and the state’s fiscal policy and fiscal health (Alm, McKee and Skidmore 1993; Erekson et al. 1999) also have an impact on lottery enactment. Erekson et al. (1999) finds that states with higher numbers of tourists have higher adoption rates. Competition between states is important and has a significant impact on the states' lottery sales. Overall competition between states decreases lottery sales in individual states by siphoning some consumers off to neighboring state lotteries (Mikesell and Zorn 1987). Similarly, neighboring state's payout rate has a positive impact on the home state's payout rate (Brown and Rork 2005). Chen and Chie (2008) note that tax rates for lottery winnings differ by state. DeBoer (1986) argues that increasing tax rates lowers the revenue from lottery sales. However, larger jackpots tend to attract more consumers and higher tax rates can fuel large jackpots. Smith (2014) finds that decreasing the tax rate on winnings will result in an increase in overall state revenues and consumer surplus. Such inter-state factors become less important in a study of intra-state lottery sales. Using a fixed effects panel model eliminates the need to control directly for competition or differences in taxation rates.

The size of the jackpot heavily influences lottery sales and consumer demand. Big rollovers and high jackpots have a positive impact on total lottery sales or revenues (Quiggin 1991; Thiel 1991; Scoggins 1995). Garrett and Sobel (1999) and Walker and Young (2001) find that skewness of prize distribution also positively impacts lottery sales. Interestingly, jackpot size matters more to consumers than the probability of winning (Cook and Clotfelter 1991). Peel (2010) finds that the jackpot size has a bigger impact on lottery sales than expected price, suggesting that large jackpots can trigger an irrational increase in purchasing even if expected earnings remain low—dubbed "lotto mania". Beenstock, Goldin, and Haitovsky (2000) find that lotto mania rather than consumer heterogeneity explains shifts in the demand for lottery tickets. Matheson and Grote (2004) find that the lotto mania phenomenon rarely occurs. Most modest increases in jackpot size stimulates ticket sales without creating hysteria among consumers that can lower the expected value of a ticket.

Game structures and jackpot size are also significant factors affecting lotteries' profitability (Forrest, Simmons, and Chesters 2002; Walker and Young 2001). Because the jackpot size and the structure of a game are so key to demand, it is important to control for both. In our paper we estimate separate relationships for draw and instant games. As well, we control for jackpot size.

The remainder of the article is organized as follows: Section two contains a description of our empirical model and econometric approach to the study. Section three describes and summarizes the data. Section four presents the empirical findings. Key conclusions and policy implications of the article are outlined in the final section.

Empirical Model

Friedman and Savage (1948) propose that individuals are motivated to buy lottery tickets by expected utility maximizing behavior, with utility of wealth functions that are shaped like an inverse "S"—convex over for middle income levels, while concave over both small and large amounts. Such a utility function can lead to a willingness to take small unfair bets with low probabilities of extremely high payoffs, yet still demonstrate a willingness to buy insurance and avoid other risks. Kahneman and Tversky (1979) offer an alternative potential explanation of lottery ticket purchases due to loss aversion. According to their prospect theory model, individuals who experience a loss may behave risk loving, taking risks in order to return to their reference level of wealth. Blalock, Just, and Simon (2007) note that these theories make different predictions about how lottery behavior will respond to reductions in income, presenting one way to test between the two potential motivations. Let $U(\mathrm{W})$ denote the utility of wealth function.

An individual solves

$$\max_{L} U = (X^{L} P^{L}) = \sum u(x_i^{L})\, p_i^{L} \tag{1}$$

Where

Then, the necessary condition for playing a lottery is

$$\Delta \mathrm{U} \equiv PU(\mathrm{W} + J - P_L) + (1 - \mathrm{P})\,\mathrm{U}(\mathrm{W} - P_L) - U(\mathrm{W}) > 0, \tag{2}$$

Where *W* denotes the current level of wealth, *J* is the jackpot amount, *P* is the probability of winning, and P_L is the lottery ticket price. If we assume that the probability of winning is very small and the price of the ticket is a small fraction of wealth, then equation (3) is approximated by

$$\Delta \mathrm{U} \approx PU(\mathrm{W} + J) > \mathrm{U}'(\mathrm{W}). \tag{3}$$

Consider then the conditions necessary for low incomes to induce a preference to play the lottery, while middle incomes do not. We denote the wealth levels by W_l and W_m for lower and middle income individuals, respectively. And since $\mathrm{W}_m > \mathrm{W}_l$ we get

$$\mathrm{U}'(\mathrm{W}_m) > PU(\mathrm{W}_m + J) > PU(\mathrm{W}_l + J) > \mathrm{U}'(\mathrm{W}_l). \tag{4}$$

Thus, the utility function must be convex somewhere between W_l and W_m. The above mentioned theory provides a look on purchasing lottery tickets based on expected utility maximization. Under this theory, we would expect lottery play to decrease as incomes increase. We would also expect that instant lottery sales (those that produce smaller awards) would be less popular among those of the lowest income levels. If we accept the lifetime income hypothesis (Tobin 1970; Friedman 2016), transitory changes in wealth, such as a spell of unemployment, should have little impact on lottery play.

An alternative theory is given by Kahneman and Tversky (1979). Prospect theory is built on the notion that individuals, in general, are more risk averse when it comes to avoiding or recovering from losses than to gains of the same size. This is typically referred to as *loss aversion*. In this case the comparison is done based on the wealth outcomes and how they relate to some initial or reference wealth level.

Let V represent the individual's overall valuation of a prospect. Let (x, p) represent a prospect where x is a vector of possible outcomes for a lottery and p is a vector of probabilities associated with these outcomes. Let $v(x|\overline{w})$ represent the individual's valuation of the outcome x given a reference wealth level $\overline{w}$. Let π represent decision weights used to evaluate probabilities. Each probability p with a decision weight $\pi(p)$, reflects the impact of p on the overall value of the choice with the following properties; $\pi(\mathrm{p}) > p, \text{if } \mathrm{p} < \overline{p}$, and $\pi(\mathrm{p}) < p, \text{if } \mathrm{p} > \overline{p}$, $\pi(0) > 0$, $\pi(1) = 1, \text{and } \pi'(0) < \pi'(1)$. The function overstates small probabilities, perhaps leading to overvaluation of lottery winnings, and understates the larger probabilities.

Then, the individual's decision problem becomes

$$\max \mathrm{V}(\mathrm{X}, \mathrm{P} \mid \overline{\mathrm{w}}) = \sum \pi(\mathrm{p}_i \mid \overline{\mathrm{w}})\, \mathrm{v}(x_i \mid \overline{\mathrm{w}}) \tag{5}$$

where $\overline{\mathrm{w}}$ is an arbitrary chosen reference point of wealth.

The function v is given by

$$v(\mathrm{x} \mid \overline{\mathrm{w}}) = \begin{cases} u_h(\mathrm{x} - \overline{\mathrm{w}}) & \text{if} \quad \mathrm{x} \geq \overline{\mathrm{w}} \\ u_l(\mathrm{x} - \overline{\mathrm{w}}) & \text{if} \quad \mathrm{x} < \overline{\mathrm{w}}, \end{cases} \tag{6}$$

where u_h is a concave function with the following assumed properties $u_h(0)=0$, u_l is a concave function with $\lim_{x\downarrow 0} u_l(x)=0$ and $\lim_{x\uparrow 0} u_l(x) > \lim_{x\downarrow 0} u_h(x)$. Thus, an individual will purchase a lottery ticket if the following holds;

$$\Delta V = \pi(\mathrm{p})\,\mathrm{u}_h(\mathrm{w}-\bar{\mathrm{w}}+x-P_L)+\pi(1-\mathrm{p})\,\mathrm{v}(\mathrm{w}-P_L \mid \bar{\mathrm{w}})-\mathrm{v}(\mathrm{w}\mid\bar{\mathrm{w}})>0, \tag{7}$$

where *w* is the current level of wealth and P_L is the lottery price. In this case the model does not differentiate between individuals in different wealth levels. It only identifies if individuals are above or below their reference level of wealth. It is assumed that the reference wealth level is more stable than the actual wealth level. Thus, when the wealth level drops causing a negative income shock, one expects that individuals will most likely play lottery to overcome the negative shock. To see this, *v* is replaced with u_L in the left-hand side to represent falling into the loss domain, and the first order derivative is taken in equation (8). We get

$$\frac{\partial \Delta V}{\partial w} = \pi(\mathrm{p})\,\mathrm{u}_h'(\mathrm{w}-\bar{\mathrm{w}}+x-P_L)+\pi(1-\mathrm{p})u_l'(\mathrm{w}-P_L-\bar{\mathrm{w}})-u_l'(\mathrm{w}-\bar{\mathrm{w}}). \tag{8}$$

By assuming that the lottery ticket price is small relative to the changes in wealth, we can approximate the equation (9) as

$$\frac{\partial \Delta V}{\partial w} \approx \pi(\mathrm{p})\,\mathrm{u}_h'(\mathrm{w}-\bar{\mathrm{w}}+x-P_L)+(1-\pi(1-\mathrm{p}))u_l'(\mathrm{w}-\bar{\mathrm{w}}). \tag{9}$$

where u_h is concave and u_l is increasing as w approaches $\bar{w}$. Equation (10) must be less than zero if the wealth shock is small compared to possible lottery winnings and p is small. Thus, as *w* is very close to $\bar{w}$, $u_l'(\mathrm{w}-\bar{\mathrm{w}}) > \mathrm{u}_h'(\mathrm{w}-\bar{\mathrm{w}}+x-P_L)$. Since $\pi'(0)<\pi'(1)$ we have $\pi(\mathrm{p})<1-\pi(1-p)$ if *p* is small enough. This theory shows that if the difference between current and reference wealth levels increases then an individual is more likely to play the lottery. They will continue playing until they recover from negative wealth shock or until they adapt to a new and lower reference wealth level. Negative wealth shocks can arise from several sources, but loss of employment seems a highly likely candidate. Based on this theory if the unemployment rate goes up then lottery sales will likely increase as well, behaving like an inferior good. The model provides no prediction for which type of lottery (draw or instant) should be more popular after experiencing a loss. Given the value, function is assumed to be convex; the individual behaves risk loving and is thus willing to play the lottery.

Data

Data are compiled from several sources. Lottery sales are provided by the State of Maine through a Freedom of Access Act (FOAA 2015) request. Gross and net sales for draw and instant lotteries are provided for each point of sale (e.g., stores, gas stations) in the state of Maine for the five-year period (2010-2014). However, only net sales are used in the analysis since the difference between two types of sales is very small and net sales provide more accurate information. Mean net sales of draw lotteries with total net sales are presented in Table 1 across stores for five years. Descriptive statistics of gross sales are presented in Table 5 in the Appendix. All data in the analysis that contain dollar amounts are deflated using the GDP Implicit Price Deflator in the U.S. (FRED 2015) with a base year of 2010.

Due to the unavailability of other explanatory variables at the neighborhood level we combined respective sales numbers across each zip code in the state of Maine. Not surprisingly, lottery sales, on average, are higher across zip code areas since they combine data from stores located in respective zip code areas. However, we observe that the pattern of sales by zip code is almost identical to the pattern of store-wise sales over time (Appendix – Figure 1).

We notice that total net sales gradually increase from years 2010 to 2015 (Table 1). During the five-year period, average lottery net sales increased by 2.01% and 2.40% per store and per zip code, respectively. These increases are mainly driven by an increase in net sales of instant lotteries. Net sales of draw lotteries, on average, are more volatile having the lowest average sales in 2014. Average draw lottery net sales faced a respective decline of 17.64% and 17.32% per store and zip code. A small number of stores reported negative sales numbers due to the nature of reporting net sales. Overall, instant lotteries are more popular than draw lotteries. The average net sales for instant lotteries during these 5 years is $485,920 compared to $177,887 average net sales of draw lotteries. One of the possible factors causing discrepancy between the two types of lotteries is that consumers usually repurchase additional instant lottery tickets to recover losses associated with their previous consumption (Rogers 1998; Whiting, Catrone and Babbra 2016).

Unemployment rates and labor force data for cities in Maine are obtained from Bureau of Labor Statistics (BLS) (2015) for years 2010-2013 (Table 2). According to BLS, the average labor force was continuously growing from 2010 to 2014. While Portland, on average, has the biggest labor force market with almost 40,000, Vanceboro has the smallest market with only 50 people in the labor force. Employment was also growing with even higher rates causing a decline in the unemployment rate. Average unemployment rates went down from 8.73% to 6.24% from 2010 to 2013. While the highest unemployment rate of 23.9% was recorded in Princeton, ME in 2012, Swans Island had the lowest unemployment of 3.3% in 2011. The data set includes both increases and decreases in unemployment in various zip codes throughout the observed period.

IRS related data for the years 2010 – 2012 are reported in Table 4. Since we do not have a panel data for population demographic characteristics, we use various IRS variables to control for some of the missing characteristics. E.g., Childcare credits and number of dependents will include the families with children, pensions will mainly include retired people and so on. We also used some variables to analyze the impact of various income sources on lottery sales. Using unemployment compensation with unemployment rate gives us the opportunity to observe not only the percentage effect of the rate but also learn something of the nature of the income loss. The amount of unemployment compensation depends on the time length that an individual worked, their previous earnings and the maximum amount that the state allows for (Internal Revenue Service 2016; Intuit Inc. 2016). I.e., unemployment compensation is higher for individuals who had higher earnings before the current unemployment. Other variables used from IRS data are number of IRS returns, taxable income, business and professional net income, total tax credits, taxes paid, and state and local income taxes amounts.

Results and Discussion

The data is analyzed using the following panel regression.

$$\ln(lottery\_sales_{it}^{M}) = \beta_0 + \beta_1 UR_{it} + \beta_2 \ln(X_{it}) + \beta_3 \ln(Jackpot_t) + \beta_4 Trend + a_i + \varepsilon_{it}$$

Where ***M*** represents draw, instant, and total lottery sales for each zip code area ***i, t*** is an indicator for a respective year, UR_t is an unemployment rate, X_t represents a vector of IRS variables, $Jackpot_t$ is the average jackpot for a respective year, $Trend$ is a time trend for years 2010-2012, a_i is an unknown intercept, fixed effects capturing unobservable characteristics of zip code areas, and ε_{it} is a residual variable.

Due to the lack of availability of BLS data, only 2010-2012 years are used in the analysis. The results of all three models are presented in Table 4. Models 1 to 3 represent the respective model for draw, instant and total lottery sales as a dependent variable. One of the major findings of this study is that there is a positive and significant (at 1% significance level) relationship between unemployment rate and draw lottery sales. An increase of 1% in the unemployment rate within the zip code area is associated with a 4.7% increase in draw lottery sales within the same zip code. The unemployment rate has a positive impact on instant and total lottery sales, as well. However, the coefficients are not statistically significant at 10% significance level.

This confirms earlier findings about regressivity of lotteries, and is highly suggestive of loss averse behavior. When people become unemployed lotteries seem to provide an easy and quick solution to overcome the loss. However, the change of unemployment rate has a significant impact on draw lottery sales only. This is not surprising given that draw lotteries usually provide huge jackpots, which are more attractive to individuals as a potential source of income compared to relatively lower winning numbers of instant lotteries. The affinity for draw over instant games is somewhat consistent with the expected utility model. As unemployment increases, individuals buy more draw lotteries in hope of getting out of bad economic circumstances.

Unemployment compensation, however, has a negative and significant impact on draw lottery sales. If unemployment compensation by IRS increases by 1% for a zip code area the draw lottery sales decrease by 0.23%. Higher unemployment compensation implies higher unemployment shock. This implies that consumers who used to get higher salaries and wages before losing their jobs buy less draw lotteries than others. It might also have an income effect; higher unemployment compensation means higher overall income which results in lower lottery consumption. Salaries and wages, and taxable pensions and annuities, however, do not have any significant impact on lottery sales

Conversely, we find that taxable income amount has a positive impact on draw lottery sales. If taxable income amount increases by 1% in the zip code area then draw lottery sales increase by 0.90%. This shows that if individuals' taxable income increases they start buying more draw lotteries. Similarly, business or professional net income amount positively impacts instant lottery sales. If business or professional net income amount increases by 1% in the zip code area then instant lottery sales increase by 0.10% (significant at 10% level). This suggests that lotteries are in fact normal goods.

The number of IRS returns has a positive and a significant (at 1% level) impact on lottery sales. If the number or IRS returns per zip code increases by 1% than the draw lottery sales increase by 1.89%, instant lottery sales go up by 1.50%, and total lottery sales increase by 1.27%. Since we have a real number of households per zip code for only 2011 the number of IRS returns might be used as a proxy for number of households per zip code. In fact, the correlation between these two variables equals to 0.99. Number of dependents, on the other hand, has a negative and significant impact on lottery sales. If number of dependents increases in zip code area by 1% then draw, instant, and total lottery sales decline by 1.29% (significant at 1% level), 0.50%, and 0.59%, respectively. This indicates that having more dependents, on average, increases household expenditures, subsequently decreasing expenditures on lottery purchases. This finding also differentiates between two different types of lotteries; an increase in number of dependents has much smaller impact on instant lottery sales compared to draw lotteries. This implies that families with higher number of dependents, on average, buy more instant lotteries than draw lotteries.

The average jackpot amount has a positive and significant impact on draw lottery sales (at 1% level). If jackpot amount increases by 1% then draw and, subsequently, total lottery sales go up by 0.75% and 0.49%, respectively. The jackpot amount has also a spillover impact on instant lottery sales. A 1% increase in jackpot amount increases instant lottery sales by 0.33%.

However, the coefficient is significant at only 10% significance level. Since only draw lotteries offer jackpots it is not surprising to see that the jackpot amount has a smaller and less significant impact on instant lottery sales.

Conclusions

Lottery sales, reaching billions of dollars annually, have become a huge source of income for state governments in the U.S. since they own most of the lotteries sold. States, however, are criticized because of the nature of lottery sales and regressivity of lottery taxes. It is argued that low SES individuals play lotteries the most, spending bigger share of their income on purchases of lottery tickets than individuals in higher SES groups. This study uses very comprehensive data on lottery ticket sales from the state of Maine. Five-year data across sellers from Maine includes not only total sales of lottery tickets but it also distinguishes between draw and instant lotteries.

While other studies used total lottery sales for the analysis, the distinction between two groups of lotteries allowed us to capture effects of various economic characteristics on sales of lottery tickets that vary in nature. As a result, we find that different factors impact the two types of lotteries differently. While unemployment rate has a positive and a significant impact on draw lottery sales, it does not have any significant impact on instant lottery sales.

We find that draw lottery sales go up as unemployment in the same zip code area rises. We also find that if there is an increase in unemployment compensation amount in a zip code area than there is a respective decrease in draw lottery sales. These two results alone show that if consumers have constant source of income in terms of salaries and/or they get paid more they rely less on lotteries for external income source. This shows that draw lotteries are very attractive to unemployed consumers with their very high jackpots. Even though the probability to win a big jackpot is very small, lotteries are thought to provide a getaway to a better life.

A limitation of this study is that we do not have a demographic data on consumers purchasing tickets. This information would add extra layer of factors that would make the analysis more robust. Another limitation is the availability of other economic factors by BLS and IRS limiting our analysis to only three years.

States offering lotteries to raise revenue for state budgets should be cautious about who the main consumers of the tickets are. Therefore, the states should be very careful how they market the lotteries. As part of the solution, they can give back a percentage of revenues from lottery sales back to low income and unemployed population in terms of subsidies or other programs.

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Table 1. Deflated Lottery Net Sales Across Stores and Zip Codes for Years 2010 – 2014 (base year - 2010)

Lottery type	Net sales					
	2010	**2011**	**2012**	**2013**	**2014**	**Total average**
	Mean (St. Dev)					
	Across stores					
	(N=1,377)	**(N=1,372)**	**(N=1,419)**	**(N=1,373)**	**(N=1,358)**	**(N=6,899)**
Draw lottery	45,114 (44,805)	41,135 (40,884)	44,312 (43,768)	43,407 (41,645)	37,155 (35,424)	42,251 (41,550)
Instant lottery	112,766 (94,101)	113,654 (97,072)	111,998 (96,480)	114,009 (94,286)	123,897 (100,505)	115,223 (96,576)
Total	157,880 (130,369)	154,789 (129,796)	156,310 (132,654)	157,416 (128,551)	161,051 (129,014)	157,474 (130,083)
	Across zip codes					
	(N=341)	**(N=343)**	**(N=340)**	**(N=338)**	**(N=335)**	**(N=1,697)**
Draw lottery	182,175 (320,593)	164,541 (293,283)	184,936 (324,537)	176,324 (304,618)	150,615 (261,002)	171,769 (301,687)
Instant lottery	455,363 (780,205)	454,616 (788,966)	467,429 (796,457)	463,119 (769,859)	502,244 (841,175)	468,429 (794,836)
Total	637,539 (1,095,428)	619,157 (1,076,499)	652,365 (1,115,265)	639,443 (1,068,929)	652,859 (1,096,531)	640,197 (1,089,422)
	Total sales (In million dollars)					
Draw lottery sales in Maine	62	56	63	60	51	292
Instant lottery sales in Maine	155	156	159	157	168	795
Total lottery sales in Maine	217	212	222	216	219	1,086
US Total	58,820	61,804	66,200	65,323	65,572	63,544

Table 2. City-wise Labor Force and Unemployment Data from Bureau of Labor Statistics for Years 2010 - 2014

Variable	**2010**	**2011**	**2012**	**2013**	**2014**	**Total**
	(N=1,360)	(N=1,356)	(N=1,402)	(N=1,354	(N=1,340)	(N=6,812)
			Mean (St. Dev)			
Labor Force	8,797 (14,854)	8,797 (14,886)	9,051 (15,117)	9,244 (15,523)	9,069 (15,182)	8,992 (15,110)
Employment	8,121 (13,744)	8,149 (13,821)	8,420 (14,089)	8,673 (14,586)	8,595 (14,400)	8,391 (14,128)
Unemployment	676 (1,117)	648 (1,071)	631 (1,034)	571 (942)	475 (789)	601 (1,001)
Unemployment rate (%)	8.73 (2.63)	8.53 (2.63)	8.07 (2.50)	7.22 (2.35)	6.24 (2.26)	7.76 (2.64)

Table 3. Tax Information and Refunds Data from Internal Revenue Service per Zip code for Years 2010 – 2012*

Variable	**2010**	**2011**	**2012**	**Total**
		Mean (St. Dev)		
Unemployment compensation amount	1,154,981 (1,387,299)	930,122 (1,128,331)	779,737 (937,348)	955,289 (1,174,994)
Taxable income amount	57,322,274 (87,281,708)	58,619,850 (90,079,340)	63,635,089 (99,608,959)	59,849,846 (92,398,789)
Taxable pensions and annuities amount	6,621,167 (8,789,391)	6,908,160 (9,310,676)	7,422,652 (9,805,312)	6,982,993 (9,306,083)
Number of IRS returns	1,827 (2,504)	1,850 (2,548)	1,866 (2,559)	1,848 (2,535)
Total tax credits amount	732,607 (999,068)	636,856 (901,358)	631,589 (891,493)	667,060 (932,136)
Childcare & dependent tax credits amount	39,648 (65,372)	39,492 (67,306)	40,760 (67,984)	39,964 (66,827)
Taxes paid amount	5,377,293 (9,365,655)	5,480,194 (9,663,309)	5,576,146 (9,938,564)	5,477,674 (9,648,274)
Number of Dependents	935 (1,231)	938 (1,250)	933 (1,241)	935 (1,239)
Business or professional net income amount	3,763,120 (5,307,812)	3,611,285 (5,355,623)	3,722,481 (5,470,000)	3,698,821 (5,372,756)
State or local income taxes amount	3,166,138 (5,586,990)	3,233,574 (5,821,595)	3,298,430 (6,045,901)	3,232,577 (5,814,830)

* - Dollar amounts are deflated using GDP Implicit Price Deflator with base year of 2010

Table 4. Coefficient Estimates of Panel Regression for Three Models

Variable	Model 1	Model 2	Model 3
		Coefficient (St. Error)	
Unemployment rate	0.047 (0.018)***	0.013 (0.012)	0.014 (0.012)
Unemployment compensation amount	- 0.232 (0.114)**	- 0.104 (0.080)	- 0.105 (0.076)
IRS Salaries and Wages	- 0.238 (0.689)	- 0.372 (0.467)	- 0.349 (0.442)
Taxable income amount	0.895 (0.377)**	0.233 (0.253)	0.383 (0.240)
Taxable pensions and annuities amount	0.292 (0.218)	0.169 (0.152)	0.194 (0.143)
Number of IRS returns	1.893 (0.850)**	1.497 (0.595)**	1.265 (0.563)**
Total tax credits amount	0.116 (0.168)	- 0.017 (0.117)	- 0.019 (0.111)
Taxes paid amount	0.578 (0.438)	- 0.047 (0.298)	- 0.021 (0.282)
Number of Dependents	- 1.290 (0.437)***	- 0.497 (0.301)*	- 0.593 (0.285)**
Business or professional net income amount	0.041 (0.087)	0.098 (0.059)*	- 0.080 (0.055)
State or local income taxes amount	- 0.532 (0.348)	0.340 (0.237)	0.279 (0.224)
Jackpot	0.748 (0.256)***	0.325 (0.179)*	0.493 (0.170)***
Trend	- 0.093 (0.046)**	- 0.056 (0.032)*	- 0.072 (0.030)**
Constant	- 23.740 (10.939)**	- 2.354 (7.321)	- 6.043 (6.929)

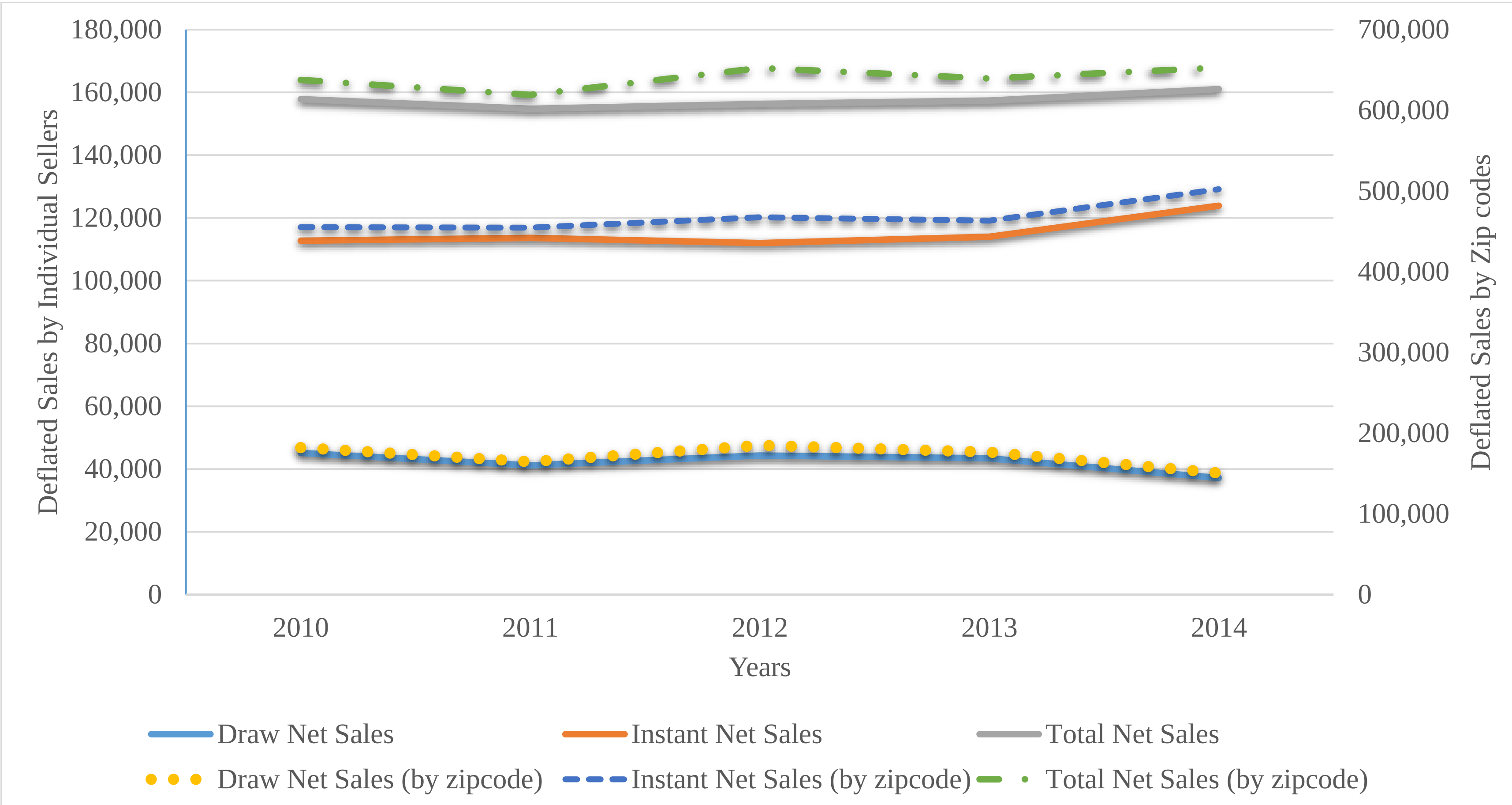

Figure 1: Deflated Gross Net Sales for Years 2010 – 2014

Appendix

Table 5. Lotteries' Deflated Gross Sales Across Stores and Zip Codes for Years 2010 - 2014

Lottery type	**Gross Sales**					
	2010	**2011**	**2012**	**2013**	**2014**	**Total**
	Mean (St. Dev)					
	Across stores					
Draw Lotteries	45,249 (44,967)	41,241 (41,016)	44,388 (43,860)	43,471 (41,719)	37,248 (35,518)	42,346 (41,661)
Instant Lotteries	113,368 (94,278)	114,288 (97,273)	113,137 (97,098)	114,753 (94,534)	124,870 (100,600)	116,043 (96,848)
Total	158,617 (130,644)	155,528 (130,107)	157,525 (133,313)	158,224 (128,800)	162,118 (129,165)	158,389 (130,418)
	Across zip codes					
Draw Lotteries	182,719 (321,657)	164,963 (294,138)	185,253 (325,168)	176,585 (305,125)	150,993 (261,712)	172,153 (302,440)
Instant Lotteries	457,796 (784,309)	457,150 (792,374)	472,181 (804,947)	466,140 (774,858)	506,189 (846,428)	471,762 (800,096)
Total	640,515 (1,100,547)	622,114 (1,080,797)	657,434 (1,124,387)	642,725 (1,074,440)	657,181 (1,102,527)	643,916 (1,095,449)