Education Spending and the Lottery in the Western United States: A Panel Data Analysis

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Abstract:

This paper investigates the relationship between the existence of a state lottery and state education spending. When consumers participate in the lottery, it is often with the assumption that even if they lose, their money will be contributed to state funded programs like education. This study looks at ten states in the west that have a variety of lottery circumstances. Both education expenditure as a percent of total state expenditure and per pupil aid are used to measure education funding. This research also incorporates multiple independent variables to fully capture the determinants of education spending. The results of this study show that the existence of the lottery has no effect on education spending. Consumers should be aware that their participation in the lottery has no positive effect on education and therefore acknowledge that playing is purely for personal satisfaction.

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1.0 INTRODUCTION

For almost a century, state lotteries have become a popular source of thrill and entertainment for the public. Customers may pick numbers and anxiously wait to try their luck or scratch their way to cash winnings. The majority of people will not win any significant prizes and will lose money on these games, but the games are popular regardless; in 2015 alone there was $73.87 Billion in sales of state lotteries (NASPL, 2016). As a state run entity, state governments have control over whether there is a lottery in the state and how the lottery is run. The odds of winning big are minuscule and some states have inefficient systems as can be seen in their payout records. For instance, in Oregon for every dollar spent there is only a twenty-three cent payout on prizes, the rest of the money either goes to administration costs or other state funded programs (Schoen, 2016). Yet, many consumers play with the impression that even if they lose, their money is going to a good cause. The lottery is sold with propaganda that the winnings go to public education funding such as in Virginia where tickets have the slogan, "Help Virginia's Public Schools" (Strauss, 2012). Lottery revenue may go to a variety of sources such as education or social services. Through analyzing the potential effects of the lottery on state funded programs such as education, it can be concluded whether the political community is misinforming consumers as lottery revenue may not have a significant effect on education spending.

The study aims to enhance the understanding of how the lottery effects education funding in the states in the western United States. The western United States is a prime region to do research for the lottery because there is a variety of lottery structures and a variety in how long the lottery has been in existence for these states. From a policy perspective, this analysis is important because policymakers need to be aware of whether

lottery revenue is being used effectively in the education system. If the lottery does have a positive effect on education, states without lotteries should think about adopting them. States with lotteries should also be conscience of the use of lottery income because in times of budget reductions for states, every dollar of revenue, especially lottery revenue that is not a tax, should be used effectively. This is also an important study for consumers because they need to be educated on their spending and truly be informed as to whether they are spending money that eventually will go to education. The relevance of this study is that the lottery is a significant source of revenue and therefore states should be capitalizing on this additional income and putting it towards useful causes like education as they advertise.

Figure 1 shows search results on Google when the term "lottery funds [state name]". These images portray the advertising by states in regards to the positive benefits of the lottery. These images prove that education funding is the main advertised beneficiary of lottery revenue. The top left image for New Mexico reads "Benefitting New Mexico's future. The top middle image from California, gives a visual that informs how 95% of revenue is given back to the community and only 5% of revenue is used for administrative expenses. The Arizona lottery model is 'Arizona Lottery Gives Back', Idaho's Lottery advertising directly refers to giving $700 million to education, the Washington lottery says when you play the lottery "All of Washington Wins", the North Carolina twenty-five year anniversary of the lottery was celebrate with the slogan, "Bigger games, Brighter Futures, More Winning Moments." These images exemplify that it is not just a perception that the lottery is positive for states' education departments, but rather it is a message engrained into the advertising and education surrounding the lottery system. If these lottery

advertisements are correct, then the lottery can be seen as a positive state run program that is increasing funding towards education as sales increase.

Figure 1: Search Results for Lottery Funding Images
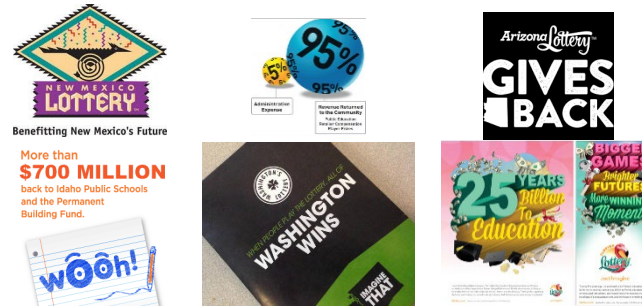
Source: Google Images

When lotteries are enacted, it is often under the pretence that the lottery is being created in part because it will help the state in some way through the use of excess revenue. Many studies are done that decipher the negative social costs of the lottery and count it as a regressive tax. Many conclude that the tax is indeed regressive; those with lower incomes are more likely to participate in the lottery more often than those with higher incomes. The research of this paper is important because regardless of whether the lottery is a regressive tax or not, if the lottery revenue creates a positive impact on education spending, then the lottery may be a worthy source of revenue regardless of who buys is. The negative social effects that occur because of the lottery may be overshadowed by its positive effects on education. Yet if lottery does not have a positive effect on education, then it may in fact have two negative points against it. It will then be a regressive tax and target the poor and also not have a positive effect on education expenditure as advertised.

This study is looking at ten states in the western region because this region includes a number of states who do not have lotteries, states who recently started a lottery, and states that have an established lottery. This is panel data study with ten states ranging from the years 1985-2015. These years were chosen because before 1985, the data is largely unavailable and thirty years accurately captures the necessary information on the lottery.

This paper was guided by three research objectives that differ from other studies: First, it investigates a region of the United States using dynamic panel data; Second, it incorporates a new variable of median house prices to incorporate housing effects on education spending; Third, it uses two different measures for education. There is very little empirical work in the literature that is a recent panel data study. Since more states have adopted lotteries, this study updates this research and provides new variables that could affect education spending. This paper successfully fills the voids in previous studies.

The rest of the paper is organized as follows: Section 2 gives a brief literature review on studies on the lottery. Section 3 outlines the empirical model. Data and methodology are described in detail in Section 4. This section is followed by section 5 which presents and discusses the empirical results of the model. Section 6 closes the paper with a conclusion and final thoughts on this study.

2.0 TREND OF EDUCATION SPENDING AND LOTTERY REVENUE

Figure 2 shows how the needs for education funding in all areas of the United States are increasing. Between 1970 and 2006, the real cost of K-12 Public Education has increased by three times, going from $50,000 to $150,000. The trend is exponentially growing as the needs for educating a student are increasing. This figure also includes the frightening visual that in these thirty-six years, reading, math, and science achievement

scores have remained stagnant. This exemplifies how the need for education funds has increased drastically over this thirty year time period. In order to find ways to improve testing scores in these key areas, states need to invest in education spending so they have the funding to improve their schools and education. The lottery has advertised themselves as a source of funding for education as an avenue to soothe some of the needs that school budgets encounter.

Figure 2: Real Cost of K-12 Public Education and Percentage Change in Achievement of 17-Year-Olds
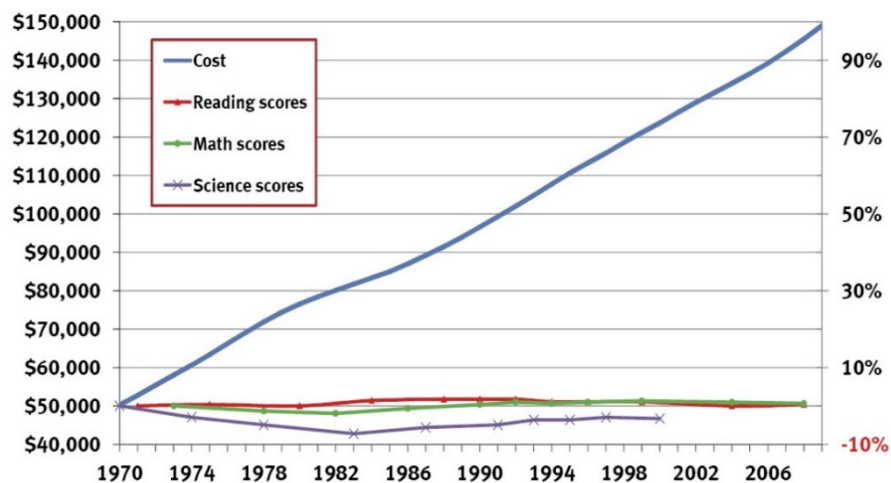

Source: National Center for Education Statistics

Below, Figure 3 shows a broad measure of the movement of the lottery through looking at total lottery sales in billions from 2006-2011. This figure shows that lottery sales increased considerably from 2006-2008 and since then have been slowly increasing during the last three years. This graph captures an important time period because it is during the financial crisis; even when the country was in financial turmoil, lottery sales still showed steady increases. The lottery is increasing in popularity and with more states adding state lotteries in the 2000s the potential for additional revenue to states is rising.

As the lottery increasing in popularity, there needs to be more tracking of funds to make sure that they are allocated in the most efficient way possible.

Figure 3: Total Lottery Sales in the United States (Billions)
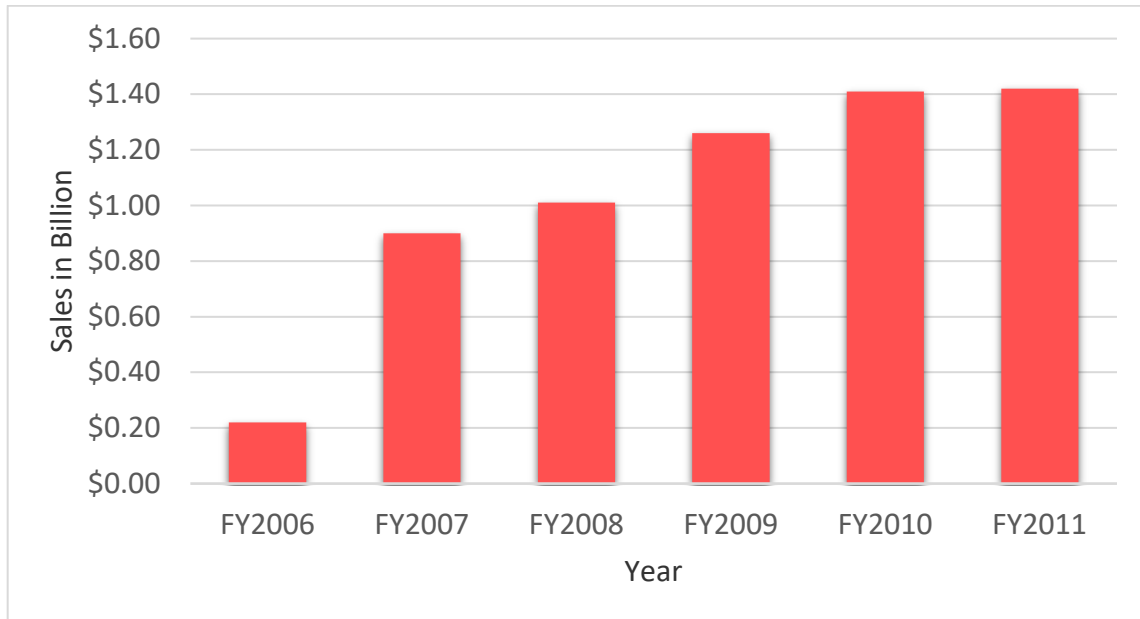
Source: Civitas Institute

Figure 4 shows the distribution of lotteries in the western United States and how many years they have existed. The darker the red on the state, the longer they have had a state lottery. The grey states do not have a state lottery. This graph shows that the distribution of lotteries and their existence varies greatly among this area of the United States. If having a lottery or having an old lottery is a significant factor for education spending, this is a region that is likely to show those results. This region has both old and young lotteries in existence and three states that do not have any lotteries at all. This also shows this is a good time to understand lottery in terms of economic growth. Since some states have been in the lottery industry for a number of years at this point, they can be benchmarks to see how to efficiently run a lottery or what improvements can be made so that funds are effective in helping their advertised cause.

**Figure 4: Lottery Adoption Years in the Western United States**
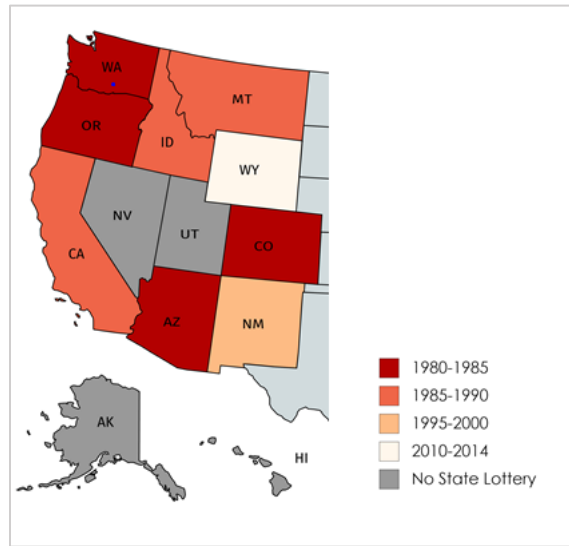
Source: US Census Bureau

Figure 5 is a detailed graph showing the lottery revenue trends for six states in the western United States which is the area of interest for this data set. The graph goes from 1977-2014 and shows the revenue for the state lottery in thousands of dollars. The state of California is a noteworthy component of the graph because since its creation in the early 1980s, the lottery's revenue has grown substantially and is continually to grow off the chart. The other states do not show the same rates with sales stagnating around lower points. Oregon shows a higher rate of revenue than the other states, but does plateau after 2008. This graph shows that there is variation within states when it comes to lottery revenue. It is also important to see that some states such Washington and Colorado have consistently low revenues which may explain why they are able to largely contribute to education.

Figure 5: State and Local Lottery Revenue, Selected Years 1977-2014
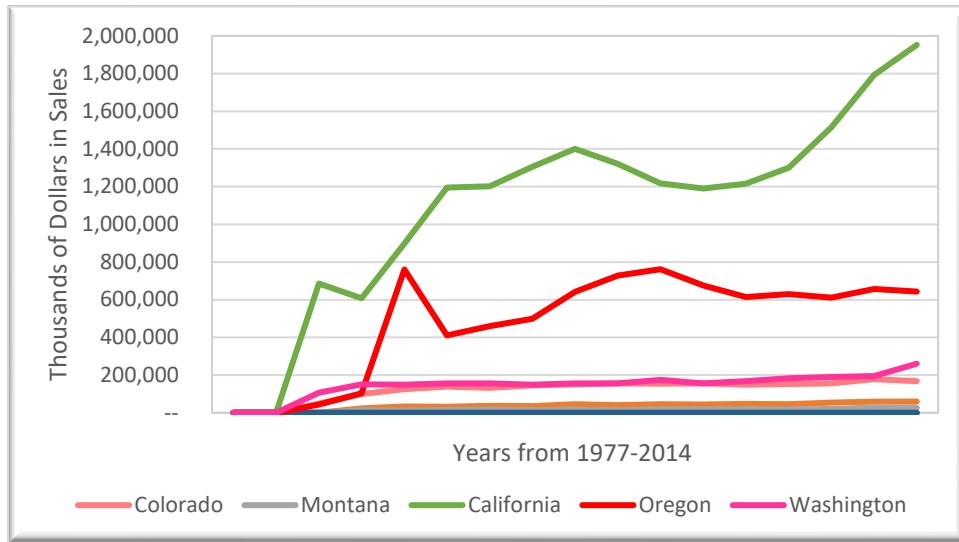
Source: US Census Bureau

3.0 LITERATURE REVIEW

In the 1980s, fiscal issues and education reforms lead to twenty-eight states creating a lottery as new source of income. The lottery had been banned for a period before 1963 when New Hampshire became the first state to adopt it once again as a means for revenue. Research by Clotfelter and Cook (1990) details the administration costs of the lottery, the volume of revenue that state governments have to work with, and types of games offered. States in the west having operating costs that range from 15-30% of sales, which after prize payoffs leads to states with an average of 40% of profit to state run programs (Clotfelter and Cook, 1990). Many state lotteries advertise that the revenue of the lottery goes towards education. State representatives use the claim that lotteries enhance education funding to overshadow the possible negative social effects that occur from gambling. Many studies have investigated the effects of the lottery and education spending. In the work by Jones

(1994), it was concluded that state lottery revenues have no effect on school spending. Lottery funds have no incidence with fiscal spending on education. Jones' study spoke strongly against states rationalizing their lottery implementation through public appeal towards education funding (Jones, 1994). This study is somewhat outdated as it was done in the 1980s and can be updated with new knowledge and a better understand of education spending. Lottery funds only accounted for .715 of general revenues for states with lottery as found in the study by Kearney (2005). This shows that overall, lottery funds make not be a significant factor for education expenditures as a whole.

More recent studies by Garrett (2001), conclude similar results to Jones that lottery revenues that are designated for education have no proven impact on education expenditures. Their paper comments that officials are not being honest when they advertise the lottery as a source of education funding. This study also introduces the important theory of diverting funds; this is the idea that lottery funding does increase overall funding, but instead of increasing education funding, the existing funds are diverted to other sources. Stanley and French (2003) conducted a similar study with comparable methodology that looked how state spending on education was effected by variables such as gross state product, number of students, population, lottery proceeds, and lottery presence. The relationship between the lottery and education spending was not supported by the data in the study and suggests the state is not an efficient operator of the lottery. This study will expand on these studies to add more relevant factors such as median house prices and more specific metrics for the lottery.

Some research (Brady and Pijanowski, 2007) advocate that is it the states' lottery procedures that actually have the power to decide whether the lottery can positively affect

education spending. The North Carolina and South Carolina lotteries are important examples of this because they differ in revenue laws; North Carolina designates the revenue to go to K-12 Education whereas in South Carolina the lottery funds are left to the discretion of the state legislature. A review of lottery adoption factors includes related research on the subject that concludes that economic development, fiscal health, election cycles, political part control and religious diffusion are all factors that occur in the states' decisions for lottery adoption (Coughlin, Garrett, ect. al., 2006). This should be factored in the analysis of this study's results because those states with recently adopted lotteries will have these underlying causes of the lottery's creation.

Some studies use different methodologies that lead them to different conclusion about state lotteries and revenue. Szakmary and Szakmary (1995) introduced a general approach of investigating how much revenue-generating potential state lotteries have by taking into account the volatility of various state revenue streams. Their results contrast much of the results on this subject as they found that between 1981-1985 state lotteries' revenues were significantly increased and the lotteries have little degenerating effect on total state revenues. This study will expand on this research as it will look more specifically on the effects on the education sector. Other research looks at lottery revenue, not only by its effects to education, but also by who benefits the most from the lottery (Rubenstein and Scafidi, 2002). When isolating the Georgia Lottery and its three education programs that funding goes to, Rubenstein and Scafidi (2002) found that lower income homes and white households tend to purchase the lottery more, but receive less of the benefit from the lottery making it a regressive tax. One of the educational programs that the Georgia lottery revenues goes to is a college fund and since high income students are more likely to go to

college, those who spend money on the lottery (lower income homes) do not receive the benefit of their spending. This study also finds that the benefits from these lottery programs are minimal.

4.0 DATA AND EMPIRICAL METHODOLOGY

4.1 Data

The study uses annual data in the form of panel data from 1985 to 2014. Panel data was chosen because changes in education expenditures need to be looked at over time and panel can account for heterogeneity. Data were obtained from the Department of Education, Nelson A. Rockefeller Institute of Government, and the United States Census Bureau. Appendix A provides a summary of the variables used in the study. Summary statistics for the data are provided in Table 1. A notable conclusion from this table is that there are very large standard deviations for median house prices and per capita income. It is also important to see that there is a lot of variation in how many years the lottery has existed in these states. A correlation matrix was used to check for multi-collinearity and make sure this model was within empirical standards.

Table 1 Summary Statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
Median	360	222841.5	152722.4	60251.34	940501.8
PercentState	360	.1825	.14684	0	.49
PCI	360	27882.8	9923.539	11492	56004
LottoState	360	.613889	.4875342	0	1
Educonly	360	.133333	.3404078	0	1
Years	360	9.430556	10.00839	0	33
PerPupilAid	360	6613.336	2455.65	2968	15897

4.2 Empirical Model

Following Jones (1994) and Garett (2001) this study adapted and modified his previous work with a couple key improvements. First, we have renovated this study to update the research to include the past twenty years as numerous state lotteries have been created. We have added multiple metrics to quantify the presence of a lottery to attempt to capture any proof that the lottery could help education spending. We have also added Median House Price as an independent variable. This was added because it would make sense that areas with higher houses prices, would have higher taxes and more wealth and therefore high education funding. House prices have the potential to be a key indicator of education funding.

This study includes two models to fully investigate the effects of this data on education spending. The first model is simple and includes basic variables whereas the second model includes more of the variables to measure lottery funds to see if there is any change in results. Multiple models were used to look deeper into how education expenditure is affected by various measures of lottery presence in a state.

The first model is written as followed:

$PerPupilAid_{it} = B_0 + (B_1)PCI_{it} + (B_2)LottoState_{it} + (B_3)Median_{it} + c$ **(1)**

$PerPupilAid_{it}$ is the dependent variable in both of these models. It represents how much money the state funds for each student in elementary and secondary school in state i at fiscal year t. This includes all students from pre-kinder care to grade twelve 12 in high school in public schools. This dollar amount captures instructional costs as well as support activities, guidance counselors, administration, transportation, and food services (Moore, 2016). If lottery funds are being given towards educations, this variable will surely capture

the majority of this funding. This variable is also used as the dependent variable in the study by Jones (1994).

The independent variables of this model are Per Capita Income, Lottery in the State, and Median House Price. Appendix A and B provide data source, acronyms, descriptions, expected signs and justification for all variables that are included in this study. This first model is the simpler of the two because it only includes the basic metrics to see if which has an effect on education spending in the form of per pupil aid. PCI_{it} (per capita income of state i at year t) is the state's per capita income with adjusted dollars and represents the general wealth of a given state. Second, $LottoState_{it}$ is a dummy variable that quantifies whether there is a lottery in that given state, i, in year t. Third, $Median_{it}$ is the median house price in each given state, i, for year t, which may capture some of the spending trends because those states with higher housing prices will have more education spending.

The second model is written as followed:

$$PerPupilAid_{it} = B_0 + (B_1)PCI_{it} + (B_2)EducOnly_{it} + (B_3)Median_{it} + (B_4)Years_{it} + c \qquad \textbf{(2)}$$

This model has the same dependent variable and still includes median house price and per capita income, but adds Lottery Funds to Education and Years Lottery has Existed. $Years_{it}$ not only captures the presence of a lottery in the state, but also includes how long the lottery has been present which adds depth to this model. $EducOnly_{it}$ entails what percent of lottery revenue goes to education. This is an interesting variable to add because some states have more efficient administrations and therefore are able to give more money to their state

funds. This variable may capture whether it is successful lottery procedures that may affect education spending.

5.0 EMPIRICAL RESULTS

The empirical estimation results are presented in Table 2 and Table 3 for each respective model.

Table 2: Regression results for the Western United States Model 1

	Per Pupil Education Spending		
	OLS Model	Fixed Effects Model	Random Effects Model
Lottery in State	-184.9 (-0.75)	-174.5 (-0.67)	-184.9 (-0.75)
Per Capita Income	0.149*** (18.90)	0.149*** (18.56)	0.149*** (18.90)
Median House Price	0.00317*** (4.37)	0.00316*** (4.26)	0.00317*** (4.37)
_cons	703.8 (1.72)	698.4*** (3.58)	703.8 (1.72)
N	360	360	360
R^2	.7585	.7575	.7534

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Note: *** , **, and * denotes significance at the 1%, 5%, and 10% respectively.   Standard errors in parentheses

This model was run using OLS, Random Effects, and Fixed Effects. After conducting the Hausman test, the results were fail to reject the null hypothesis and the random effects model was proved to be most appropriate, indicated by the p-value being greater than 0.05. Per Capita Income and Median House Price were both significant at the highest level of one percent. The coefficient of all of these were positive which was as predicted, yet the coefficients were relatively small. For instance, for every dollar increase in per capita income, per pupil state aid will increase by 15 cents. For every dollar increase in median house price, per pupil state aid will increase by .3 cents; this is a very small coefficient. The higher the per capita income of a state, the higher the per pupil state aid; this is also true for median house prices. This indicates that the best predictor of education wellness, is the wealth of the state. The coefficients for both of these were relatively small as well. The r-squared for this model is .75 which a moderate level of prediction power; this means that 75% of the variation in per pupil state aid can be explained by the model. The r-squared between, which explains the variation in the dependent variable with time concerns without concerns for cross-sectional data, in the model is .765 which is also a moderate level of prediction. Lottery in the State was insignificant to Per Pupil Aid. This is consistent with the results of Jones (1994). Interpreting these results concludes that the lottery is not a factor of education spending. The lottery in a state did have a negative coefficient which would be consistent with previous information, if it was significant.

Table 3: Regression results for the Western United States Model 2

	OLS Model	Fixed Effects Model	Random Effects Model
Per Pupil Education Spending			
Education Only	778.9** (3.07)	840.5** (3.21)	778.9** (3.07)
Per Capita Income	0.234*** (25.50)	0.234*** (25.13)	0.234*** (25.50)
Median House Price	0.00113 (1.94)	0.00120* (2.03)	0.00113 (1.94)
Years Lottery Has Existed	-57.41*** (-6.54)	-58.62*** (-6.54)	-57.41*** (-6.54)
_cons	26.29 (0.72)	255.4 (1.83)	262.9 (0.72)
N	360	360	360
R²	.7585	.7575	.7534

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Note: *** , **, and * denotes significance at the 1%, 5%, and 10% respectively. Standard errors in parentheses

The results of this model differ slightly from the first model. The Hausman test concluded again that random effects should be used for this model. In this model, the number of years the lottery has existed is statistically significant to the model at the highest level of significance. The sign is not as expected, as it is negative. For every year the lottery has existed, it is predicted that education spending will go down by 57.41 dollars. This may be suggesting that lotteries dilute money from going to education; it may also suggest that the longer a lottery has been around, the less efficiently it is run. Per capita income was

statistically significant at the highest level with is consistent in both models. This suggests that it is places with higher incomes that have better education funding, not those with lotteries. This coefficient was positive as expected and suggests that for every one dollar increase in per capita income, per pupil state aid increases by 23 cents. Median house price was not significant in this model. Education only was statistically significant at the 5% level and had a positive coefficient. This does make sense with previous research because lotteries that give their funding purely to education would have the largest possible effect on education funding. Interpreting these results gives proof that going deeper into the logistics of the lottery can produce different results. Though these results do not prove the lottery is correlated to education funding, it does start to give proof that the structure of the lottery such as whether the money is given to education only, may be a factor to how efficient the lottery is being run. From looking at these two models, it is apparent that the first model is more accurate at understanding what effects education spending.

5.0 CONCLUSION

These models support the background information covered in previous studies. Lotteries do not have an impact on education spending. Broader factors like median house price and per capita income are far more likely to have correlations to per pupil spending than lottery metrics. The second model did have slightly conflicting results, but all point to the fact that the lottery has no effect on education spending and if there is a chance that is has a minimal effect, that effect would most likely be a negative one. There are limitations to this research because lottery data is difficult to find over a long range of time. More lottery data, varying measures of education spending, and more state-specific metrics could be added to this research to make it stronger and fully investigate the lottery's effect on

state funding. This work could be improved by incorporating all forms of gambling including casinos. The lottery is an important subject to study because not only is it a national pastime that millions participate in, but it is a chance for states to increase their budget without taxing the public. State lottery programs could have direct, strong relationships with school systems to make sure revenue is positively impacting education. Yet, instead of a lottery and school partnership, lottery revenue is going to waste under the watch of state officials. This misallocation of revenue should be further explored in research.

A note for this study is that further research uncovered a theory of diverting funds. This research suggested that lottery revenue may in fact be used for education, but the education funding that previously existed is then moved to another location such as infrastructure or welfare and therefore it appears that the lottery is not helping education at all, when it really does have a positive effect. This theory should be furthered researched as well. If this theory is true, then states are not exactly lying to the public, but rather being incredibly sneaky in the allocation of state funds. In the spirit of democracy, it would be the most appropriate that citizens that are spending this money on the lottery have the ability to choose what state programs are given lottery revenue. If consumers are spending money on a state run program, they should be able to see the benefits in their expenditure somewhere in programs by the state.

The results of this model are important for policymakers. The lottery should not be falsely advertised as an education booster. States are essentially lying to their citizens when they say that spending on the lottery is helping schools. The lottery may be a way that state governments reallocate resources because it is easier for people to support a lottery, than a

government run tax or fundraiser. Lottery funds also do not just go towards education which is misleading because the lottery is often advertised a partner of the education system. To conclude, if lotteries are not allocated for their intended use, then the lottery becomes a regressive tax. Negative social costs are increase because it is often those in lower classes that are participating in the lottery. Since they are not receiving the positive benefit that is advertised in the form of education spending, there are generally limited benefits for anyone to play the lottery other than education. The lottery includes a flurry of excitement, hope, and thrill, but consumers should not be confused as not only are the odds against them in winning, but the odds are also against that they will ever see the return on their spending for the students in their state.

Appendix A: Variable Description and Data Source

Acronym	Variable	Description	Data source
Years	Lottery Years	Number of Years the Lottery Has Been in Place	Nelson A. Rockefeller Institute of Government
PerPupiAid	Per Pupil State Aid	Per Pupil Amounts for Current Spending on Public Elementary-Secondary School Systems By State	Department of Education
EducOnly	Education Only	Does the Lottery Revenue Only Go to Education 1 if Yes	Nelson A. Rockefeller Institute of Government
LottoEduc	Lottery Funds to Education	Does Lottery Income go to Education, 1 if Yes	Nelson A. Rockefeller Institute of Government
LottoState	Lottery In State	Is there a Lottery in the State, 1 if yes	Nelson A. Rockefeller Institute of Government
PCI	Per Capita Income	Per Capita Income for Each State	US Census Bureau
PercentRev	Percent of Revenue to the State	Percent of Lottery Revenue Given to State (2015)	Nelson A. Rockefeller Institute of Government
Median	Median House Price	Median House Price, Adjusted Dollars	US Census Bureau

Appendix B- Variables and Expected Signs

Acronym	Variable	What it Captures	Expected Sign
Years	Lottery Years	History of Lottery, More Years more efficient and better run	+
EducOnly	Education Only	Does lottery funding just go to education or does it go to other funds like parks and recreation or infrastructure	+/-
EducOnly	Lottery Funds to Education	Do the lottery funds go to education, a couple states do not have funding towards education from the lottery	+
LottoState	Lottery In State	Is there a Lottery in the State and does that help education	+/-
PCI	Per Capita Income	Per Capita Income for Each State	+
PercentRev	Percent of Revenue to the State	Percent of the revenue given to the state to distribute to funding such as education spending	+/-
Median	Median House Price	House price of the area, high house prices may lead to better education environments	+

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