

Where the money goes: The role of funding allocation in lottery markets

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Abstract

A key characteristic of state-authorized lotteries is that they are required by law or through their licenses to make payments to society (in the form of taxes paid to the treasury, duties, funds to sports, or funds for other good causes). So state lotteries serve to some extent as a public finance tool. This paper aims to study how lottery markets around the world respond to different funding allocation strategies, but also how lottery sales respond to the macroeconomy. These are crucial issues to enable these markets to confront future challenges and to maintain lottery payments for society. Consequently, an economic-related approach is taken to investigate the role of funding allocation in lottery markets from an international perspective using panel data information from *The WLA Global Lottery Data Compendium*. The empirical findings show a negative relationship between lottery sales and financial contributions to society. However, relevant differences exist depending on the funding strategy adopted, and a positive link between sales revenue and allocating funds to education or social purposes is observed. Overall, it is found that lottery is a normal good and as an implicit tax, regressive.

Keywords: lottery markets, demand, funding allocation, good causes, international comparison.

Introduction

Lottery is probably the most popular state licensed and controlled gambling product. The worldwide market for lottery includes a huge number of countries and jurisdictions where operators provide this gambling product to the public in different regulated environments.

A fundamental characteristic of state lotteries – and the key difference to the commercial gambling industry – is that gambling products (lotteries, sports betting, etc.) are operated for the public benefit. Accordingly, the state lotteries' proceeds are used for the benefit of society as a whole rather than being a source of private profit. Thus, governments argue that authorized lotteries promote social welfare and are morally appropriate (Miller and Pierce, 1997).

Therefore, the introduction of lotteries in the gambling market is in line with the public's interest in them as an alternative method for the government to raise new revenue without raising taxes. Governments have, consequently, authorized lotteries primarily as a means of generating non-tax revenues which are often allocated to particular public purposes, usually including education, sports, social causes, etc., or directly to the treasury with no assigned allotment. Thus, a common strategy to support state lotteries has been to allocate a share of lottery profits to a particular public service program. As a result, over 100 countries and 200 jurisdictions worldwide have recourse to lotteries for raising general revenues to help public finance or specific purposes (Ariyabuddhiphongs, 2011; Pérez and Humphreys, 2013).

Based on this public interest argument, these markets are strongly regulated and even sometimes operated under a public monopoly structure. Their success in terms of sales, and therefore the revenue they generate, is backed by the supply of long-odds gambling products which offer appealing life-changing prizes.

For the use of lotteries as a public finance tool¹, operators must be authorized to provide gaming services by the corresponding public authority, with the objective to meet the demand for lottery in a responsible and regulated manner. In addition, as an act of social responsibility, they are required to make mandatory financial contributions to society (funding specific good causes or allocating money directly to the public treasury). On average, a state licensed lottery gives back to society as mandatory payments – as opposed to and not including sponsorships, but including taxes and other charges – 29% of revenue sales and some even return almost 70%.²

This paper aims to better understand the role that funding allocation plays in terms of the demand for lottery under different regulatory environments³. The long-term issue to be addressed would be the ability of the state lottery model to generate revenue for public purposes. This could be considered a relevant topic in the field of public finance and the economics of lottery markets. In addition, whether a lottery is linked to a particular public purpose is not just potentially important for sales, but it may also be relevant in convincing the government or society to support the introduction of such a lottery in the gambling market.

At the same time, attention will be paid to the macro-determinants of the (aggregate) demand for lottery providing a worldwide comparison of the way in which lottery sales respond to the macroeconomy and even an international inquiry about different allocation strategies of the money raised by lottery. In particular, the income elasticity of lottery, i.e., the change in lottery sales associated with a change in income, is of interest for several reasons. First, income is one of the key determinants of lottery expenditure, and understanding the determinants of lottery expenditure is important because of the extreme popularity of lottery and the high level of purchase involvement in countries around the world (normally a positive relationship between consumers' income and the demand for lottery is observed). Second, critics of government sponsored lotteries frequently claim that low-income individuals purchase a disproportionate number of lottery tickets, adding additional emphasis to research on the relationship between income and lottery spending (Perez and Humphreys, 2011).

The paper is organized as follows: the following section briefly analyzes the previous literature in the field, highlighting the most relevant studies. Next, the data collection and database is reported. Then, the empirical model and the methodological approach are described. The paper ends by discussing the empirical findings and drawing some concluding remarks from them.

¹ The use of lotteries as a public finance tool remains controversial. Those opposed to the use of lotteries have based their objections on issues such as the regressivity of lottery tax as well as moral considerations (Skidmore and Tosun, 2008). On the other hand, lottery supporters use the good causes and funding allocation argument.

² The Swedish operator, *AB Svenska Spel*, allocated on average 60% of sales revenue to public purposes during the sample period. This figure increased to 69.32% in 2014. In any case, it should be noted that this includes not only the funding allocating to either good causes or the public treasury, but also taxes and other mandatory payments.

³ As public policy is often affected by historical, cultural, and local political factors, as authorized-lottery markets proliferate, regulatory issues will continue to be treated differently in each jurisdiction.

A brief review of previous literature

While Garrett (2001a) and Matheson and Grote (2009) provide cross-country studies of lotteries, very little work has been done comparing lottery demand, structures, and funding allocation models among different jurisdictions worldwide. Most of the studies published to date on lotteries have been made at either a national or state (regional) level. And this is also the case for the branch of studies devoted to analyzing the allocation strategies for lottery revenues, including Mikesell and Zorn (1986), Borg and Mason (1990), Garrett (2001b), Rubenstein et al. (2002), Landry and Price (2007), Pantuosco et al. (2007), Hedenus (2014), and Jones (2015), among others.

Even though some empirical evidence supporting the beneficial application of lotteries could be found, as in Morgan and Sefton (2000) and Lange et al. (2007), there is a limited empirical literature analyzing the relationship between funding allocation and lottery sales at the country level.

In any case, although there seems to be a consensus that the allocation of lottery funds to society does not exclude any of the fundamental theories about why people buy lottery tickets (expected utility maximization (Friedman and Savage, 1948), prospect theory (Kahneman and Tversky, 1979), or Conlisk (1993)'s utility of gambling), it could clearly be complementary to them. Therefore, it would be possible for people to support the introduction of a lottery and even to acquire some additional utility in buying lottery tickets if they knew that a portion of the price would be allocated to a specific public purpose, even if the ticket purchased does not win any prize. The utility of the game will increase for an individual who buys lottery tickets considering that part of the funds will go to charitable causes and/or revert back in the form of payments to society, generating an increase in the demand for lottery tickets.

Some previous papers in the literature seem to support this thesis. Stivender et al. (2016) deduce that if individuals value the contributions made by the lottery, they are more likely to buy lottery tickets as an indirect contribution to public finances. Thus, under this assumption, participation in the lottery market could be understood as a function of the (perceived) use of funds. Under this framework, funding allocation would serve as a strategy, not only to differentiate the monetary prize as a special type of money (Hedenus, 2014), but also to influence the aggregate demand for lottery money. If that is the case, there should be statistically significant differences among different funding allocation systems and countries.

From the other market perspective, that of supply, operators, being cognizant of the preferences of lottery buyers, will allocate more (or less) funds to society in an attempt to maximize their profits, trying to choose the best strategy to boost their sales. Funding allocation can therefore be considered a successful marketing strategy that goes beyond an act of solidarity.

Data sample

Information on worldwide lottery markets have been obtained for the years 2013 to 2017 from *The WLA Global Lottery Data Compendium*, an annual review of the lottery industry based on data from the World Lottery Association (WLA) members. It reports detailed information about lottery markets including all types of lottery games sales, funding allocation, regulations, etc.

The lottery sales data were restricted to national lottery operators that have reported their figures to the WLA during the sample period. Regional/state operators have been excluded because their area of activity is not well specified or because of a lack of macroeconomic information. Similarly, US lottery operators were not included for data availability reasons. In addition, some operators do not declare any allocation of lottery revenue and therefore the final use of these funds is not reflected in the WLA Compendium and thus in the data used here. So the baseline sample set consists of a balanced panel of 61 nationwide lottery operators, from 54 different countries, observed over 5 years.

Table 1 summarizes relevant figures per global region from the lottery markets (operators and countries) considered. Some interesting facts can be observed. First, during the sample period (2013-2017), lottery ticket sales account on average for at least 0.44% of each country's GDP, reaching 1% of Asian countries GDP. Second, in terms of per capita lottery sales, different groups of regions can be observed: African countries median expenditure is slightly over 12 USD per capita; in both Latin America and Asia median per capita sales are close to 25 USD; a third group includes Europe, whose population median spending in lottery tickets is more than 90 USD; finally, New Zealand lottery market median per capita sales exceed 140 USD.

(INSERT TABLE 1 AROUND HERE)

As mentioned, the WLA data provide full information on how each operator allocates lottery revenue (public treasury, good causes...). In particular, the report distinguishes between funds that go directly to the public treasury (sometimes called "cash for treasury"), from where they are distributed to different purposes, and those allocated to specific good causes. In the 2013 to 2017 period, the 61 WLA operators analyzed here raised over 80,000 million 2011 USD in money for good causes.

Good causes are classified into five categories: culture – revenue from lottery funds that support projects in the field of culture and heritage; education – money returned to society in the form of payments for educational purposes; social activities – donating revenue from lottery to charitable causes and other social activities; sport – payments made in support of sport; and "other good causes" – covers compulsory payments to society that are specifically allocated to good causes other than education, culture, social activities and sport, such as the environment, healthcare and other public services or facilities.

Table 2 shows the (average) proportion of sales and (average) per capita Euros allocated to each of the two main uses of lottery funds (public treasury and good causes) by operator's country location (world region). In addition, this information is also presented for the five previously mentioned good causes categories.

Through the sample period, lottery operators worldwide allocated (on average) 7.43% of lottery sales revenue to good causes, while this percentage was 10.86% in the case of the revenue share that went directly to the public treasury. So, just over 11 USD per capita in the former case and 30 USD per capita in the latter.

(INSERT TABLE 2 AROUND HERE)

With the exception of New Zealand, lottery operators in the sample opted for both funding allocation strategies (public treasury and good causes). However, differences among funding allocation policies by operator's location can be derived from Table 2. In Africa, Asia, Europe, and Oceania, the highest percentage of money from the lottery goes directly to the public treasury, over 40 USD per capita in Oceania, and 83 USD per capita in Asia. This can be explained by the huge amount of payments to the treasury made by the Hong Kong operator, *HKJC Lotteries Limited* (more than 400 USD per capita per year). African operators allocate the smallest percentage of lottery proceeds to payments to society. Most operators in Latin America opt to use the lottery funds for some specific good cause, accounting for more than 9% of sales revenue.

In terms of the five good causes categories in this study, just over 4.5% of lottery sales worldwide go to "other causes." This can be explained by lottery operators in Latin America allocating a large proportion of funds to this particular use: for every citizen in the considered countries, 2.95 USD from the lottery are allocated to payments to society, such as the environment, healthcare, and other public services or facilities. Turning to other specific good causes, it can be noted that in the case of Asian and European operators, the money from the lottery basically goes to support sport and social activities, whereas in Latin America operators also opt to finance education with lottery money.

Empirical model

Methodology

This paper adopts an economic approach to investigate the role funding allocation plays within the state-authorized lottery model in different regions of the world under different regulatory environments. Aggregate data on lottery sales, population (market size), and some macroeconomic variables, including income (GDP) and domestic credit to the private sector (% of GDP)⁴, are used to analyze the international distribution of the money raised by lotteries. Specifically, the empirical approach focuses on estimating an aggregate demand function for lotteries but controlling for the alternative ways in which lottery funds are allocated. The available information has a panel data structure which allows observing the previous mentioned variables at the country level for the 2013-2017 period.

Although aggregate data can certainly be used to study changes in market demand due to changes in, say, market size and income, a critique of this analysis would be that using country-level data to make inferences about individual behavior would assume that all consumers within a jurisdiction have identical preferences.

In any case, empirical estimation of aggregate demand functions is quite common in the literature that examines the demand for state-lottery tickets (e.g., Mikesell, 1989; Cook and Clotfelter, 1993; Hansen, 1995; Price and Novak, 1999, 2000; Tosun and Skidmore, 2004; Garrett and Coughlin, 2009; Ghent and Grant, 2010) – these studies are only a few examples of the work done in the area of state-lottery demand; see Grote and Matheson (2011) and Perez and Humphreys (2013) for additional studies and further discussion. However, apart from Garret (2001a), there is a lack of studies in the field of international lotteries at a country level and from an international perspective.

⁴ This data has been obtained from *World Bank Open Data* – <https://data.worldbank.org/>.

Model specification and variables

The baseline panel data model to estimate is described in Equation 1,

$$y_{it} = f(x_{jt}, z_{it}, w_j) \quad (1)$$

where lottery sales revenue for operator i in year t (y_{it}), is described as a function of macroeconomic and market variables in year t for the country j in which operator i operates (x_{jt}), a vector of lottery characteristics (percentage of sales allocated to society – either in the form of payments to the treasury or good causes funding – and the existence of competing operators) including a dichotomous indicator that controls for the different funding allocation strategies (z_{it}), and a set of categorical variables that stand for the world region in which country j is (w_j). Subscript t accounts for years 2013 to 2014.

Each country's GDP and population are included in the specification to control for the income effects and the size of the market, respectively. Also, each country's domestic credit to the private sector (% of GDP) is considered to control whether observed differences can be explained by financial reasons. This refers to financial resources provided to the private sector (including consumers) by financial corporations, such as through loans and trade credits. The demand for lottery could be correlated with recourse to credit, since the costs of purchasing a car, a house, or a university education are beyond the regular income of consumers unless the money is obtained by credit. The lottery can be then understood as a fickle form of finance to afford such indivisibility expenses (Kwang, 1965). There are changing economic and demographic conditions among countries. Lottery sales revenue and income (GDP) were deflated by each country consumer price index to transform them in real terms. Consequently, these two variables are measured in 2011 USD.

Results

Funding allocation and good causes strategies

Table 3 shows the estimated coefficients by random-effects model⁵ for Equation 1, where each model specification differs only in the good causes indicator considered, in order to analyze whether there is any significant relationship between lottery sales and the allocation made to any of the specific good causes described earlier in the paper. So, in the first column, the dichotomous variable that controls for the different funding allocation strategies among the good causes categories considered (*good causes indicator*) takes value 1 if the operator allocates funding to culture and 0 otherwise. Similarly, for columns 2 to 5, the good causes indicator accounts for the other categories (education, social, sport, other). A set of lottery characteristics is also included in the specification counting for the existence of competing operators and the percentage of sales revenue devoted to public accounts (society).

Given the functional form chosen for the demand equation, the estimated coefficient of the economic variables in natural logarithm form could be directly interpreted as short-run elasticities.

⁵ In order to determine whether the panel data model is fixed effects or random effects, a Hausman (1978) specification test is performed suggesting the use of random effects is appropriate.

(INSERT TABLE 3 AROUND HERE)

The results in Table 3 indicate that allocating funds to education or social activities are correlated with greater lottery sales. All other possible uses of the money from the lottery do not appear to have a statistically significant effect on sales.

In particular, per capita lottery expenditures are approximately 15% higher for those operators that allocate lottery proceeds to education. And it rises to over 17% in the case of donating revenue from lottery to charitable causes and other social activities. However, a negative correlation can be observed between the percentage of sales allocated to public accounts (payments to the treasury and good causes funding) and the lottery sales achieved. As expected, the existence of competing operators in the same jurisdiction negatively impacts each operator's sales revenue, but this effect is significantly weak.

Combined, these results suggest that in terms of lottery sales it is (positively) important what the funds are allocated to (specific purpose) and (negatively) how much of sales are assigned (in general) to make payments to society. The latter can be easily explained by the fact that the amount of money allocated to any purpose is removed from the amount of money that goes into the prize pool negatively affecting lottery demand. In any case, following Landry and Price (2007), if the sole motivation for lottery play was the opportunity of winning a prize, per capita expenditures should be independent of the designation of proceeds allocated to a particular public service program. This could even be used as an argument in favor of the lottery.

Although we aim to assess the effects of funding allocation and good causes strategies in worldwide lottery markets, we also comment on the results of the control variables included in all model specifications in Table 3. Since the model we are estimating corresponds to a demand equation, we included, as previously alluded to, a proxy for income at the country level (GDP) and a variable capturing the size of the market (population), both having geographical and time variation.

The results for all the considered specifications indicate a positive and significant effect for the income variable, identifying the lottery as a normal good. In addition, the estimated income elasticities below the value of one show, as in Clotfelter and Cook (1990), that sales revenues increase less than proportionately with income (GDP), which makes lottery, as an implicit tax, regressive. With respect to the population variable, a non-significant negative effect of the market size is obtained.⁶

Finally, a positive correlation is found between lottery sales and credit to the private sector as a percentage of GDP. In those jurisdictions with higher recourse to credit, it appears that the demand for lottery tickets is greater, confirming that lottery is perceived as an alternative financial resource.

Robustness test

Given the correlational nature of the data and likelihood of endogeneity, some correlation and collinearity diagnostic measures were computed. First, no correlation coefficient between a particular good cause indicator and the other control variables was found to be statistically significant at the 5% level after Bonferroni adjustment. Second, an analysis

⁶ It should be pointed out that part of the geographical variability of the population is captured by the world region dummies.

of the variance inflation factors (VIF) showed there is no evidence of multicollinearity. Finally, following Davidson and MacKinnon (1993) a Durbin-Wu-Hausman test for endogeneity was performed suggesting consistency of the model specifications.

Limitations

When interpreting the results of this paper, it must be noted that the use of aggregate data leads to assume that lottery sales response to funding allocation is the same for all individuals, so heterogeneity among people in the same jurisdiction is not taken into account. This is a weakness of this study that must be mentioned.

Concluding remarks

This paper attempts to contribute to the study of the aggregate behavior of lottery players worldwide. First, the empirical results reached confirm that lottery can be understood as a fickle form of finance to afford indivisibility expenses and that there are differences in lottery consumption among world regions. Additionally, the adopted allocation strategy of lottery funds to a particular public purpose (good cause) may, in some cases, affect the demand for lottery. Finally, it empirically shows that lottery is a normal good and as an implicit tax, regressive.

In particular, the empirical results suggest that per capita lottery expenditures are greater when lottery proceeds are allocated to either education or social activities. However, there seems to be a negative relationship between the money that goes to public purposes and the level of lottery sales. This may be explained by the fact that people do positively perceive the final destination of the money but are concerned about the amount – since the amount of money allocated to any public purpose is removed from the amount of money devoted to prizes.

Important policy recommendations that can be derived from this outcome would be that linking the lottery to a particular public purpose could serve as an argument to convince the government or society of supporting either its introduction or operation, and that perhaps lottery operators should invest more in marketing the end-use of the payments they make to society. In any case, a full explanation of the causal mechanism between aggregate lottery demand and the use of payments to society is still needed.

However, this paper offers a further step in the literature of state lottery markets as it helps to better understand the role that funding allocation plays in terms of the demand for lottery. It is also hoped that it serves as a guide for lottery researchers, regulators, and/or policymakers and legislators around the world, as it raises questions about the international distribution of lottery revenue and the implications of payments made to society.

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Table 1. International comparison of lottery markets by world region (2013-2017).

	Africa	Asia	Europe	Latin America	Oceania	Global
# countries	7 ^a	9 ^b	29 ^c	8 ^d	1 ^e	54
Median GDP (million 2011 USD)	26,418	710,951	229,211	256,937	159,666	231,825
# lottery operators ^f	8	11	33	8	1	61
Median sales (million 2011 USD)	211	2,026	614	396	678	578
Sales/GDP	0.77%	1.01%	0.54%	0.46%	0.44%	0.64%
Median (<i>per capita</i>) sales (2011 USD)	12.71	26.90	92.33	24.55	145.42	54.15

Notes: ^a Burkina Faso, D.R. of the Congo, Ghana, Morocco, Mauritania, Niger and Togo. ^b China, Hong Kong SAR, India, Israel, Japan, Lebanon, Philippines, Thailand and Sri Lanka. ^c Austria, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, France, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Malta, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Turkey and United Kingdom. ^d Brazil, Chile, Ecuador, Mexico, Panama, Peru, Trinidad and Tobago and Saint Lucia. ^e New Zealand. ^f Countries with two nationwide lottery operators include: Denmark, Italy, Spain, Sweden, Morocco, China and Japan.

Table 2. Different funding allocation strategies (2013-2017).

		Africa	Asia	Europe	Latin America	Oceania	Global
# lottery operators allocating lottery revenue directly to the public treasury		3-4	6-7	24-27	4-5	1	39-42
Public treasury	Sales proportion	4.11%	10.01%	13.51%	5.73%	27.80%	10.86%
	<i>per capita</i> USD	1.28	83.41	23.68	17.27	42.07	30.07
# lottery operators declaring specific allocation of lottery funds		3-4	6	25-27	4-5	-	38-42
Good causes (total)	Sales proportion	0.59%	6.10%	9.30%	9.33%	-	7.43%
	<i>per capita</i> USD	0.21	4.10	15.84	6.78	-	11.68
Culture	Sales proportion	0.04%	0.02%	0.68%	0.31%	-	0.64%
	<i>per capita</i> USD	0.01	0.03	2.95	0.53	-	2.09
Education	Sales proportion	0.08%	0.07%	0.06%	0.99%	-	0.29%
	<i>per capita</i> USD	0.06	0.11	0.29	1.17	-	0.39
Social	Sales proportion	0.20%	0.63%	1.96%	0.05%	-	1.84%
	<i>per capita</i> USD	0.07	0.44	9.22	0.80	-	5.14
Sport	Sales proportion	0.05%	3.59%	2.77%	2.42%	-	3.77%
	<i>per capita</i> USD	0.03	3.78	7.93	4.31	-	6.16
Other causes	Sales proportion	0.20%	1.77%	3.68%	5.32%	-	4.62%
	<i>per capita</i> USD	0.13	1.21	9.07	2.95	-	6.29

Note: It should be noted that not always the same operators that allocate funds to the treasury do it, at the same time, to a specific good cause.

Table 3. Funding allocation and good causes strategies (2013-2017).
 Dependent variable: *(log) (per capita) Lottery sales*

	Culture (1)	Education (2)	Social (3)	Sport (4)	Other (5)
Good causes indicator	0.021	0.144***	0.162***	0.038	-0.004
% to society	-0.567**	-0.574**	-0.576**	-0.579**	-0.558**
Competing operators	-0.752*	-0.754*	-0.777*	-0.732*	-0.738*
<i>(per capita) GDP</i>	0.894***	0.940***	0.943***	0.891***	0.881***
Population	-0.192	-0.189	-0.189	-0.195	-0.199
Credit to private sector (% GDP)	0.867***	0.861**	0.866**	0.860**	0.868**
Constant	9.777***	9.904***	9.909***	9.822***	9.840***
Year dummies	YES	YES	YES	YES	YES
World region dummies	YES	YES	YES	YES	YES
R ² overall	0.490	0.501	0.497	0.492	0.487
# observations	305	305	305	305	305
# lottery operators	61	61	61	61	61
# time periods	5	5	5	5	5

*Note: * Significant at 10%; ** significant at 5%; ***significant at 1%. (per capita) GDP and population are in natural logarithm form.*