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Testing the Permanent Income Hypothesis using the Spanish Christmas Lottery

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Abstract

The Spanish Christmas Lottery is one of the most common lottery games played in Spain. This paper analyses how local windfall gains from the Christmas Lottery can affect household consumption behavior. We find that there is a significant increase in goods consumption in the winning Regions. More precisely, we find that durable goods are sensitive to lottery winnings, meaning that those households living in the winning Regions of the lottery spend more on this type of goods. Non-durable goods do not seem to react to the income shock, as the estimated effect is inelastic, although the effect is statistically significant. Despite these findings are in line with the theoretical predictions, these results imply a violation of the Permanent Income Hypothesis for long-life goods, as households do not smooth their consumption when a one-time and positive income shock occurs.

Keywords: Consumption, Durable goods, Non-durable goods, Lottery, PIH, Winning Region
JEL Classification: C01, C23, C26, C55, C93, D12 and D14.

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1 Introduction

Research during past years in consumer behavior has focused on how income shocks affect the behavior of individual agents (see Berniell, 2016; Hsieh, 2003; Kuhn et al., 2011). Based on the theoretical economic predictions, agents should smooth consumption by consuming their average income in every period. It would imply that if agents experience a positive income shock, like a windfall, it should act as a buffer-stock: they smooth consumption and save money for future periods where income might be lower (see Adamopoulou and Zizza, 2017 and Berger et al., 2015). This prediction is known as the Permanent Income Hypothesis (PIH) proposed firstly by Milton Friedman in 1957 (see Friedman, 1957). Hall in 1978 tested this Hypothesis, where he found that if agents' consumption is based on all information individuals have in the moment of making the decision, past income and consumption decisions in previous periods should not have an inference in current consumption decisions. However, we should distinguish between positive and negative transitory shocks in income. Making such distinction is important, as agents can behave differently under the different scenarios that a given economy can present.

This paper focuses on windfall effects in income towards household consumption. We consider the exogenous variation in income in local areas that emerge from the payments from the Spanish Christmas Lottery. More precisely, we focus on how lottery winnings from this lottery can affect household consumption behavior. However, there are some facts from the Spanish Christmas Lottery to be considered in this study. Firstly, the prize offers a large shock in income that creates a significant impact in the local economy in the awarded region. On average, this shock increases the GDP of the winning province by 3.5%. This factor implies that winning Regions are richer and thus, have more disposable income to increase consumption. Secondly, the prize does not only belong to one person, it is shared among all those individuals who bought the same lottery number[1], therefore the shock affects more than one household, making the analysis more heterogeneous. Thirdly, around 75% of the Spanish population plays this lottery, implying that ordinary citizens play it, thus, it alleviates disturbances created by gamblers' behavior (see Bermejo et al., 2019). Finally, winners are clustered. This is because the whole series of a lottery ticket are sold almost in one lottery outlet, therefore, it makes easy to locate who are the potential winners and how the winning regions of the lottery behave after receiving the income shock.

[1]This is a syndicate game, where most of individuals share tickets with friends, colleagues or relatives.

The Spanish Christmas Lottery is a natural experiment conducted every Christmas in Spain, where the first prize awards the winner with a total of 400.000€ for each ticket bought. The randomness of the prize makes winners to get an income shock they might not be expecting, as the likelihood of winning is 1 over 100,000. Therefore, the exogeneity and the size of the first prize provide us a good source of research to investigate how households in winning Regions react to it; i.e., whether households increase savings and postpone consumption after experiencing the shock, satisfying the Permanent Income Hypothesis, or simply they spend the money from the lottery income shock. Hence, the research question we are trying to answer in this paper is how the lottery shock affects household consumption in the winning Regions of the Spanish Christmas Lottery. Our underlying hypothesis is that given the size of the shock, the Permanent Income Hypothesis holds and households use the lottery prize to increase savings and use this money for future consumption.

This paper belongs to a growing literature in consumer behavior and changes in demands when agents suffer from an income shock. Despite this is not the first paper that uses the Spanish Christmas lottery as an exogenous shock affecting individuals' behavior (see Bagués and Esteve-Volart, 2016 and Bermejo et al., 2019), it is the first one that uses such income shock to analyze the behavior in consumption in those regions that were awarded with the first prize of the Christmas Lottery. As Garvía (2007) states, this is a particular type of lottery in which it is a social game rather than a gamblers' game. This means that most of the Spanish population takes part in the game, implying that the majority of the Spanish population can be part of the treatment group and experience the lottery shock.

Recent theoretical findings in the behavior of agents towards consumption of durables and non-durable goods when they face a positive income shock lead to a violation of the Permanent Income Hypothesis, but a fulfilling of the Life-Cycle Hypothesis [2]. The later implies that when a windfall effect occurs, consumption for non-durable goods remain stable, and these do not react to positive alterations in income. However, agents spend the money from the shock on durable goods, meaning that durable goods are sensitive to income shocks and respond significantly when there is an unexpected increase in income (see Cerletti and Pijoan-Mas, 2014). Moreover, the fact of receiving a one-time and positive income shock makes agents to anticipate the purchase of durable goods

[2]The Life-Cycle Hypothesis (LCH) concept was first introduced by Franco Modigliani in 1954. This Hypothesis states that individuals smooth their consumption over their lifetime, planning their earnings along their life - borrowing during periods of low income and saving along times of high income (see Deaton, 2005).

instead of waiting until the good becomes obsolete (see Grossman and Laroque, 1990).

Related to this topic, other theoretical studies find that when shocks are positive and unexpected, agents tend to decrease their time discounting and become more impatience towards future consumption, thus, they prefer to consume more in the current period (see Haushofer et al., 2013). On the other hand, if the shock occurs to rich individuals, we should not expect to see many changes in their consumption (see Fagereng et al., 2016). Despite that, changes in income lead to strong responses in consumption and play an important role in household decisions (see Krueger and Perri, 2010). In any case, agents have a larger propensity to consume when they face positive income shocks, however, when the future is uncertain individuals tend to save and postpone their consumption (see Kaplan and Violante, 2014).

Focusing on empirical research based on lottery prizes, very little has been investigated on how the impact of a lottery prize affects households' behavior consumption (only studied for countries like Norway, the Netherlands, United Kingdom and Alaska). As in this paper, previous literature have used a difference-in-difference method to compare household decisions in winning places compared to those who live in non-lottery winning places. In countries like the Netherlands, main findings suggest that agents spend the money from the lottery in durable goods, especially in cars (see Kuhn et al., 2011). Therefore, we can assert that this paper adds to this literature by extending the evidence to the Spanish case and providing results consistent with the Life-Cycle Hypothesis but not with the Permanent Income Hypothesis.

Knowing the particular characteristics of this lottery and the randomness of the shock, we use information on expenditures and the Christmas Lottery first prize at a regional level to identify the effect of a positive income shock on different categories of consumption expenditures. Using a difference-in-difference estimator, we find that the windfall effect caused by the first prize of the Spanish Christmas lottery has a significant impact on households' consumption behavior. On a first instance we find that the effect of the lottery income shock has a positive and statistically significant impact on household total expenditures. This implies that it works as a good instrumental variable set for total expenditures when we estimate the Engel Curves in the second stage regression, as relevance and exogeneity properties for instrumental variables are satisfied. When analyzing the Engel Curves, there is evidence that those households who live in winning regions of the Christmas Lottery increase their consumption in non-durable and durable goods. However, the estimated effect for the aggregate of non-durable goods is inelastic and the effect for durable goods is elastic.

Specifically, we find that households who live in the winning region increase their consumption in durable goods by 11.47%, whereas the estimated increase in consumption for non-durable goods is 9.26%. This implies that non-durable goods are not sensitive to income changes as the estimated effect is below 10% and it is inelastic whereas durable goods respond sensitively to income shocks, as the effect is above 10%. Such findings make that the Permanent Income Hypothesis is not satisfied, as agents do not smooth their consumption and they spend the money from the lottery prize. However, these results are consistent with the Life-Cycle models for consumption, where households adjust their income to durable purchases in time to smooth their consumption (see Browning and Crossley, 2009) and these are also line with the theoretical predictions by Cerletti and Pijoan-Mas (2014).

The paper is structured in six further sections. Section 2 and Section 3, are based on descriptive information about the lottery procedure and data description. Section 4 describes the identification strategy. Section 5 is based on the model we want to study and the methods used to estimate it. In Section 6 we present the estimated results. Finally, Section 7 concludes the paper.

2 The Spanish Christmas Lottery

The Spanish Christmas Lottery (*Lotería de Navidad*) is a national lottery game organized by the National Lottery Organization, which its raffle takes place every 22^{nd} of December, and it is played since 1812. This lottery is the biggest event worldwide. It covers one fifth of the total lottery sales in Spain (see Bermejo et al., 2019). The Christmas Lottery is not a common type of lottery, where one buys the ticket, waits until the raffle occurs and only a few people participate in the game. In this case, around 75% (and increasing) of Spaniards participate on it and one of the most common things is to share tickets with friends, family or work-colleagues (see Bagués and Esteve-Volart, 2016). Therefore, we can assert that this lottery can be considered a social network event rather than a gamblers' event (see Garvía, 2007). To strength this argument, most of the Christmas Lottery players buy tickets only for this lottery and do not play other lotteries held in Spain.

The amount of money spent across the population is more or less the same. On average 64€ are spent by the Spanish population in the Christmas Lottery[3]. According to the survey run by the

[3]The source of this information is *El Economista*

Centre for Sociological Research individuals plan to spend between 40€ and 60€ in 2004, and only around 8% of the sample population planned to spend more than 150€. Each lottery ticket costs 20€ and the whole series (10 tickets) cost 200€. There are also shares and participations that cost between 2€ and 5€ and normally 1€ goes to charity.

From Table 3 in Appendix A, we observe those regions that have been awarded with the first lottery prize, known as *el Gordo* - which in English would be translated as *"the fatty"*[4]. One realizes that prizes are very clustered and it is just some towns that win the lottery every year, being sometimes just one city the awarded one. This is because each lottery outlet has assigned -randomly- the numbers it has to sell. Thus it makes the winner more visible and easier to check whether those winner regions change their consumption behavior. One of the reasons that explain this factor is that the Christmas Lottery is a syndicate game, i.e., people who are in the same network want to play the same number (see Bagués and Esteve-Volart, 2016).

All lottery tickets have five-digit numbers. In total, from 2011 there are 100,000 numbers played in the Christmas Lottery draw[5], including from the 00,000 to 99,999. Each ticket number is split into 160 series, which each of these consist in 10 fractions (known as *décimos*). Each fraction can become into shares or minor units (known as *participaciones*). From all these numbers, a total of 1,807 get a prize; however, the probability that someone wins the lottery is really small, more precisely one has 0.001% chances of winning the first prize, which is 24 times lower than the likelihood of being hit by a car, as professor E. Nualart[6] stated[7]. Table 1 shows how prizes are distributed, the amount of money associated to each fraction bought and the proportion one gets per each euro invested:

Apart from these prizes, if someone's ticket contains the lasts numbers of *the "fatty"*, the individual also gets some amount of money per euro invested in return. Therefore, in total, the 70% of the revenues is dedicated to prizes and the remaining 30% are the commissions that the outlets get from selling the lottery tickets. In addition, if these prizes are higher than 2,500€, then these are taxed with the 20% of the total amount, which goes to the Treasury. This tax was set in 2013. Before the tax appeared, the amount won for the first prize was 300,000€, therefore, for those who

[4]Term that Bagués and Esteve-Volart., (2016) used in their paper to refer to the first prize of the Christmas Lottery.

[5]Until 2004, only 66,000 numbers were played, and between 2005 and 2010 this amount was increased to 85,000.

[6]Universitat Pompeu Fabra, Department of Economics.

[7]http://www.lavanguardia.com/loterias/20161217/412674283722/probabilidades-gordo-loteria-navidad.html

Table 1: Distribution of the Lottery Prizes

Prize	Numbers awarded	Amount won per fraction	Proportion
First prize (*the "fatty"*)	1	4,000,000€	20,000€ per euro
Second prize	1	1,250,000€	6,250€ per euro
Third prize	1	500,000€	2,500€ per euro
Fourth prize	2	200,000€	1,000€ per euro
Fifth prize	8	60,000€	3,000€ per euro
Pedrea	1,974	1,000€	5€ per euro

Source: http://www.abc.es/loteria-de-navidad/premios.html

win the lottery after 2013, even they have to pay taxes, they still win more than before: 320,000€ after tax, which is around 12 times the average Household income (26,730€)[8].

Lastly, there are two exceptional outlets where the Christmas Lottery is sold. The first one is in Madrid and the other one in Sort (a town located in the Province of Lleida): in Madrid, there is a very famous outlet called *doñaManolita*, and the outlet located in Sort (which means "luck" in Catalan) is called *La Bruixa d'Or* (translated from Catalan: "the gold witch"). These two outlets are very famous for selling numbers that during several years have been awarded with high prizes and thus, many people from the whole country go there to buy tickets for superstitious reasons.

3 Data

Table 3 in Appendix A presents the towns and cities of Spain that were awarded with the first prize of the Spanish Christmas Lottery. This information allows us to compare what happened in those Regions awarded with the main prize of the Christmas Lottery against those that did not. This information is publicly available in any related source one looks for. This is the first source of information to build the dataset for this paper.

The second source of data is the *Encuesta de Presupuestos Familiares (EPF)*[9] survey data, provided

[8] *Source:* INE, 2016.
[9] Family Income Survey

by the *Instituto Nacional de Estadística (INE)*[10]. Our data obtains information about consumption expenditures and households' and it is composed by 22,346 households covering years from 1998 to 2016. Data is presented in terms of Panel Data from year 1998 until 2005. After 2005 the INE changed the data collection process and the institute presents it in form of Pooled Cross Section. Surveys in each wave can take place in any given period of the year. Households are interviewed about their personal earnings, their expenditures, their age, marital status, studies, gender, among other variables of interest, including the region where they live. This last source of information allows us to identify where individuals live and thus, identify those who are potential winners of the Christmas Lottery. This might present a drawback in our data, as it is hard to give more precision in our sample to locate potential winners. However, despite this handicap in data, it allows us to analyze the consumption behavior in winning regions and thus, have a general approach of what is the consumption pattern in those regions who won the first prize of the Spanish Christmas Lottery. On the other hand, our database collects information about those households who are lottery players; therefore, we are allowed to identify who is a lottery participant and who is not. Hence, knowing this information allows us to construct the treatment group that is formed by those households who live in the winning region and bought lottery. The remaining of the sample belongs to the control group. Monetary variables (income and consumption expenditures) are given in *pesetas*[11], meaning that we need to do the conversion to Euros. Moreover, income is given monthly and expenses are given yearly; therefore, we modify expenditures to a monthly variable. This implies that we need to set the following assumption:

Assumption 1: *Individual i, such that $i = \{1, 2, 3, \cdots, N\}$, spends the same amount of money in consumption during all months of the year, i.e, consumption is constant during the whole year.*

3.1 Lottery expenditure

We use data on Christmas Lottery expenditures available in the textitSociedad Estatatal de Loterías y Apuestas del Estado (SELAE). Moreover, we also use the national GDP and the national GDP per capita data together with the unemployment rate to measure the average ratio spent in the Christmas Lottery with respect to GDP and measure its correlation with unemployment. These last sources are also available in the INE. Table 2 presents a summary statistics for

[10] Spanish National Statistics Institute

[11] Old currency in Spain, before the Euro

all these variable of interest covering from 1998 until 2011, to know the relationship of lottery expenditures between national GDP and unemployment. The reason why our analysis extends only to 2011 is because after that year the data about Christmas Lottery average national expenditure differs across several sources and hard to find a general consensus.

Table 2: Lottery Expenses

Year	GDP	% of exp. to GDP	GDP pc	Exp. per capita	unemployment
1998	118386400€	0.29%	140236.8€	39.87€	17.27%
1999	121493500€	0.30%	142041.3€	41.83€	14.99%
2000	125689700€	0.29%	145465.5€	42.42€	13.35%
2001	130972800€	0.30%	149243.1€	44.19€	10.11%
2002	136616500€	0.31%	153629.1€	47.76€	11.25%
2003	142270900€	0.32%	157438.8€	50.09€	11.19%
2004	147994900€	0.32%	161861.8€	50.88€	10.41%
2005	154340900€	0.33%	165057.9€	53.13€	9.07%
2006	160380700€	0.32%	169275.2€	53.56€	8.18%
2007	165626800€	0.32%	173197.8€	54.55€	8.33%
2008	171188800€	0.30%	175453.3€	51.89€	13.42%
2009	162610600€	0.31%	164495.8€	50.37€	17.67%
2010	162272700€	0.31%	164185.9€	49.82€	19.53%
2011	162326500€	0.30%	164724.6€	49.27€	21.82%

Source: http://www.manuelbagues.com/research.html

% of exp. to GDP shows the amount spent on the Christmas Lottery relative to GDP and unemployment is the unemployment rate.

Exp. Per capita represents the average expenditures in the Christmas Lottery by the Spanish Population.

From Table 2, we observe that the Christmas Lottery Expenditure relative to GDP is equal to 0.3%. This fact has been stable along the years analyzed, but also in the previous two decades (see Bagués and Esteve-Volart, 2016). However, looking at real values, Christmas Lottery expenditures along the years increased until 2006 where it became stagnant and felt during the following years - coinciding with the economic recession in 2008. After these years lottery consumption was on average around 50€ but started to increase again. In 2018 consumption raised to 67.58€ according to the *SELAE*.

Figure 1: Relationship between Unemployment and Lottery Expenditures, from 1998 to 2011

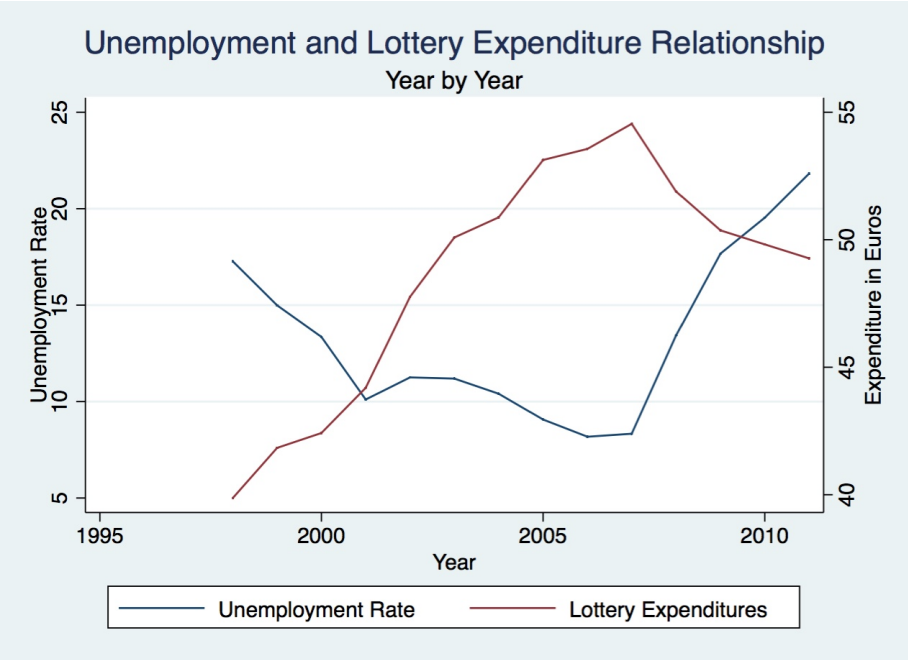


Figure 1 shows the negative relationship between unemployment and Christmas Lottery expenditures. This pattern is confirmed in Table 2, however this picture shows that in periods of recession or less employment, people spend less in lottery. This could be explained by the fact that more unemployment implies less earnings and thus, less money to be spent on "luxuries" or things that are not of first necessity. However, this does not mean individuals stop playing.

3.2 Summary Statistics across winning and non-winning regions

Table 4 and Table 5 in Appendix B present a summary statistics across winning and non-winning regions of the Christmas Lottery. The first one offers a comparison in consumption in budget shares. This is done to compare the amount spent by households in relative terms with respect to total expenditures. This is computed as follows:

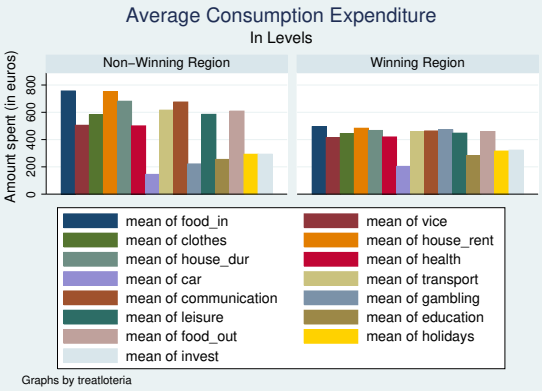
$$\omega_i^g = \frac{c_i^g}{\sum_{i=1}^{N} c_i^g}$$

where the demands for budgets shares are independent from each other (see Attanasio and Lechene, 2002 and Browning and Crossley, 2007).

The second table presents a comparative of consumption in levels across regions. In general terms, we observe differences across groups. Winning regions spend 708€ per year more than those households living in non-winning regions. Moreover, households in winning regions invest (or save) 30€ more per month than those in non-winning ones. However, the aggregates show the contrary: households in winning regions spend 531€ less in durable goods, 794€ less in non-durable goods and 1325€ less in total. These differences are statistically significant at the 1% significance level by looking at the performance of the t-tests, which implies that there are differences in consumption behavior between regions.

Figure 2: Comparison of the consumption goods across winning and non-winning Regions.

(a) Mean Analysis



(b) Variance Analysis

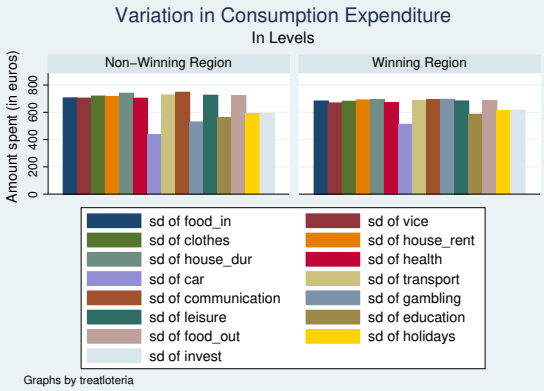


Figure 2 shows a visual comparative in consumption behavior across groups. Subfigure 2a shows the difference in average terms and subfigure 2b shows the difference in variability across groups. Consumption levels do change across Regions, in general, being consumption more pronounced in non-winning regions, as we observed from Table 5. Therefore, from Figure 2, the Permanent Income Hypothesis seems to not hold as there are differences in consumption for the majority of goods across groups. From the comparison in variation from subfigure 2b, there is more variability in car's value for the treated group. For remaining goods, variability in consumption is very similar across groups.

In conclusion from this section, we can state that winning regions consume less or equal than non-winning Regions. However, testing for such changes across groups lead to significant differences across regions, except for gambling where people consume the same amount in both groups.

4 Identification Strategy

The identification strategy is based on the idea that winning the Spanish Christmas lottery is akin to a random income shock. There are two caveats in this approach: (i) only households that participate in the Christmas lottery can experience such a shock; and (ii) in our database, we do not observe winning households, but only whether, in a given year, a particular household was in a winning region - i.e. whether that region had lottery winners - or not.

We can assert that, in any given year, households in winning regions that had purchased a Christmas lottery ticket have a non-zero probability of having won; while all other households that year have a zero of having won. Therefore, we create an interaction term involving the binary variables *lottery* (whether a household had purchased a lottery ticket) and *win_region* (whether the household was in a winning region) as an instrument for household expenditures, as well as the *win_region* variable per se.

Households that purchase the Christmas lottery ticket are likely to be different from those that do not, and winning regions may be systematically different from those that did not win (e.g. they may be more populated, have individuals who are more likely to purchase lottery tickets, etc.) Therefore, we control for region fixed-effects and year fixed-effects in our specifications. Thus, the interaction term is picking up, in a specific year, the difference in household expenditures between households that play the Christmas lottery and those that do not, differencing across regions that had winners versus regions that did not, after controlling for region fixed-effects and year fixed-years.

Moreover, we need keep the key assumption that Bermejo et al. (2019) state, which applies also to this paper, that *the winning province is randomly assigned conditional on expenditures on lottery tickets by province.*

Our identifying assumption is that this difference-in-difference effect on household expenditures is

due to lottery winnings rather than region-year shocks correlated with the selection of the winning region in a given year. Because the selection of the winning region in a given year is random, there is no obvious reason why it would be correlated with other region-year shocks. Recall that the winning the Spanish Christmas Lottery is yearly shock that takes place every 22^{nd} of December.

5 Empirical Analysis

In this section, we investigate the existing relation between economic outcomes and the consumption behavior across winning and non-winning regions of the Spanish Christmas Lottery. We first analyze whether living in the winning region has a significant impact in the expenditures behavior. Secondly, we introduce such income shock in the consumption-demand regression, to deal with potential endogeneity that might arise in the Engel Curves demand analysis. Regressions used to estimate our outcome of interest are inspired from previous papers in the literature, especially the Engel Curves consumption demand. Some authors include past-time consumption in the analysis or other non-linearities, as the square logarithm of total expenditures (see Arellano et al., 2017 and Blundell et al., 1993). However, in our case none of these effects are statistically significant, thus, we do not include them in the regression analysis. Extending our analysis, we also analyze the effects of living in a winning Christmas Lottery Region in the Labor Market and the family composition.

5.1 Consumption Analysis

Starting with the most simple regression analysis, we test the effect of the random income shock caused by the Christmas Lottery on household consumption. In words, we are interested in observing whether consumption behavior changes for those households who live in winning regions and are potential winners of the Christmas Lottery. Our specification uses a difference-in-difference estimator that compares households' consumption behavior in those Regions awarded with the first prize of the Christmas Lottery relative to other Regions. The reduced form regression is as follows:

$$\ln(c^g_{h,t}) = \beta_0 + \beta_1 win\_region_{h,t-1} + \beta_2 lottery_{h,t-1} + \beta_3 win_{h,t-1} * lottery_{h,t-1} + u_{h,t} \quad (1)$$

where $c^g_{i,t}$ denotes the consumption demand for household h at time t for good g; $win\_region_{h,t-1}$ is a dummy variable representing whether the household lives in a winning region or not; $lottery_{h,t-1}$ is another dummy variable taking value one if the household bought lottery and zero otherwise; and $win_{h,t-1} * lottery_{h,t-1}$ is the interaction term between the previous two dummies. $\varepsilon_{h,t}$ represents the error term of the regression. β_3 is our coefficient of interest, representing the average difference effect in consumption demand between winning and non-winning Regions.

In addition to the reduced form in Equation (1), we do a robustness check by adding more controls to the regression to check if estimates are robust to the inclusion of additional variables. The regression is:

$$\begin{aligned} \ln(c^g_{h,t}) &= \beta_0 + \beta_1 win\_region_{h,t-1} + \beta_2 lottery_{h,t-1} + \beta_3 win_{h,t-1} * lottery_{h,t-1} + X'_{h,t}\boldsymbol{\beta_4} \\ &\quad + (gdp_{r,t}, lot\_exp_{r,t-1})'\boldsymbol{\beta_5} + \eta_h + \tau_t + u_{h,t} \end{aligned} \tag{2}$$

where, $X'_{h,t}$ is a vector of individual characteristics including age, age square, education, marital status and job status. We also include a vector of demographic characteristics about the regions: GDP per capita in each Region represented by $gdp_{r,t}$, and the lottery expenditures per Region, $lot\_exp_{r,t-1}$. η_h is a household fixed effect and τ_t is a time fixed effect.

This estimation process is interesting itself to check whether living in a winning region has an impact in consumption. However, this cannot be generalized beyond the lottery setup. A more precise estimation process is the estimation of the Engel Curves consumption demand. To give a more general specification, we use the income shock from the lottery as an instrument to estimate the effect of total expenditures on consumption demand. By doing this, we are solving the endogeneity problem that arises from adding total expenditures in the regression analysis. The first stage equation is:

$$\begin{aligned} \ln(exp_{h,t}) &= \beta_0 + (win\_region_{h,t-1}, lottery_{h,t-1}, win_{h,t-1} * lottery_{h,t-1})'\boldsymbol{\beta_1} + X_{i,t}\boldsymbol{\beta_2} \\ &\quad + (gdp_{r,t}, lot\_exp_{r,t-1})'\boldsymbol{\beta_3} + \eta_h + \tau_t + \nu_{h,t} \end{aligned} \tag{3}$$

Equation (3) requires the estimation of five parameters (β_1, β_2, β_3, η and τ). After having done it, we need to check that the relevance property for the instruments holds. This can be easily check by computing the F-test for instrumental variables.

Next, we explore the effect of total expenditures, instrumented with the income shock, on consumption demand. In the second-stage regression, the logarithm of consumption expenditure for good g is our dependent variable. We complement the regression with the adjusted total expenditures

from the first stage regression and the control variables added in Equation (3). Then, the second stage regression is as follows:

$$\ln(c^g_{h,t}) = \gamma_0 + \gamma_1 \ln(exp_{h,t}) + (X_{h,t})'\boldsymbol{\gamma_2} + (gdp_{r,t}, lot\_exp_{r,t-1})'\boldsymbol{\gamma_3} + \eta_h + \tau_t + u_{i,t} \quad (4)$$

Equation (4) is estimated using an instrumental variable Panel Data method with fixed effects.

The estimated results for Equations 1, 2, 3 and 4 are presented in section 6.

5.2 Labor Supply

Blundell et al. (2016) find that labor supply can work as insurance when a permanent income shock occurs, leading to a consumption smooth behavior. There is also evidence that a 40% of permanent shocks to wages affects consumption directly (see Heathcote et al., 2012). However, when shocks cannot be insurable, some households go to the second market to get a second job to cover the loss in income and smooth their consumption (see Danzer, 2011).

In this subsection we analyze the effect of the random income shock caused by the Christmas Lottery on the labor market. In words, we want to observe whether living in a winning Region affects the amount of hours worked by households or the employability ratio. The regression under such scenario is the following:

$$\begin{bmatrix} employed_{h,t} \\ num\_hours_{h,t} \end{bmatrix} = \beta_0 + \beta_1 win\_region_{h,t-1} + \beta_2 lottery_{h,t-1} + \beta_3 win_{h,t-1} * lottery_{h,t-1} + u_{h,t} \quad (5)$$

where $employed_{h,t}$ is a dummy variable that takes value one if the head of the household is employed and zero otherwise; and $num\_hours_{h,t}$ represents the amount of daily hours worked by the head of the household.

Equation (5) shows the reduced form estimation for the labor market outcomes. As we did for consumption, we do as well a robustness check by adding more controls to the regression to check if estimates are robust to the inclusion of additional variables. The regression is:

$$\begin{bmatrix} employed_{h,t} \\ num\_hours_{h,t} \end{bmatrix} = \beta_0 + \beta_1 win\_region_{h,t-1} + \beta_2 lottery_{h,t-1} + \beta_3 win_{h,t-1} * lottery_{h,t-1} + X'_{h,t}\boldsymbol{\beta_4} + (gdp_{r,t}, lot\_exp_{r,t-1})'\boldsymbol{\beta_5} + \eta_h + \tau_t + u_{h,t} \quad (6)$$

In this case, the vector of individual controls, $X_{h,t}$, does not included the employment status as this is our dependent variable under Equation (6).

5.3 Intergenerational analysis

When households experience a windfall effect, like a lottery prize, they tend to think also in the family composition and increase the number of children, as they have more money or potential savings. Therefore, in this subsection we analyze the effect of the random income shock caused by the Christmas Lottery on the family composition, i.e., we want to check if living in a winning Region of the lottery affects the family composition by having more children. To test this idea, Equation (7) and Equation (8) are providing us this analysis, using the forecast in two periods ahead for dependent children at home:

$$child_{h,t+2} = \beta_0 + \beta_1 win\_region_{h,t-1} + \beta_2 lottery_{h,t-1} + \beta_3 win_{h,t-1} * lottery_{h,t-1} + u_{h,t} \quad (7)$$

where $child_{h,t+2}$ represent the amount of children in the household 2 periods after the lottery shock. Equation (7) presents the reduced form estimation. Equation (8) presents the extended regression, where we do the robustness check by adding more control variables to the analysis:

$$\begin{aligned} child_{h,t+2} &= \beta_0 + \beta_1 win\_region_{h,t-1} + \beta_2 lottery_{h,t-1} + \beta_3 win_{h,t-1} * lottery_{h,t-1} + X'_{h,t}\boldsymbol{\beta_4} \\ &\quad + (gdp_{r,t}, lot\_exp_{r,t-1})'\boldsymbol{\beta_5} + \eta_h + \tau_t + u_{h,t} \end{aligned} \quad (8)$$

6 Results

The estimated results for the proposed regressions in the previous section are presented in Appendix C. We are mainly concerned about the effect that living in the winning Christmas Lottery Region has on consumption. In words, analyze the own effect of the lottery prize on household consumption, but also on labor supply and family composition.

6.1 Consumption Estimation

Table 6 shows the results for the reduced form regression in Equation (1). We find a statistical significant and positive effect in all goods except for *vice*, *rent*, *clothes*, *transport* and *education* where the effect of the lottery prize in the winning Region is close to zero or non-statistically relevant. However, we find a negative and significant effect for car value, gambling, holiday expenditures and savings. These results imply that there might be a be a change in the consumer behavior in the winning regions for those individuals who have bought lottery; or that at least there exists a spread effect in consumption across neighbors in the same region, given that we do not know exactly which individuals in the data have won the lottery and who have not. On the other hand, the coefficient of living in the winning region per se is statistically significant for all goods. However, to capture whether there is an effect in consumption in those regions that won the first prize of the Christmas Lottery, we need to look at the performance of the F tests in Table 6. The F-test is performed under the following hypothesis:

H_0 : The pure win effect has no effect on consumption demand.

H_a : The pure win effect has an effect on consumption demand.

The results from the F-test show that there is a change in consumption behavior in the winning regions compared to non-winning ones.

In Table 7 we report the fixed effects estimations from Equation (2). We find a positive and statistically significant relationship between the aggregate of durable and non-durable goods consumption and the lottery income shock. However, the estimated coefficient for the treatment effect for most of the goods itself report a negative and significant effect; meaning that living in the winning region for those households who buy Christmas Lottery has negative implications in consumption demand, or simply there is a redistribution of resources across goods. However, the consumption household behavior in the winning Regions is better captured by estimating the Engel curves demand analysis as proposed in Equation (4).

Table 8 presents the results for the first stage regression presented in Equation (3). The main finding is that the lottery income shock has a positive and statistically significant effect in total expenditures. Therefore, column (1) shows that the income shock causes households to spend more in general, despite the effect of the shock is inelastic to total expenditures. This implies that the relevance condition for instrumental variables is satisfied, as well as orthogonality or exogeneity,

which is automatically fulfilled as the wining regions are completely randomly assigned. To test the relevance condition we run an F-test under the following null hypothesis:

$$H_0: \text{ The set of instruments for total expenditures are not relevant.}$$

$$H_a: \text{ The set of instruments for total expenditures are relevant.}$$

The results from the F-test for instrumental variables is 133.57. It shows that the relevance condition is satisfied and the set of instruments we are using are strong, as the resulting number is greater than 10.

We only take into account the results for the logarithm of total expenditures, as the estimated results are in line with the theory and explain well our expectations: the lottery income shock has a positive impact relative to expenditures. Despite the set of instrumental variables is relevant and statistically significant for expenditures in levels, the estimated results lead to a contradiction per se in the theory, in which the income shock has a negative impact in total expenditures.

In Table 9 we have the results for the second stage regression from estimating Equation (4). We find that adjusted total expenditures have an effect in the aggregate of durable and non-durable goods. Despite the effect is statistically significant in both cases, durable goods are sensitive to the income shock, as the estimated coefficient is elastic; and non-durable goods are not as sensitive to the income shock as the estimated coefficient is below one, thus, non-durable goods are inelastic to the lottery income shock. More precisely, households who live in the winning region increase their consumption in durable goods by 11.47% compared to those households who live in non-winning regions, whereas the estimated effect for non-durable goods consumption is 9.26% higher in winning regions.

Analyzing goods itself, we find a statistically significant and positive effect as well for the majority of goods, except for *holidays* expenses where the effect is not significant. However, those goods that are considered non-durables or of immediate consumption, report an estimated coefficient lower than one. Such effects found under this estimation are consistent with the theory, where non-durable goods should not react to the income shock, whereas durable goods consumption is likely to react to income shocks. Therefore, we should expect an inelastic effect of non-durable goods to the income shock and an elastic effect of durable goods to the lottery shock. This effect is achieved in this paper by looking at the results in Table 9.

Hence, with such results we can conclude that living in the winning Region of the Spanish Christmas Lottery causes a positive and significant change in household consumption. This implies a violation of the Permanent Income Hypothesis.

6.2 Labor Supply Estimation

In columns (1), (2) and (3) of Table 10 in Appendix C we have the results for the estimated regression in (5) and Equation (6). We do not find an effect in employability status of the heads of the households due to the lottery income shock. This implies that living in a winning lottery region does not affect individuals' current employment status. When doing the robustness check in column (3) by adding individual controls, demographic characteristics and fixed effects; the lottery income shock still does not alter the employment status of the head of the household.

However, we find a positive and statistically significant effect for the amount of hours worked; meaning that people in the winning regions tend to work for more hours. Despite the fact that the logic might state that more money should lead to a reduction in hours worked, these results make sense if we take into account the findings by Bermejo et al. (2019). They find that the amount of new firms increase in the winning regions (such result is statistically significant) and thus, new owners of such businesses need to dedicate more time to the creation and well functioning of their enterprises. Therefore, this might be one of the reasons why amount of hours worked increase in winning Regions of the Spanish Christmas Lottery. In words, we can state that the number of entrepreneurs may increase in the winning regions, according to the findings in Bermejo et al. (2019).

6.3 Intergenerational Estimation

Columns (4) and (5) in Table 10 in Appendix C reports the estimated results for Equation (7) and Equation (8). We do not find any changes in the family composition due to the lottery income shock. Therefore, living in the winning region does not affect the number of children in the household. When doing the robustness check by controlling for individual characteristics, demographic controls and fixed effects, the effect of the income shock is still not relevant for the family composition in the periods after the income shock happened.

Finally, if we run a regression with on-time period forecasted or just in the present time, we do not find significant results either. Therefore, there is no evidence that the lottery shock affects significantly family composition by having more children.

7 Conclusion

The advantages of using the Spanish Christmas Lottery as a yearly Natural Experiment for household consumption are several. Firstly, the economic impact of winning the lottery is large, the increase in the local GDP of the winning region increases by 3.5%. Moreover, the Spanish population spends around 0.3% of the national GDP on it. Secondly, the number is not unique to one individual; the same number can be shared by groups of friends, colleagues or family members; and more than one person can get the same number. This has two immediate consequences: (i) it makes the analysis more heterogeneous, and (ii) it makes the lottery to be a Syndicate game where over 75% of the population participates on it. Finally, winners are clustered and easy to locate as each winning number is typically sold by one outlet.

There is evidence that when households experience an unexpected increase in income, they tend to spend their money instead of satisfying the Permanent Income Hypothesis and smooth consumption. This paper takes advantage of the Spanish Christmas Lottery, a complete randomized and exogenous income shock, to study the causal effect of the lottery prize on household consumption. We show that winning regions increase their consumption compared to non-winning ones. Such effect is stronger for durable goods. We find that durable goods have an elastic effect towards the income shock, meaning that consumption of durable goods react to the lottery prize. However, we find that non-durable goods are non-sensitive to the lottery prize as the effect found is inelastic. These findings are in line with Kuhn et al. (2011) in the Dutch Postcode Lottery. Moreover, these results are also in line with the predicted theory in Cerletti and Pijoan-Mas (2014), where positive shocks in income are spent in durable goods only.

There is also evidence of a positive effect of the lottery shock on the amount of hours worked. Winning regions tend to work for more hours compared to non-winning ones. This result goes in line with the ones found by Bermejo et al. (2019). However, we do not find any evidence that the lottery income shock make individuals to change their employability status or their family

composition.

Finally, the obtained results in this paper can help policy makers to encourage Spanish Politicians incurring into new fiscal policy measures, such tax rebates or reductions in personal income taxes (know in Spain as *IRPF*) to encourage household consumption, especially in durable goods.

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A Awarded cities and towns in Spain

Table 3: Cities and towns awarded with the First Lottery Prize

Year	City awarded
2016	Madrid
2015	Roquetas de Mar (Almería)
2014	San Bartolomé (Las Palmas), Boñar (León), El Bosque (Cádiz), Lugo y Murcia
2013	Avilés (Asturias), Barcelona, Mondragnó (Guipúzcoa), Bailén y Huelma (Jaén), Leganés (Madrid), Madrid, Palencia, El Rosal (Pontevedra), Sanlúcar la Mayor (Sevilla), Quintanar de la Orden (Toledo), Manises (Valencia) y Valencia
2012	Alcalá de Henares (Madrid), Chiclana, Barbate, Algeciras, Villamartín, Albacete, Madrid, Valladolid, Culleredo, Oviedo, Gijón, Nava, Zaragoza, Huesca, Tudela, Alaquàs, Manises, Telde, Lanzarote, Almuñécar, Cullar Baza, Albote, Málaga, Marbella, Villarrasa, Nueva Carteya y Priego de Córdoba, Aranda de Duero, Burgos, Castelldefels y Barcelona, among others.
2011	Grañén (Huesca)
2010	Saldaña (Palencia), Garachico (Tenerife), Éibar (Guipúzcoa), Molina de Segura (Murcia), Cerdañola del Vallés y Pallejà (Barcelona), Alcorcón (Madrid), Cáceres, Zaragoza, Alicante, Barcelona y Madrid.
2009	Madrid
2008	Barcelona, San Quirico de Tarrasa (Barcelona), Torrevieja (Alicante), Oñate (Guipúzcoa), Madrid, Zaragoza, Quesada (Jaén), Allariz (Orense), Soria
2007	Alicante, Tíjola (Almera)í, Avilés, Llanes y Nava (Asturias), El Prat de Llobregat y Vich (Barcelona), Carballo y Santiago de Compostela (La Coruña), Sort (Lérida), Madrid, Teruel y Alcañiz (Teruel), Talavera de la Reina (Toledo), Bilbao y Elorrio (Vizcaya), Puerto de la Cruz (S.C. de Tenerife)
2006	Almazán (Soria), Santiponce (Sevilla), Vitoria, Fuenlabrada (Madrid), Valencia, Onil y Benidorm (Alicante)
2005	Vich (Barcelona)
2004	Sort (Lérida)
2003	San Sebastián, La Coruña, Rianjo, (La Coruña), Valencia, Massamagrell, (Valencia), Sort (Lérida), Ronda (Málaga), Casas Ibáñez (Albacete), Capdepera (Mallorca)
2002	Granada, Madrid, Segovia, Alcantarilla (Murcia), Calahorra (La Rioja), Elda (Alicante), El Ejido (Almería), Lucena (Córdoba)
2001	Murcia, Lorca (Murcia), Santa Cruz de La Palma (S.C. de Tenerife)
2000	Segovia
1999	Elche (Alicante)
1998	Villabona (Guipúzcoa), San Sebastián de los Reyes (Madrid), Oyón (Álava), Sabadell (Barcelona), La Unión (Murcia), Málaga, Alicante, León

Source: Wikipedia

B Summary Statistics

Table 4: Summary statistics: budget shares for the different type of goods

	Winning Regions		Non-Winning Regions		Testing Differences	
Variable	Mean	Standard Deviation	Mean	Standard Deviation	$t-$test difference	$p-$value
food_in	40.259	24.721	31.002	24.926	53.46	0.000
vice	3.798	3.024	4.417	4.545	-28.02	0.000
clothes	5.199	3.353	6.32	5.268	-45.42	0.000
house_rent	8.083	7.117	13.114	12.246	-94.55	0.000
house_dur	6.100	3.731	7.114	5.192	-37.58	0.000
health	3.685	2.984	4.231	4.563	-24.95	0.000
car	1.466	4.065	1.52	6.309	-1.80	0.072
transport	5.679	3.521	6.32	5.126	-25.02	0.000
communication	4.047	3.039	5.542	5.053	-66.20	0.000
gambling	3.451	3.366	1.617	3.08	78.28	0.000
leisure	6.687	4.157	5.919	4.701	26.15	0.000
education	2.158	2.789	1.734	3.261	21.44	0.000
food_out	5.042	3.926	6.646	6.176	-55.49	0.000
holidays	2.206	2.859	2.223	3.725	-0.84	0.404
savings	2.141	2.979	2.281	3.872	-6.59	0.000
durables	24.796	13.57	28.742	15.999	-40.97	0.000
non-durables	75.204	13.57	71.258	15.999	40.97	0.000

Source: Instituto Nacional de Estadística (INE)

Values presented in percentage terms.

Table 5: Summary statistics: consumption levels for the different type of goods

	Winning Regions		Non-Winning Regions		Testing Differences	
Variable	Mean	Standard Deviation	Mean	Standard Deviation	$t-$test difference	$p-$value
expenditure	6142.035	9116.764	7466.984	8062.632	-54.68	0.000
food_in	494.232	682.966	756.257	705.810	-19.34	0.000
vice	413.992	668.994	504.907	704.275	-28.71	0.000
clothes	443.9	680.967	581.29	719.097	-55.33	0.000
house_rent	483.164	690.793	751.442	716.39	-44.02	0.000
house_dur	466.88	691.939	681.198	740.17	-17.23	0.000
health	419.028	672.042	500.366	703.422	16.55	0.000
car	203.607	511.858	144.905	436.296	-32.83	0.000
transport	457.271	686.601	615.758	727.598	-43.47	0.000
communication	463.125	693.414	675.36	747.225	52.08	0.000
gambling	471.313	695.78	221.525	529.395	-28.73	0.000
leisure	446.935	683.507	585.001	725.357	6.46	0.000
education	281.067	585.446	254.655	562.258	-31.07	0.000
food_out	459.041	686.111	608.818	721.418	5.46	0.000
holidays	315.778	611.247	292.49	591.395	6.90	0.000
savings	322.703	616.366	293.014	593.813	-19.09	0.000
dur	2600.31	3999.109	3130.787	3574.774	-22.05	0.000
non_dur	3541.725	5186.04	4336.198	4608.617	-20.93	0.000

Source: Instituto Nacional de Estadística (INE)

Values presented in Euros.

C Estimation Results

Table 6: Reduced form estimation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
	food_in	vice	clothes	house_rent	house_dur	health	car	transport	communication	gambling	leisure	education	food_out	holidays	savings	durable	non-durable
win_region	-1.158***	-0.839***	-1.128***	-1.500***	-1.223***	-0.905***	-0.148***	-1.077***	-0.927***	8.17e-12***	-1.095***	-0.328***	-1.144***	-0.403***	-0.0317	-1.558***	-1.484***
	(-64.28)	(-38.42)	(-50.41)	(-67.63)	(-53.34)	(-41.81)	(-16.07)	(-46.92)	(-38.98)	(329.94)	(-48.99)	(-21.36)	(-50.26)	(-24.31)	(-1.70)	(-60.77)	(-66.24)
lottery	-0.298***	0.378***	0.138***	-0.568***	-0.564***	0.296***	1.018***	0.0742***	-1.006***	3.563***	0.164***	0.742***	0.291***	0.906***	0.856***	-0.486***	-0.275***
	(-33.66)	(29.96)	(11.19)	(-49.87)	(-46.33)	(23.54)	(107.98)	(5.95)	(-72.56)	(382.96)	(13.27)	(66.10)	(23.28)	(77.36)	(74.85)	(-37.03)	(-24.39)
lottery*win_region	0.139***	-0.0393	0.0453	0.122***	0.311***	0.0990**	-0.182***	0.0399	0.569***	-0.974***	0.202***	0.0351	-0.0910**	-0.132***	-0.440***	0.277***	0.170***
	(5.60)	(-1.25)	(1.43)	(3.87)	(9.69)	(3.15)	(-8.68)	(1.24)	(16.83)	(-40.94)	(6.45)	(1.35)	(-2.82)	(-4.83)	(-15.34)	(7.65)	(5.36)
_cons	5.459***	2.931***	3.679***	5.032***	4.362***	2.942***	0.397***	3.789***	3.879***	-3.51e-12***	3.579***	1.091***	3.720***	1.343***	1.376***	5.771***	6.638***
	(893.00)	(337.78)	(431.65)	(665.20)	(523.29)	(342.44)	(94.48)	(434.70)	(417.97)	(-510.31)	(413.48)	(164.83)	(426.32)	(191.85)	(199.13)	(653.33)	(880.27)
F-test	3522.29	1493.00	2307.45	3817.68	1652.73	1249.17	306.78	2109.46	223.07	1675.81	1643.64	196.87	2902.80	601.55	467.29	2501.13	3408.54
p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
N	305550	305550	305550	305550	305550	305550	305550	305550	305550	305550	305550	305550	305550	305550	305550	305550	305550
r2	0.0323	0.0120	0.0160	0.0396	0.0226	0.0113	0.0498	0.0140	0.0226	0.408	0.0136	0.0195	0.0188	0.0259	0.0201	0.0274	0.0314
F	3010.0	1326.7	1662.8	3843.5	2279.2	1236.2	4731.4	1448.6	2390.3	.	1437.7	2037.1	1995.3	2694.7	1995.7	2591.0	2849.2
ll	-688527.3	-789470.1	-783951.8	-761556.6	-781067.1	-788029.2	-669780.5	-788754.8	-814942.9	-653238.1	-784858.8	-738855.7	-789211.8	-753508.6	-750764.2	-805940.8	-760038.8

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The H0 for the F-test is that the pure win effect has no effect on consumption demand.

We find a statistical significant and positive effect in all goods except for *vice*, *rent*, *clothes*, *transport* and *education* where the effect of the lottery prize in the winning Region is close to zero or non-statistically relevant. However, we find a negative and significant effect for car value, gambling, holiday expenditures and savings. The results from the F-test show that there is a change in consumption behavior in the winning regions compared to non-winning ones.

Table 7: Interaction effects estimation by adding individual controls

	(1) food_in	(2) vice	(3) clothes	(4) house_rent	(5) house_dur	(6) health	(7) car	(8) transport	(9) communication	(10) gambling	(11) leisure	(12) education	(13) food_out	(14) holidays	(15) savings	(16) dur	(17) non_dur
win_region	-0.148***	0.0398	-0.0367	-0.168***	-0.166***	0.0448*	0.253***	-0.0316	-0.172***	0.667***	-0.116***	0.0903***	-0.0652***	0.102***	0.174***	-0.201***	-0.164***
	(-14.92)	(1.84)	(-1.88)	(-15.60)	(-11.99)	(2.05)	(13.66)	(-1.81)	(-12.51)	(41.90)	(-6.16)	(3.45)	(-3.61)	(4.47)	(7.68)	(-15.62)	(-13.95)
lottery	0.165***	1.052***	0.842***	0.0610***	0.303***	1.194***	1.449***	0.702***	0.192***	4.279***	0.945***	1.699***	0.813***	1.346***	0.997***	0.384***	0.388***
	(27.75)	(80.55)	(71.66)	(9.40)	(36.32)	(90.63)	(129.78)	(66.75)	(23.22)	(446.59)	(83.49)	(109.84)	(74.72)	(98.07)	(73.22)	(49.70)	(54.87)
lottery*win_region	0.0900***	-0.341***	-0.206***	0.0333*	0.000498	-0.332***	-0.460***	-0.159***	-0.0114	-1.453***	-0.129***	-0.438***	-0.209***	-0.355***	-0.359***	0.0487**	0.0445**
	(6.88)	(-11.90)	(-7.98)	(2.34)	(0.03)	(-11.48)	(-18.74)	(-6.90)	(-0.63)	(-69.02)	(-5.18)	(-12.64)	(-8.74)	(-11.77)	(-11.99)	(2.87)	(2.87)
log lottery expenditures	-0.828***	-1.448***	-1.317***	-1.374***	-1.415***	-1.287***	-0.493***	-1.253***	-1.320***	-0.836***	-1.087***	-0.884***	-1.057***	-1.656***	-0.597***	-1.509***	-1.190***
	(-20.26)	(-16.15)	(-16.34)	(-30.84)	(-24.75)	(-14.23)	(-6.43)	(-17.37)	(-23.24)	(-12.72)	(-13.99)	(-8.53)	(-14.16)	(-17.59)	(-6.39)	(-28.46)	(-24.56)
log gdp	-1.034***	-1.561***	0.412	-1.589***	-2.022***	0.908*	-0.0847	-0.784*	-0.396	2.152***	0.378		1.976***	0	0	0	0
	(-5.34)	(-3.68)	(1.08)	(-7.53)	(-7.47)	(2.12)	(-0.23)	(-2.29)	(-1.47)	(6.91)	(1.03)		(5.59)	(.)	(.)	(.)	(.)
age	-0.0342***	0.0812***	0.0416***	-0.0434***	-0.0192***	0.0388***	0.0167***	0.121***	-0.0257***	0.0344***	0.0612***	0.0935***	0.0663***	0.0805***	0.126***	-0.0301***	-0.0256***
	(-20.98)	(22.71)	(12.95)	(-24.44)	(-8.43)	(10.75)	(5.45)	(42.19)	(-11.35)	(13.13)	(19.74)	(22.93)	(22.27)	(21.45)	(33.71)	(-14.24)	(-13.26)
age^2	0.000315***	-0.000760***	-0.000663***	0.000400***	0.000147***	-0.000266***	-0.000224***	-0.00149***	0.000245***	-0.000274***	-0.000833***	-0.00112***	-0.000916***	-0.00103***	-0.000585***	0.000273***	0.000194***
	(19.60)	(-21.57)	(-20.93)	(22.85)	(6.55)	(-7.47)	(-7.42)	(-52.37)	(10.99)	(-10.61)	(-27.28)	(-28.07)	(-31.21)	(-27.83)	(-15.94)	(13.11)	(10.18)
marital	0.0515***	-0.0339***	-0.0236***	0.0480***	0.0371***	-0.0477***	-0.0601***	-0.0627***	0.0304***	-0.101***	-0.0522***	-0.171***	-0.0539***	-0.0522***	0.0190**	0.0494***	0.0478***
	(17.74)	(-5.32)	(-4.11)	(15.17)	(9.14)	(-7.42)	(-11.04)	(-12.24)	(7.53)	(-21.52)	(-9.45)	(-22.63)	(-10.16)	(-7.80)	(2.87)	(13.10)	(13.87)
education	0.0125***	0.0138***	0.0429***	0.0104***	0.0204***	0.0548***	0.000170	0.0629***	0.0385***	0.00238	0.0852***	0.0698***	0.0778***	0.101***	-0.0981***	0.0176***	0.0215***
	(6.87)	(3.48)	(11.98)	(5.27)	(8.03)	(13.67)	(0.05)	(19.64)	(15.28)	(0.82)	(24.70)	(14.77)	(23.48)	(24.18)	(-23.66)	(7.47)	(9.98)
employmed	-0.0144*	-0.0345*	0.0670***	-0.00513	-0.00426	0.0404**	0.0123	0.0997***	0.0507***	0.0378***	0.0761***	-0.0250	0.168***	0.154***	-0.136***	-0.00140	0.00489
	(-2.32)	(-2.54)	(5.49)	(-0.76)	(-0.49)	(2.95)	(1.06)	(9.13)	(5.89)	(3.80)	(6.47)	(-1.55)	(14.91)	(10.80)	(-9.61)	(-0.17)	(0.67)
retired	-0.112***	-0.517***	0.0171	-0.158***	-0.125***	-0.330***	-0.397***	0.0667*	-0.173***	-0.268***	-0.0749*	-0.830***	-0.0518	0.293***	-0.340***	-0.188***	-0.125***
	(-6.86)	(-14.42)	(0.53)	(-8.84)	(-5.46)	(-9.11)	(-12.94)	(2.31)	(-7.62)	(-10.17)	(-2.41)	(-21.34)	(-1.73)	(7.77)	(-9.10)	(-8.87)	(-6.46)
_cons	8.476***	10.03***	4.043***	10.80***	11.90***	1.982	1.711	6.927***	6.625***	-4.776***	3.009**	2.440***	-1.738	-10.16***	32.24***	12.54***	10.81***
	(16.06)	(8.67)	(3.88)	(18.78)	(16.12)	(1.70)	(1.73)	(7.44)	(9.03)	(-5.62)	(3.00)	(6.15)	(-1.80)	(-8.35)	(26.73)	(18.31)	(17.28)
N	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096	172714	211096	211096	211096	211096	211096
r2	0.831	0.518	0.612	0.874	0.802	0.507	0.212	0.693	0.814	0.650	0.633	0.308	0.675	0.347	0.391	0.867	0.855
F	25098.2	5479.2	8053.4	35411.8	20700.1	5241.7	1374.2	11508.2	22321.9	9474.7	8785.5	1809.1	10617.1	2707.6	3271.2	33372.3	30183.6
ll	-313556.1	-479286.5	-456940.3	-331776.1	-384391.8	-481154.9	-446261.4	-433516.8	-383050.6	-413941.4	-449123.5	-399819.6	-440738.3	-489749.1	-488040.1	-368522.0	-349549.3

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We find a positive and statistically significant relationship between the aggregate of durable and non-durable goods consumption and the lottery income shock. However, the estimated coefficient for the treatment effect for most of the goods itself report a negative and significant effect; meaning that living in the winning region for those households who buy Christmas Lottery has negative implications in consumption demand, or simply there is a redistribution of resources across goods.

Table 8: First stage estimation: expenditures and log-expenditures

	(1)	(2)
	log expenditures	expenditure
lottery*win_region	0.0546***	-1031.3***
	(3.35)	(-23.44)
win_region	-0.179***	201.4***
	(-14.54)	(6.08)
lottery	0.391***	2945.6***
	(52.71)	(147.11)
lottery expenditure		-18.77***
		(-16.75)
log lottery expenditure	-1.280***	
	(-25.15)	
gdp		-194.6***
		(-6.34)
log gdp	-1.588***	
	(-6.59)	
age	-0.0292***	116.5***
	(-14.37)	(21.26)
age^2	0.000243***	-1.312***
	(12.16)	(-24.30)
marital	0.0523***	-102.4***
	(14.45)	(-10.49)
education	0.0194***	96.58***
	(8.59)	(15.84)
employed	-0.000287	110.1***
	(-0.04)	(5.29)
retired	-0.153***	-712.6***
	(-7.51)	(-12.96)
_cons	12.17***	3079.7***
F-test for the IV	133.57	337.92
p-value	0.000	0.000
N	211096	211096
r2	0.858	0.820
F	30822.0	23267.1
ll	-359893.4	-2027705.0

Regions and time fixed effects included.

t statistics in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The first stage regression is revealing us that the coefficient of interest, $win{*}lottery$ is significant for both, expenditures in levels and in logs. However, this effect is negative for expenditures in levels, whereas for logarithms the esteimated effect is possive as one would expect. Therefore, we keep the log-especification for our analysis. In addition, if we look at the F-tests for the instruments, we observe that in both cases, reported coefficients are significant and greater than 10, which implies that the set of instrumental variables we are using is strong and satisfies the relevance condition, as well as the exogeneity condition which is automatically satisfied by the randomization of the lottery shock.

Table 9: Second stage estimation: consumption in log-levels

	(1) food_in	(2) vice	(3) clothes	(4) house_rent	(5) house_dur	(6) health	(7) car	(8) transport	(9) communication	(10) gambling	(11) leisure	(12) education	(13) food_out	(14) holidays	(15) savings	(16) dur	(17) non_dur
log expenditures	0.725***	0.505***	0.684***	0.979***	1.037***	0.453***	-0.571***	0.549***	1.101***	-0.964***	1.009***	0.406***	0.870***	0.146	-0.294**	1.147***	0.926***
	(14.75)	(4.68)	(7.06)	(18.27)	(15.09)	(4.17)	(-6.19)	(6.34)	(16.13)	(-12.05)	(10.80)	(3.85)	(9.69)	(1.29)	(-2.62)	(17.99)	(15.89)
lottery	-0.108***	0.780***	0.525***	-0.326***	-0.114***	0.945***	1.586***	0.449***	-0.253***	4.373***	0.514***	1.233***	0.421***	1.215***	1.042***	-0.0672*	0.0244
	(-5.28)	(17.40)	(13.03)	(-14.62)	(-4.00)	(20.89)	(41.36)	(12.44)	(-8.90)	(131.42)	(13.22)	(28.07)	(11.28)	(25.80)	(22.31)	(-2.53)	(1.01)
log lottery expenditures	0.0968	-0.781***	-0.428**	-0.120	-0.0846	-0.687***	-1.199***	-0.539***	0.0939	-1.991***	0.215	-0.505**	0.0705	-1.449***	-0.954***	-0.0403	-0.00506
	(1.33)	(-4.90)	(-2.98)	(-1.52)	(-0.83)	(-4.27)	(-8.80)	(-4.21)	(0.93)	(-16.84)	(1.56)	(-3.24)	(0.53)	(-8.66)	(-5.75)	(-0.43)	(-0.06)
log gdp	0.104	-0.672	1.557***	-0.0302	-0.362	1.713***	-0.889*	0.134	1.371***	0.957**	2.024***	3.753***	3.418***	5.733***	-10.75***	-0.0751	0.171
	(0.51)	(-1.51)	(3.89)	(-0.14)	(-1.28)	(3.82)	(-2.34)	(0.37)	(4.87)	(2.90)	(5.25)	(8.62)	(9.23)	(12.28)	(-23.20)	(-0.29)	(0.71)
age	-0.0132***	0.0966***	0.0621***	-0.0148***	0.0112***	0.0527***	0.000892	0.138***	0.00656*	0.00920**	0.0910***	0.0983***	0.0922***	0.0856***	0.118***	0.00337	0.00139
	(-6.04)	(20.21)	(14.44)	(-6.25)	(3.66)	(10.93)	(0.22)	(35.81)	(2.16)	(2.59)	(21.95)	(20.99)	(23.15)	(17.02)	(23.61)	(1.19)	(0.54)
age^2	0.000140***	-0.000890***	-0.000835***	0.000162***	-0.000106***	-0.000383***	-0.0000932*	-0.00162***	-0.0000240	-0.0000674*	-0.00108***	-0.00116***	-0.00113***	-0.00107***	-0.000521***	-0.00000599	-0.0000315
	(6.94)	(-20.18)	(-21.04)	(7.37)	(-3.78)	(-8.61)	(-2.47)	(-45.73)	(-0.86)	(-2.06)	(-28.32)	(-26.88)	(-30.84)	(-23.16)	(-11.33)	(-0.23)	(-1.32)
marital	0.0138***	-0.0613***	-0.0600***	-0.00317	-0.0172**	-0.0724***	-0.0315***	-0.0920***	-0.0274***	-0.0543***	-0.105***	-0.173***	-0.100***	-0.0609***	0.0334***	-0.0106*	-0.000621
	(3.56)	(-7.21)	(-7.84)	(-0.75)	(-3.18)	(-8.44)	(-4.33)	(-13.43)	(-5.08)	(-8.60)	(-14.29)	(-20.80)	(-14.12)	(-6.81)	(3.76)	(-2.11)	(-0.13)
education	-0.00160	0.00410	0.0296***	-0.00856***	0.000268	0.0461***	0.0113**	0.0523***	0.0172***	0.0213***	0.0656***	0.0484***	0.0610***	0.0982***	-0.0923***	-0.00467	0.00351
	(-0.78)	(0.91)	(7.29)	(-3.81)	(0.09)	(10.11)	(2.92)	(14.37)	(6.00)	(6.34)	(16.76)	(10.95)	(16.20)	(20.69)	(-19.60)	(-1.75)	(1.44)
employed	-0.0142*	-0.0339*	0.0675***	-0.00483	-0.00389	0.0410**	0.0127	0.100***	0.0511***	0.0394***	0.0767***	-0.0197	0.169***	0.154***	-0.136***	-0.00105	0.00517
	(-2.30)	(-2.50)	(5.53)	(-0.72)	(-0.45)	(2.99)	(1.10)	(9.16)	(5.94)	(3.91)	(6.52)	(-1.48)	(14.95)	(10.83)	(-9.59)	(-0.13)	(0.70)
retired	-0.00144	-0.439***	0.122***	-0.00799	0.0339	-0.260***	-0.483***	0.151***	-0.00470	-0.411***	0.0798*	-0.821***	0.0819*	0.316***	-0.384***	-0.0129	0.0163
	(-0.08)	(-11.12)	(3.44)	(-0.41)	(1.35)	(-6.51)	(-14.30)	(4.76)	(-0.19)	(-14.04)	(2.33)	(-21.21)	(2.49)	(7.62)	(-9.34)	(-0.55)	(0.76)
_cons	-0.302	3.573*	-4.492**	-1.126	-0.768	-3.836*	8.294***	0.0774	-6.844***	5.765***	-9.427***	-10.62***	-12.54***	-12.24***	35.53***	-1.433	-0.460
	(-0.40)	(2.17)	(-3.03)	(-1.37)	(-0.73)	(-2.31)	(5.88)	(0.06)	(-6.56)	(4.71)	(-6.60)	(-6.58)	(-9.14)	(-7.07)	(20.69)	(-1.47)	(-0.52)
N	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096	211096
r2	0.831	0.517	0.612	0.874	0.802	0.506	0.211	0.693	0.814	0.641	0.633	0.331	0.675	0.346	0.390	0.867	0.855
F	25793.0	5621.5	8270.6	36395.2	21273.8	5378.4	1401.1	11821.6	22939.7	9380.1	9025.3	2591.5	10901.8	2776.4	3355.8	34299.4	31022.2
ll	-313564.8	-479383.0	-456992.1	-331777.3	-384397.3	-481243.6	-446439.3	-433556.1	-383059.6	-416493.4	-449155.4	-475052.4	-440805.5	-489833.6	-488116.7	-368522.4	-349549.4

Region and time fixed effects included.

t statistics in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We find that adjusted total expenditures have an effect in the aggregate of durable and non-durable goods. Despite the effect is statistically significant in both cases, durable goods are sensitive to the income shock, as the estimated coefficient is elastic; and non-durable goods are not as sensitive to the income shock as the estimated coefficient is below one, thus, non-durable goods are inelastic to the lottery income shock. Analyzing goods itself, we find a statistically significant and positive effect as well for the majority of goods, except for *holidays* expenses where the effect is not significant.

Table 10: Labor supply and intergenerational analysis

	(1)	(2)	(3)	(4)	(5)
	Hours Worked	Employed	Employed	Children$_{t+2}$	Children$_{t+2}$
win_region	-0.0755**	-0.00684*	-0.00639	0.00830	0.0175
	(-2.93)	(-2.05)	(-1.73)	(0.54)	(1.07)
lottery	-0.300***	0.0124***	0.00678**	0.0195	0.0202*
	(-22.12)	(6.43)	(3.05)	(1.92)	(1.99)
lottery*win_region	0.208***	0.00219	-0.00281	-0.0423	-0.0393
	(5.55)	(0.46)	(-0.58)	(-1.88)	(-1.82)
log lottery expenditures			-0.00736		-0.00253
			(-0.48)		(-0.03)
log gdp			0.467***		
			(6.47)		
age			-0.00147**		-0.000136
			(-2.60)		(-0.05)
age^2			-0.0000848***		-0.00000233
			(-16.95)		(-0.08)
marital			0.0166***		0.00904
			(15.36)		(1.82)
education			0.0650***		0.000179
			(98.59)		(0.06)
employed					-0.00527
					(-0.50)
retired					0.00486
					(0.17)
_cons	4.190***	0.419***	-1.117***	4.509***	4.192***
	(463.97)	(321.75)	(-5.68)	(682.16)	(4.52)
N	174706	278490	211096	202738	188500
r2	0.00301	0.000225	0.136	0.0000332	0.000249
F	165.7	19.26	847.5	1.999	1.150
ll	-406960.6	-158845.7	-105272.9	-407812.7	-366129.8

Region and time fixed effects included.

t statistics in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We do not find an effect in employability status of the heads of the households due to the lottery income shock. This implies that living in a winning lottery region does not affect individuals' current employment status. However, we find a positive and statistically significant effect for the amount of hours worked; meaning that people in the winning regions tend to work for more hours. On the other hand, we do not find any changes in the family composition due to the lottery income shock.

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