The Sentimental Propagation of Lottery Winnings: Evidence from the Spanish Christmas Lottery*

Morteza Ghomi[1], Isabel Micó-Millán[1], Evi Pappa[2]

[1]Bank of Spain
[2]University Carlos III

October 9, 2023

Abstract

We exploit the Spanish Christmas lottery and consumer confidence survey data to investigate the impact of highly geographically clustered lottery winnings on consumer sentiment and durable consumption. Albeit not receiving lottery prizes, consumers in winning provinces become significantly more optimistic about the Spanish macroeconomic conditions than those living elsewhere. This variation in sentiment is shown to be orthogonal to changes in regional fundamentals and leads to a rise in spending intentions. Young, less educated, low-income, and unemployed individuals react stronger to the lottery shock. At the regional level, lottery wins significantly increase car licenses, reduce unemployment, and intensify job creation and prices.

Keywords: Consumer sentiment, durable consumption, lottery shocks
JEL D12 E21 E32 E62

*Morteza Ghomi: morteza.ghomi@bde.es; Isabel Micó-Millán: isabel.mico@bde.es. Evi Pappa: ppappa@eco.uc3m.es. We thank Yuriy Gorodnichenko, an anonymous referee, Manuel Bagues, Fabio Canova, Juanjo Dolado, Alvaro Escribano, Morten Ravn, Telmo Perez, and Omar Rachedi for useful feedback. We thank SELAE for granting us access to the lottery data and acknowledge financial support for project PID2021-122931NB-I00 of the Spanish Ministry of Education.

1 Introduction

In a classical quote of The General Theory of Employment, Interest, and Money (Chapter 12), Keynes (1936) mentions: "A characteristic of human nature is...that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation." Many studies have revived this idea to show that expectations shape economic behavior (see, e.g. Blanchard (1993)). Among them, Cochrane (1994) rationalized the positive relation between sentiment and economic activity by arguing that sentiment reflects news about future economic conditions while later Beaudry and Portier (2006) have brought this link to the center of macroeconomic research. Yet, most of the existing studies provide indirect evidence of the effects of autonomous changes in sentiments on economic activity. An exception is the work of Lagerborg et al. (2022) which show that sentiments shocks instrumented by mass shootings are an important driver of cyclical fluctuations in the US. Likewise, Mian et al., 2021; Benhabib and Spiegel, 2019) and Gillitzer and Prasad (2018) use variation in consumer sentiment associated with political preferences to investigate whether innovations to consumer sentiment have a causal effect on consumption.

This paper uses some unique features of the Spanish Christmas lottery to estimate jointly the individual and aggregate effects of optimistic sentiments driven by lottery wins. These positive feelings are shared by many people living in the same province which accentuates the role of consumer confidence in the transmission of these postive shocks.[1]. We show that lottery shocks impact significantly on consumers' sentiment leading to demand effects that improve macroeconomic conditions in the winning regions.

The Spanish Lottery has three main characteristics that differentiate it from other existing lotteries: (i) large size and quantity of prizes, (ii) clustering of prizes to individuals living in the same province, and (iii) high level of participation. In particular, rather than awarding a big prize to a few individuals, as in most lottery schemes, the top prizes of the Spanish Christmas lottery are awarded to several individuals sharing the same ticket number who often live in the same geographical area. Since sharing these lottery tickets is a social tradition, participation in this event is extremely high, reflecting that many people tempt luck attracted by its big prizes. On average the winning provinces receive an income shock equivalent to 0.2 percent of their GDP, a figure that goes up to 3.4 percent in the provinces that receive the biggest prize per capita.

We use data from the monthly Consumer Sentiment Survey conducted by the Center of Sociological Research (CIS). Each month around 1,000-1,500 nationally representative households across Spain answer a questionnaire related to their past and intended consumption behavior, as well as to their current views and expectations about their own personal finances and their employment status, considering the evolution of the Spanish labor market and the overall economic outlook of Spain. Following the methodology of the University of Michigan Survey, we construct regional indices of confidence for the current (ICC) and expected macroeconomic conditions (ICE) and show by means of local projections (see, e.g. Jordà (2005)) that confidence reacts positively and significantly on impact to lottery wins at the regional level. To explore in depth the sentimental propagation of

[1]The response of consumption and hours to lottery income for winners has been studied extensively (see, e.g., Imbens et al. (2001), Lindqvist et al. (2020), and Kuhn et al. (2011)) Our focus does not rely on analyzing the effects of the income shock for those households that receive money transfers but rather to investigate the effects of the positive news of the lottery arrival on the overall sentiment in the region where they live.

lottery wins, we use binary choice and ordinal regression models to study the effects of the lottery win on individual sentiment and consumption behavior using the same survey data. We find that lottery wins change significantly consumer sentiment at the individual level. Households become temporarily more optimistic about their current and future income and employment. In addition, they improve their expectations about the evolution of the Spanish economy if they live in a province that won the lottery. Furthermore, households living in regions awarded with the lottery are more likely to report an increase in future durable purchases relative to households not residing in these provinces.

Exploiting regional data on new car licenses as a proxy of car purchases, we also find that lottery wins also stimulate durable consumption in the winning provinces. According to our estimates, the growth rate of car licenses increases by 10 percentage points in winning provinces. This change is comparable with the cyclical changes in the growth rate of car purchases recorded in the NIPA tables by Attanasio et al. (2022). These authors show that movements in the extensive and intensive margins of car purchases may contain valuable information about the forces driving households' choices and the business cycle. Hence, the estimated responses of car licenses to the lottery shock suggest a non-negligible role for the sentimental effects of lottery wins. We also show that lottery wins affect more significantly the sentiment and intended consumption of young, less educated, unemployed, and low-income households and that the effect of lottery wins on sentiment is stronger during recessions.

The improvement in sentiments can be attributed to both news about future economic fundamentals and animal spirits. We try to disentangle these two channels using all available data and provide compelling evidence pointing that lottery wins satisfy the exclusion restriction of having no direct effect on spending intentions. The following reasons stand out. First, given that the probability of being a prize receiver in a winning province is only 0.015 percent, the lottery win is most likely unrelated to both current and future individual income. Second, surveyed households do not report a significant rise in their ability to pay bills after a lottery win, indicating that it does not increase the respondents' individual income. Third, we show that the sentiment reaction is not statistically different between regions that won high vs. low prizes per capita, implying that economic sentiment reacts to the lottery prize news and not to the monetary transfer. Fourth, the Spanish Christmas lottery and in particular its top prize, *El Gordo*, has a long history in Spain; hence, if winning the lottery carries news about a potential economic upturn in the region, rational agents should not expect this expansion to affect the rest of Spain. However, we show that sentiment increases significantly as regards questions related to the evolution of the Spanish economy as a whole which is unrelated to regional fundamentals. This is further confirmed when we look at regions with active secessionist movements, like Catalonia and the Basque Country where people can clearly distinguish between national and regional conditions. Finally, we show that business sentiment does not react significantly to the lottery shock.

Next, we examine the dynamic effects of the lottery shock on macroeconomic conditions using monthly Spanish province-level data. We find that lottery wins have significant and economically important favorable effects. On average, after a province wins a lottery of 1000 euros per capita, the unemployment rate falls sluggishly reaching its maximum drop (-0.3 percentage points) after a year and it remains significantly lower 20 months after the initial impact. We show that this drop in unemployment cannot be attributed to a reduction in participation induced by the wealth effect of the

lottery win. Moreover, it is shown that both the number of short and long-term contracts signed by individuals registered as unemployed in the National Employment Agency and labor market tightness (defined as the ratio of total contracts per number of unemployed) rise significantly and persistently after the lottery prize shock. Furthermore, the price level in the winning province increases persistently reaching its maximum 17 months after the shock, and exhibits a slow mean reversion, returning to its pre-shock value after approximately two years.

It is important to note that we are not the first ones to use the data from the Spanish Christmas Lottery to address economic issues. Bagues and Esteve-Volart (2016) use lottery prizes to identify random increases in provincial income and study how they affect electoral outcomes. They also report significant expansionary effects of lottery wins using annual data and show that the incumbent party tends to obtain relatively more votes in those provinces that won the prize in election years. Similarly, Bermejo et al. (2021) also make use of annual data to find that firm and job creation rises significantly in winning provinces, suggesting that the money windfalls induce supply-side effects, especially in recessions and among firms that are financially constrained. However, we differ from these studies in using more granular and higher frequency (monthly) data to focus the analysis on the sentimental propagation of lottery winnings, a topic that this literature does not directly address.

The remainder of the paper is structured as follows. Section 2 describes the lottery and the data. Section 3 presents the methodology and reports results on the effects of lottery wins on sentiment. Section 4 presents the effects of lottery wins on consumption. Sections 5 provides empirical evidence supporting that our results are not driven by income increases or expected increases in regional fundamentals. Section 6 reports heterogeneous responses to lottery wins. Section 7 reports the macroeconomic effects of lottery wins. Section 8 includes robustness exercises. Finally, Section 9 concludes. An Online Appendix gathers further results discussed in the main text, as well as the output of several robustness exercises.

2 Data

2.1 Spanish Christmas Lottery data

The Spanish Christmas Lottery (*Lotería de Navidad*) is a national lottery scheme that is held on December 22nd of each year since 1812, and is considered one of the biggest lottery events worldwide. Tickets have five-digit numbers and are sold by the National Lottery and Gambling Agency (*Loterías y Apuestas del Estado*). Each number is sold at a cost of €200. The amount of numbers played between 2005 and 2010 was 85,000 and has increased to up to 100,000 numbers since 2011. Each number is printed multiple times in so-called *series* (an average of 170 series per number were printed every year since 2005). Since the €200 tickets may be too expensive for many purchasers, each of the tickets is split into 10 identical sub-tickets (or fractions) sold for €20 known as *décimos* (1/10 of the value of the total ticket). Furthermore, it is very common to buy a share of a *decimo* (between €1 and €5.), called a *participación* (participation in English), through local associations, workplaces, sports teams, etc.

Lottery tickets are sold in official lottery outlets located throughout the country.[2] There are three

[2]Since 2015 lottery prizes can also be purchased online; yet, they only represent about 1% of the total

main prizes: the top prize, popularly known as *El Gordo*, which awards to each fraction holder of the winning number €20,000 per euro played, and the second and third prizes which reward winners with €6,250 and €2,500 per euro played, respectively. Traditionally, a lottery outlet sells most (if not all) of the series of a single number. The Lottery has become a collective game, meaning that Spaniards like to share *decimos* with relatives, friends, or co-workers. This implies that most of the winners of a lottery number usually live in the same area (province or village) and that the main top prizes end up being split as smaller prizes to several individuals living in the same location.

Data on prizes and expenditure on Christmas Lottery by province are assembled using information from the National Lottery and Gambling Agency (*Sociedad Estatal Loterías y Apuestas del Estado*) and the dataset constructed by Bagues and Esteve-Volart (2016).

2.2 Survey data

As regards individual-level data on Spanish confidence, consumption attitudes and individual characteristics, they are all collected from monthly surveys conducted by the Center of Sociological Research (*Centro de Investigaciones Sociológicas-CIS*) from April 2013 to January 2020[3]. The survey, follows closely the methodology adopted by the University of Michigan's Survey of Consumer Confidence and asks 1000-1500 nationally representative households questions related to their past and intended durable purchases and their current views and expectations about their own personal finances, as well as about their employment prospects and the overall economic outlook of Spain.

2.3 Macroeconomic data

Following the methodology of the University of Michigan, we aggregate the answers to the confidence questions across respondents and across questions at the province level to produce two broad indices: the Index of Current Economic Conditions (ICC) and the Index of Consumer Expectations (ICE)[4]. The ICC relates to current sentiment and is based on answers to the questions concerning consumers' assessment of their own current financial and economic situation as well as of the current state of the Spanish economy. The ICE summarizes answers to questions about consumers' expectations for their future household finances, their employment status given the Spanish labor market conditions, and the evolution of the Spanish economy as a whole.

Next data on unemployment and labor contracts by province is obtained at a monthly frequency from the National Employment Agency (*Servicio Público Estatal de Empleo*), while provincial and nationwide CPI, number of mortgages, and population data are obtained from the Spanish Statistical Office (*Instituto Nacional de Estadística*). We obtain also monthly data on employment by province from Social Security Statistics (*Seguridad Social Estadísticas, SSE*). Finally, monthly data on car licenses at the provincial level come from the Spanish Traffic Authority (*Dirección General de Tráfico, Ministerio de Interior*).

Detailed information and descriptive statistics of the data used in the analysis and the construction of the confidence aggregates is available in the Online Appendix A and B.

---

sales.

[3]This time period is the one when the full range of individual characteristics is available.

[4]We focus on provinces with at least 25 respondents and average the responses for every two months to make the sample representative at the province level.

3 Effects of lottery wins on consumer sentiment

3.1 Effects of lottery wins on aggregate consumer sentiment

We start by investigating whether the lottery prize arrival in a region affects aggregate sentiment. To control for potentially confounding events (other than lottery wins) that may affect consumer sentiment in the winning provinces and to provide a more causal interpretation to the results, we use Jordà (2005)'s local projections (LP) for the longest available sample, namely, 2011M11 - 2020M1. For each variable and each horizon $h \geq 0$ we run the following linear LP regression:

$$S_{j,t+h} = \alpha_{j,h} + \beta_h \text{LotteryPrize}_{j,t} + \delta_h \text{LotteryExp}_{j,t-1} + \sum_{k=1}^{12} \psi_{k,h} X_{t-k} + \sum_{s=1}^{12} \lambda_s M_s + \varepsilon_{j,t+h} \quad (1)$$

where $S_{j,t+h}$ is the outcome variable of interest for province j at time $t+h$, $\text{LotteryPrize}_{j,t}$ is after-tax Christmas Lottery prize per capita (in 1000 euros) in province j at time t, and $\text{LotteryExp}_{j,t}$ is the corresponding Christmas Lottery expenditure per capita in province j at time $t-1$.

Note that we include Christmas Lottery expenditures in our regression since this variable might affect the probability of winning the lottery *in a specific province* and therefore helps correctly identify the treatment effect (see also Bagues and Esteve-Volart (2016) and Bermejo et al. (2021)). The Lottery event is random and, thus, the coefficient β_h would identify the causal effect of the lottery shock at time t in province j on consumer sentiment at time $t+h$ in province j. To make sure our results are not driven by local or aggregate shocks that correlate spuriously with the lottery prizes, the vector $X_{j,t}$ includes lags of provincial and aggregate unemployment rates and CPI inflation. To also control for any potential pre-trends in consumer sentiments, we add to our specification in Equation (1) up to one year lags of sentiment indices, province-fixed effects α_j and a set of monthly dummies M_s. All variables are detrended using a fourth-order polynomial.[5] Standard errors are robust and clustered at the province level.

Figure 1 plots the impulse response functions (IRFs) of ICC (left panel) and ICE (right panel) together with 90 and 68 percent confidence bands to the lottery shock. After this shock, both indices significantly increase for up to one year. Since the indices range between 0 and 200, their response implies that winning a lottery prize can change on average the households' sentiment in a province from being completely pessimistic to being completely optimistic about the economic conditions [6].

[5] Results are similar if we use growth rates or detrend the data with the HP filter (see Figures I.3 and I.4 in the Online Appendix).

[6] Similar results hold for the lottery rewards net of expenditure for lottery tickets (See Figure I.5 in the Online Appendix). We also investigate whether lottery expenditure is endogenous to sentiment by testing whether past values of the sentiment indices affect the per capita lottery expenditure in the Online Appendix A.4. Results do not support any significant reverse causal relationship.

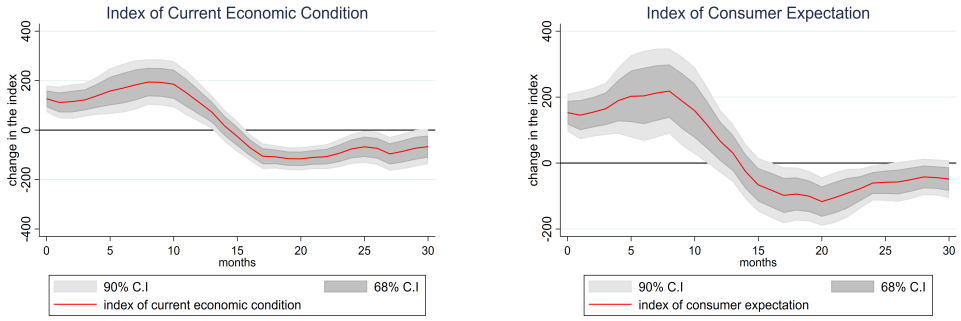


Figure 1: Effect of Christmas Lottery Prizes on Aggregate Sentiment

Note: IRFs to Christmas Lottery prizes shock in the LP model (1) for the index of consumer current condition, ICC (left) and the index of consumer expectation, ICE (right). Standard errors are robust and clustered at the province level and IRFs are smoothed by centered moving average.

The first-stage F-statistic strongly rejects the null hypothesis that the lottery awards have no explanatory power for consumer confidence. For ICC, it is equal to 42.7 on impact, and to 23.6 one month after the shock, while for ICE the corresponding values are 10.8 and 65.0, respectively (see Online Appendix, Table I.1). Hence, lottery wins stimulate average sentiment significantly in the short run. Bagues and Esteve-Volart (2016) find that the incumbent party tends to obtain relatively more votes in the provinces that won the lottery and attribute this effect to a temporary increase in happiness that makes voters more lenient toward the incumbent. We confirm their intuition using survey data and provide direct evidence of the effects of lottery awards on economic sentiment.

3.2 Effects of lottery wins on individual sentiment

To reinforce the credibility of the aggregate indices results, we next look at the response of individual sentiment to lottery wins by exploiting survey responses mapped to Spanish regions. In this subsection, we analyze whether those households living in awarded provinces tend to be more optimistic about their current and future household finances and employment prospects, as well as about the current and future evolution of the general economic conditions in Spain. We estimate the following ordered probit model:

$$c_{i,j,t,s} = \alpha + \beta \text{LotteryPrize}_{j,t,s} + \delta \text{LotteryExp}_{j,t,s} + \gamma X_{i,j,t,s} + \zeta_{j,s} + \epsilon_{i,j,t,s} \tag{2}$$

where $c_{i,j,t,s}$ denotes the survey responses of individual i in province j at year t and month s regarding economic sentiment, $\text{LotteryPrize}_{j,s,t}$ is a dummy variable that takes the value of 1 if Christmas Lottery income is awarded in the province j at year t and month s and $\text{LotteryExp}_{j,t,s}$ is the corresponding expenditure on the Lottery in per capita terms.

Although the Christmas Lottery event is genuinely random and, thus, the coefficients β would identify the causal effect of the lottery shock on individual sentiment in a winning province, individual characteristics and economic conditions are likely to be also relevant in determining sentiment and household consumption (see also Benhabib and Spiegel (2019); Mian et al. (2021)). For that reason, we include as further controls a vector of individual characteristics ($X_{i,j,t,s}$) comprising age, gender, marital status, education level, employment status, and household income. Finally, we also add a set

of month times province dummies ($\zeta_{j,s}$) to control for regional shocks affecting sentiment.

Table 1: Survey evidence on the effects of Christmas Lottery on consumer sentiment

	(1)	(2)	(3)	(4)	(5)	(6)
	Household Income	Future Household Income	Employment Prospects	Future Employment Prospects	Spanish Economy	Future Spanish Economy
Lottery Prize Dummy	0.119***	0.131***	0.180***	0.099**	0.113***	0.108**
	(0.045)	(0.037)	(0.053)	(0.050)	(0.040)	(0.043)
Lottery Expenditures	23.922***	14.205***	6.076**	-18.748***	-5.767*	-15.075***
	(3.236)	(2.966)	(2.385)	(2.819)	(3.265)	(2.981)
Month × Province Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Individual Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Observations	117476	112951	112047	106086	114776	109441
Pseudo R^2	0.051	0.041	0.025	0.014	0.022	0.014

Note: Robust standard errors clustered by province are reported in parentheses. Significance * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1 presents the estimation results of Equation (2) for the answers related to current and future household income (first and second column), current and future employment prospects based on the evolution of the labor market in Spain (third and fourth column) and current and future economic conditions in the Spanish economy (last two columns). The estimates clearly suggest that lottery wins affect significantly and positively consumers' sentiment about current and future economic conditions for all the variables they are asked about.

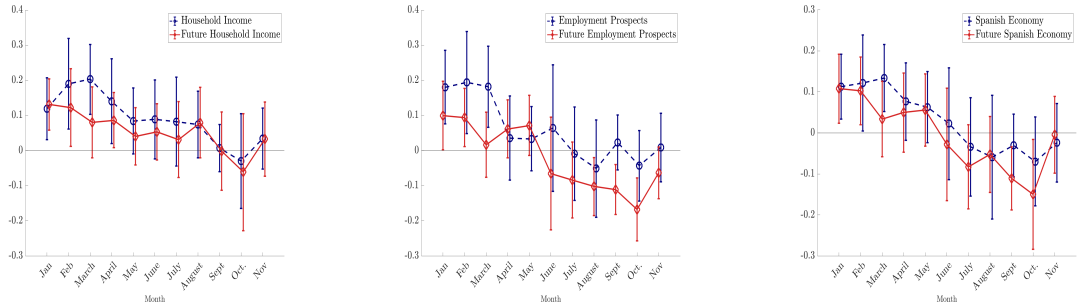
Following the analysis of the aggregate indices, we next examine the persistence of the sentiment responses to the lottery win. To do so, we first redefine our treatment variable, $LotteryPrize_{j,t,s}$, to vary across provinces and months and interact it with monthly dummies $M_{s,t}$. Thus, our baseline empirical specification in Equation (2) is modified as follows:

$$c_{i,j,t,s} = \alpha + \sum_{s=1}^{11} \beta_s(\text{LotteryPrize}_{j,t} \times M_{s,t}) + \delta \text{LotteryExp}_{j,t,s} + \gamma X_{i,j,t,s} + \zeta_{j,s} + \epsilon_{i,j,t,s} \tag{3}$$

The interaction term $\sum_{s=1}^{11} \beta_s(\text{LotteryPrize}_{j,t} \times M_{s,t})$ takes value 1 in those provinces awarded with the Christmas Lottery not only in January but also in the subsequent months of the lottery draw. This captures the dynamic effects of the lottery shock on sentiment for those households living in the winning regions compared to households residing in the non-winning regions.

Figure 2 plots the β_s coefficients and their 95% confidence intervals from estimating Equation (3) using an ordered probit model where the dependent variable is each of the six consumer sentiment questions. The positive effect on sentiment for those households living in the winning provinces is instantaneous and dies out after five (six) months for current (future) household income (see Panel 2a). Consumers become also more optimistic about their current and future employment perspectives. While their sentiment about current labor conditions persists, their expectations about future employment subdue two months after the lottery shock (See Panel 2b). Similarly, Panel 2c shows that household sentiment for the current and future state of the Spanish economy increases significantly on impact and one period after the lottery award and tones down in the subsequent

months.



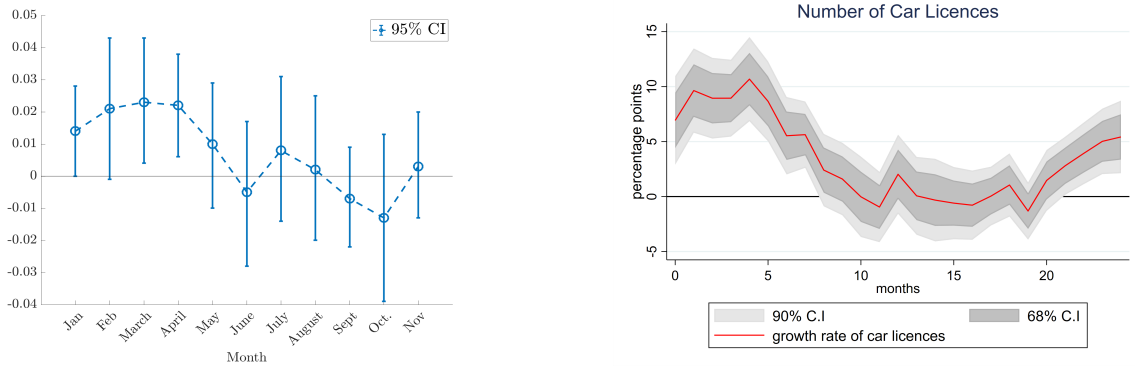
(a) Household Income **(b)** Employment Prospects **(c)** Spanish Economy

Figure 2: Dynamic effects of Christmas Lottery on consumer sentiment

Note: The figures plot the β_s coefficients and their 95% CI from estimating equation (3) using a ordered probit model.

4 Lottery wins and durable consumption

Changes in expectations about future economic conditions have traditionally been considered an important source of variation in consumer spending (see, e.g., Gillitzer and Prasad (2018)). In this respect, the survey respondents, apart from being asked about their expectations, are also asked about whether they plan to increase, maintain or decrease their durable consumption in the next 12 months (*intended durable consumption)*. Figure 3a plots the marginal effects associated with the β_s coefficients and their 95 percent confidence intervals when estimating an ordered probit model with intended consumption as the dependent variable in Equation (3). The estimated results suggest that living in provinces awarded with the Christmas lottery significantly increases the probability of households reporting an increase in future consumption by 2-3 percentage points in the next four months after the lottery win.



(a) Intended Durable Purchases **(b)** Growth rate of car licenses

Figure 3: Effects of Christmas Lottery on intended household durable consumption and car licenses

Note: The left panel plots the marginal effects associated to the β_s coefficients and their 95% CI from estimating Equation (3) using an ordered probit model. The right panel plots IRFs to Christmas Lottery prizes in the LP model (1) for the year-to-year growth rate of new vehicle licenses. Standard errors are robust and clustered at the province level and response functions are smoothed by centered moving average.

In addition, survey respondents are also asked whether they have purchased any durable goods in the past six months (*realized durable consumption*). Yet, given that it is very difficult to pin down the exact timing of the consumption responses using this survey question, we have resorted to regional monthly car licenses data provided by the Spanish Traffic Authority between 2010 and 2017 to analyze how the lottery affects actual durable consumption. In particular, we investigate how the year-to-year growth rate of car licenses responds to the lottery win using LP to estimate a similar specification to Equation (1).

Figure 3b plots the impulse responses of the year-to-year growth rate of car licenses to the lottery shock. As can be seen, there is a clear rise in new vehicle licenses in winning provinces during the first six months after the lottery win[7]. In particular, the growth rate of car licenses increases significantly on impact by around 7 percentage points, followed by 10 percentage points five months after the shock while it starts declining thereafter. Our estimates are somewhat comparable to those reported by Attanasio et al. (2022) who show, using NIPA data, that car purchases' year-to-year growth in the US dropped by 24% in 2008Q4 and between 10% and 20% around NBER recessions. Combining our results with the theory developed in Attanasio et al. (2022) pointing that movements in the extensive and intensive margins of car purchases may contain valuable information about what drives the business cycle, we conclude that the magnitude of the sentimental effects of lottery wins we report are not negligible[8].

So far, we have shown that lottery wins spur sentiment and consumption expenditures. However, we have not linked the responses of these two variables. In the Online Appendix we study the joint responses of intended durable consumption and consumers' expectations in the survey and show that individuals tend to give positive answers to both questions, indicating that sentiment responses are related to the demand for durable goods at the individual level (see Figure D.1).

5 Disentangling real from sentiment effects from lottery wins

5.1 Disentangling income vs sentiment effects

Given that lottery wins involve monetary transfers for some households living in the winning province, it is in principle very difficult to disentangle whether the effects we report come from sentiment or from monetary transfers to the lucky inhabitants. However, the probability of being a winner of any of the top Christmas lottery prizes in a winning province is 0.015 percent which is very low, implying that the surveyed households are very unlikely to be lottery winners. Fortunately, we have a more direct way to examine whether this is the case in our sample. The CIS asks survey participants the following question about the households' ability to pay bills: *Which of the following assertions describes best the economic situation of your household with respect to your ability to pay bills?*. The answers vary between 1 and 5 with items from 1 "*Struggle to pay bills and have to take debt*" to 5 "*Get easily to the end of the month and manage to save a lot.*" If lottery wins involve monetary

[7] Figure C.1 in the Online Appendix shows that the question on realized durable consumption also picks six months after the lottery award, while Figure C.2 shows that the realized consumption of vehicles and furniture and large appliance are the items that increase significantly after a lottery win. Given the number of coefficients in those regressions, we perform multiple hypotheses testing to ensure there are no false positives.

[8] Given the absence of publicly available data on non-durable consumption, we show that lottery wins increase retail sales and Google searches for restaurants in the Online Appendix (see Figure I.10)

transfers, they should affect the respondents' answers to this question. In effect, one should expect survey respondents to improve significantly their current ability to pay bills if they happen to be one of the lottery winners in the region. We show that wins do not alter significantly the ability to pay bills of the surveyed households, suggesting that our results do not stem from changes in the wealth of the surveyed households (See Table E.1 in the Online Appendix). Moreover, the amount of money won in the lottery is irrelevant for the reaction of sentiment. We repeat our exercise by distinguishing between provinces that win high lottery prizes per capita and those that win smaller amounts. We show that the treatment effect of winning the lottery is similar for provinces that won more than the average prize per capita and those receiving smaller prizes (See Table E.2 in the Online Appendix). Both exercises suggest that our results are not be driven by direct wealth effects.

5.2 Lottery wins and news about fundamentals

Although lottery wins do not imply monetary transfers for the majority of agents living in the province, they can still bring news about changes in economic fundamentals at the regional level. This implies that our results on the effects of lottery shocks on economic sentiment do not operate through a simple increase in optimism but rather through the news about improved regional economic fundamentals after the lottery win. The Spanish Christmas lottery is, after all, an event with a long historical tradition and agents in the winning provinces might expect an improvement in the economic activity of their regions due to the increase in wealth of the winners, or precisely because they expect demand or supply conditions to improve. Obviously, this is a more difficult concern to tackle.

Using data on business confidence that are available at the quarterly frequency for seven Spanish autonomous communities with a unique province, we first show that the Harmonised Business Confidence Index from the Spanish Statistical Office does not react to lottery wins (See Figure F.2 in the Online Appendix). Next, we argue that even if lottery wins represent good news about economic stimulus at the local level, households should not get optimistic about the overall state of the Spanish economy. To formalize this argument, we construct aggregate indices for the individual questions about future personal finances, future employment outcomes, and the future of the Spanish economy, and investigate how sentiment about those different issues moves on average after a lottery win. We present estimates in the Online Appendix that demonstrates that all indices react significantly to the lottery win on impact (See Figure F.3) [9]. If the lottery win was a signal about changes in local demand, when asked about the Spanish macroeconomic conditions, one should expect rational respondents to be less optimistic. Instead, the data suggests that survey respondents change radically their sentiment about the future Spanish economy after a lottery win. Yet, one might argue that the increased optimism about the prospects of the Spanish economy in the winning regions is driven by agents being unable to disentangle local from national demand shocks. To investigate this hypothesis, we exploit the presence of active secessionist movements in the provinces of Catalonia and the Basque Country. Political attitudes shape perceptions of national economic conditions (Duch et al., 2000) and economic arguments have been playing a major role in the discourse of those movements (Muñoz and Tormos, 2015). Therefore, households living in Catalonia or the Basque Country should be able to disentangle news about regional from news about national fundamentals. We test whether

[9] In addition, Table F.1 in the Online Appendix presents the first stage F-statistics for the different sentiment questions. Sentiment about the Spanish economy is significantly more responsive to lottery news relative to sentiment about personal finances and employment prospects.

the treatment effect of winning the lottery differs significantly between these regions and the rest of Spain (see Section F.3 in the Online Appendix for details on the empirical specification). We illustrate in the Online Appendix (Table F.2) that the sentimental effects of lottery winnings are not significantly different in regions with secessionist movements. Hence, the boost in sentiment seems the only plausible explanation for the positive reaction of consumer confidence about the Spanish economy after lottery wins.

The evidence we report suggests that while lottery wins seem to be related to economic sentiment, they seem unrelated to changes in individual economic fundamentals, or news about future regional fundamentals. With this evidence at hand, we can proceed to evaluate at the individual level the causal effect of changes in sentiment on individual intended consumption. Following Gillitzer and Prasad (2018), we employ an IV strategy and use the lottery prize dummy variable as an instrument for changes in consumer sentiment. The Online Appendix collects results (See Table F.3) that show that lottery wins are a strong instrument for shifts in sentiment about future economic conditions and that such shifts affect significantly spending intentions.

6 Heterogeneous Effects

How individuals react to exogenous variations in income can depend on their characteristics. For example, it might be that some individual traits make individuals more susceptible to changes in their sentiment. We investigate this hypothesis by allowing for an interaction effect between the lottery prize dummy and individual characteristics and looking at whether these interactions matter in explaining consumers' sentiment dynamics in response to the lottery prize shocks.

The results of these regressions for the questions related to future economic conditions are collected in Tables G.1 to G.3 in the Online Appendix. Although the lottery prizes do not seem to affect asymmetrically the different individual groups for future income (see Table G.1), when asked about their future employment prospects, households with older, richer, more educated, and employed members appear to be significantly less optimistic (see Table G.2). The lottery shocks consistently drive the increases in younger individuals' sentiment about their future employment and the sentiment of female respondents. When forming expectations about the future of the Spanish economy, (see Table G.3), all individuals become more positive after a lottery win, but higher income and more educated households tend to be less optimistic about the evolution of the Spanish economy. In accordance with the sentiment responses, households that are not employed, that have low income, and have only a high school diploma change significantly their intended consumption responses after a lottery shock (See the estimates presented in Figure G.1 in the Online Appendix).

7 Regional macroeconomic effects of lottery wins

In this section, we report how lottery wins propagate in the local economy. Following the specification for aggregate sentiment indices in Equation 1, we identify the causal effect of an exogenous lottery win at time t in province j on different regional macroeconomic outcomes at time $t+h$ in province j for the longest possible sample we have available, that is, 2005M5 - 2020M1. All variables in the

aggregate regressions are detrended using a fourth-order polynomial.[10] As before, standard errors are robust and clustered at the province level.

Figure 4 presents the dynamic responses of the province-level unemployment rate, CPI, and total provincial labor contracts to a thousand euros of per capita lottery rewards shock (rewards are expressed in constant prices to take into account possible changes in inflation), together with their respective 68 and 90 percent confidence bands. As can be observed, lottery prizes do not affect the unemployment rate on impact. It takes approximately half a year for the unemployment rate to react to the shock. Provincial CPI prices also respond sluggishly, lifting significantly seven months after the initial shock and remaining above the mean for almost two years after the winning.

The significant drop in the unemployment rate after lottery wins could be attributed to a fall in labor force participation stemming from the positive wealth effect of the lottery wins. Since the data for participation is not available at monthly frequency by province, we use the total number of short and long-run contracts signed by workers registered as unemployed in the National Employment Agency as a close proxy to changes in vacancies and employment. Figure 4 shows that the share of total contracts over the working population increases after the lottery shock, providing further evidence for the improvement in the labor market conditions[11].

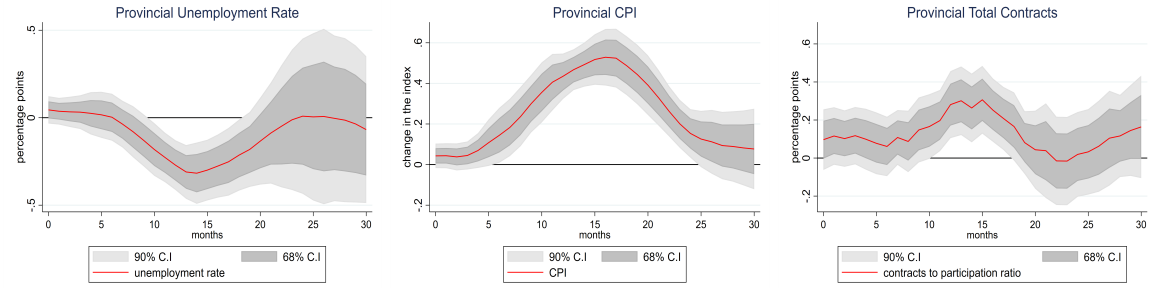


Figure 4: Effect of Christmas Lottery prizes on unemployment, CPI and total contracts

Note: This Figure displays impulse responses to Christmas Lottery prizes. Standard errors are robust and clustered at the province level and response functions are smoothed by a centered moving average.

Our results in this section confirm partially and extend the results of Bagues and Esteve-Volart (2016) and are compatible with the results of Bermejo et al. (2021) that document a higher firm creation in winning provinces using annual data. Although our results are compatible with theirs, since higher firm creation could drive the increase in job vacancies and the fall in unemployment we report, the mechanism we put forward is different. The sentimental responses to the lottery win indicate that a demand effect is clearly operative.

[10] Results are robust to variations of the specification regarding the detrending method, alternative variable definitions as well as the sample period, see Figures I.3 and I.9.

[11] In the Online Appendix we also present responses for short vs long term contracts and labor market tightness (Figure I.8). We also examine the effects of lottery wins on house prices and mortgages. Contrary to Kent and Martinez (2020) and in accordance to Bagues and Esteve-Volart (2016), we detect no effect of the lottery shock on rental prices or mortgages at any short horizon (Figure I.11). We also perform the IV exercise at the regional level and use lottery wins as an instrument to identify the causal effects of autonomous changes in sentiment in the local economy. Unemployment and CPI react significantly to the identified shock (See Figure F.4 in the Online Appendix).

8 Robustness exercises

We have performed several exercises to examine the robustness of our results that are presented in the Online Appendix (see, J.1-J.14). First, we have shown that our results are robust to including in the lottery prizes El Niño (The Kid) lottery that takes place on the 6th of January. Given the proximity of the two lotteries, ignoring El Niño might cast some doubts on the results we present since the provinces we considered as the control group in our regressions might have been treated with monetary transfers coming from the El Niño lottery. Our main results survive the data extension.

Second, we examine the possible presence of spillover effects by replacing data of the winning province in Equation (1) with data of the region (autonomous community) to which the province belongs. For example, instead of running regressions using Barcelona as the economic unit, we instead replace this with data for Catalonia. In line with Bagues and Esteve-Volart (2016), the results do not support any significant spillover effects in neighboring provinces for the unemployment rate, while a moderate increase in CPI at the community level is observed. We also show that results are similar when we aggregate data at quarterly level.

Results on the sentimental effects of lottery wins also survive a number of robustness checks including pre-trend controls, placebo lottery prizes, the exclusion of outliers, alternative definitions of the lottery prize variable, as well as excluding the two most frequent winning provinces over our sample period (Madrid and Barcelona), or regions with lottery outlets that have a winning tradition (Madrid and Lleida). We also examine both at the aggregate and the individual level whether our findings stem from a redistribution mechanism from rich to poor provinces in Spain. Both analyses suggest that the nature of the experiment we are considering talks more about changes in sentiment due to positive news and less about regional redistribution. Finally, addressing the criticism of Canova (2020) on cross-sectional estimates, we estimate the effect of a lottery shock unit by unit, to then compute a cross-sectional average, finding that our results are robust to adopting the proposed methodology.

9 Conclusions

According to our analysis, the Spanish Christmas lottery prizes stimulate economic activity in the winning regions and their propagation works through sentiment. Lottery winnings induce significant demand effects that lead to an increase in car purchase growth, a reduction in unemployment, a rise in job vacancies, and moderate increases in CPI prices at the province level. Households living in provinces awarded by the lottery, although they do not directly receive any prizes and do not perceive any change in the regional fundamentals, become more optimistic about the future economic conditions in Spain on impact and increase their intended consumption responses.

Our findings square well with the theory developed in Pappa et al. (2023) on sentiment-driven cycles. They show that the countercyclicality of earnings risk induces sensitivity to sentiment shocks. The evidence we report gives further support to the presence of countercyclical earning risk especially for young, low educated, low-income, and unemployed individuals.

References

Aguiar, M., Hurst, E., Karabarbounis, L., 2013. Time use during the great recession. American Economic Review 103, 1664–1696.

Attanasio, O., Larkin, K., Ravn, M.O., Padula, M., 2022. (s)cars and the great recession. Econometrica 90, 2319–56.

Bagues, M., Esteve-Volart, B., 2016. Politicians' luck of the draw: Evidence from the spanish christmas lottery. Journal of Political Economy 124, 1269–1294.

Beaudry, P., Portier, F., 2006. Stock prices, news, and economic fluctuations. American Economic Review 96, 1293–1307.

Benhabib, J., Spiegel, M., 2019. Sentiments and Economic Activity: Evidence from U.S. States. Economic Journal 129, 715–733.

Bermejo, V.J., Ferreira, M.A., Wolfenzon, D., Zambrana, R., 2021. Entrepreneurship and regional windfall gains: Evidence from the spanish christmas lottery .

Blanchard, O.J., 1993. Consumption and the Recession of 1990-1991. American Economic Review 83, 270–274.

Browning, M., Crossley, T.F., 2009. Shocks, stocks, and socks: Smoothing consumption over a temporary income loss. Journal of the European Economic Association 7, 1169–1192.

Canova, F., 2020. Should we trust cross sectional multiplier estimates? Journal of Applied Econometrics .

Cochrane, J.H., 1994. Shocks. Carnegie-Rochester Conference Series on Public Policy 41, 295–364.

Duch, R.M., Palmer, H.D., Anderson, C.J., 2000. Heterogeneity in perceptions of national economic conditions. American Journal of Political Science , 635–652.

Gillitzer, C., Prasad, N., 2018. The effect of consumer sentiment on consumption: Cross-sectional evidence from elections. American Economic Journal: Macroeconomics 10, 234–69.

Imbens, G.W., Rubin, D.B., Sacerdote, B.I., 2001. Estimating the effect of unearned income on labor earnings, savings, and consumption: Evidence from a survey of lottery players. American Economic Review 91, 778–794.

Jordà, O., 2005. Estimation and inference of impulse responses by local projections. American Economic Review 95, 161–182.

Kent, C., Martinez, A., 2020. When a town wins the lottery: Evidence from spain. mimeo Standford University .

Keynes, J.M., 1936. The General Theory of Employment, Interest, and Money. Palgrave Macmillan, United Kingdom.

Kuhn, P., Kooreman, P., Soetevent, A., Kapteyn, A., 2011. The effects of lottery prizes on winners and their neighbors: Evidence from the dutch postcode lottery. American Economic Review 101, 2226–47.

Lagerborg, A., Pappa, E., Ravn, M.O., 2022. Sentimental Business Cycles. The Review of Economic Studies Rdac053.

Lindqvist, E., Östling, R., Cesarini, D., 2020. Long-run effects of lottery wealth on psychological well-being. Review of Economic Studies 87, 2703–2726.

Mian, A., Sufi, A., Khoshkhou, N., 2021. Partisan Bias, Economic Expectations, and Household Spending. The Review of Economics and Statistics , 1–46.

Muñoz, J., Tormos, R., 2015. Economic expectations and support for secession in catalonia: between causality and rationalization. European Political Science Review 7, 315–341.

Pappa, E., Ravn, M.O., Sterk, V., 2023. Chapter 19 - expectations and incomplete markets, in: Bachmann, R., Topa, G., van der Klaauw, W. (Eds.), Handbook of Economic Expectations. Academic Press, pp. 569–611.