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How Do Cash Windfalls Affect Entrepreneurship? Evidence from the Spanish Christmas Lottery

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Abstract

We show cash windfalls affect the real economy by spurring entrepreneurship. We identify these effects using the Spanish Christmas Lottery, which provides a unique setting as prizes are geographically concentrated and distributed among thousands of households. We find higher start-up entry, job creation, and self-employment in winning regions. Consistent with a financial constraints channel, results are strongest in sectors relying on external finance and regions with limited credit access. Newly created firms are larger, more profitable, and survive longer. For existing firms, however, growth and profitability do not respond to lottery awards, but wages increase due to tighter labor markets.

I. Introduction

Entrepreneurship is a fundamental force for economic prosperity and job creation (Haltiwanger, Jarmin, and Miranda (2013)). While there is a large body of research suggesting that economic conditions can play an important role in the creation and growth of new businesses, the causal impact of economic conditions

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on entrepreneurship is not well-established empirically.[1] Establishing causality from economic conditions to entrepreneurial activity is challenging because many (potentially unobserved) drivers of economic activity also influence entrepreneurship. In addition, data availability hinders the analysis of entrepreneurial activity, as small and medium-sized firms are mostly private.

This article overcomes these challenges by using detailed firm-level data on the population of Spanish firms and using large shocks to local economic conditions provided by a unique randomized natural experiment: the Spanish Christmas Lottery. Specifically, we use regional variation in lottery prizes to investigate the effects of exogenous cash windfalls on business entry, job creation, self-employment, and firm growth dynamics. We find that cash windfalls affect the real economy by spurring entrepreneurship. We conclude that, while the decision to start a new business depends heavily on the financial constraints of the founder, the decision to expand an existing business depends more on the potential investment opportunities that arise after a local income shock.

Several features of the Spanish Christmas Lottery—the biggest lottery worldwide—make it suitable for this study. First, the lottery prizes are large and have an economically significant impact. The winning province experiences an average cash windfall equivalent to almost 6% of its gross domestic product (GDP). Second, winners are geographically concentrated as each ticket number is typically sold by one lottery outlet, and most prizes are collected in the province where tickets are sold. This concentration generates significant variation in lottery prizes across the 50 provinces in Spain, which we will exploit in our empirical strategy. Third, the lottery prize is distributed among several thousand people sharing the same ticket number.[2] Moreover, lottery players are likely to be ordinary citizens because the lottery is a social event; about 75% of the Spanish population participates. This mitigates the concern that the effect we measure is driven by the behavior of gamblers, which might differ from that of an average individual. Finally, the lottery is played annually on the same day of the year, regardless of economic conditions. This is an advantage over alternative cash windfall events used in the literature, like tax rebates, which are policy instruments and are, therefore, closely contingent on economic conditions.

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[1]Using a panel of 22 OECD (Organization for Economic Co-operation and Development) countries, Koellinger and Thurik (2012) study the relation between the business cycle and the rate of entrepreneurial activity in a country. Lee and Mukoyama (2015) also examine the patterns of firm entry and exit over the business cycle and find that entry rates differ significantly during booms and recessions. Clementi and Palazzo (2016) show that the number of entrants increases following a positive productivity shock.

[2]On average, there are between 1,600 and 16,000 holders of the winning number. Moreover, according to survey data, 87% of people participate through a syndicate, and people share their ticket price with relatives (64%), friends (33%), or co-workers (28%).

The key assumption in our empirical strategy is that *conditional* on expenditures on lottery tickets by province, the winning province is randomly assigned. It is important to condition on lottery expenditures as, unconditionally, the probability of winning could be correlated with entrepreneurship. This correlation could arise if the conditions that prompt individuals to buy lottery tickets are the same as those that spur entrepreneurship (e.g., low-risk aversion). If that were the case, residents of more entrepreneurial provinces would buy more tickets and, thus, be more likely to win. Indeed, we show that a province's probability of winning the lottery is a function of observables, such as provincial inflation, unemployment, and GDP per capita. After we control for lottery expenditures, however, no macroeconomic variable has any explanatory power to predict the lottery prize. Thus, conditional on lottery expenditures, the provincial cash windfalls generated by the lottery are likely exogenous.

We find that lottery prizes have a positive and significant effect on entrepreneurial activity. The number of new firms and jobs created by startups increases significantly in winning provinces. We estimate that the firm entry rate increases by 0.23 percentage points and the job creation by startups increases by 3.3 percentage points for every €1000 of lottery prize per capita. To generalize the magnitude of our effect beyond the lottery setting, we estimate the effect of *disposable income* on entrepreneurship by instrumenting household disposable income with the provincial lottery prize. First, we estimate that every euro of lottery prize from a ticket sold by an outlet in a province leads to an increase in disposable income of 83 cents. In addition to showing a strong first-stage relationship, this result confirms that most prizes are collected by households in the province where the tickets are sold. Second, we estimate that a shock of €1000 in disposable income increases firm entry by 0.29 percentage points. This indicates that a one-interquartile-range increase in disposable income per capita (€3760) leads to the creation of 271 firms per province and year. This effect represents about 13% of the average number of new firms created in a province annually. The same shock to disposable income increases job creation by startups by 16%, representing about 1000 new jobs per province and year.

Multiple mechanisms may drive the effect of lottery prizes on entrepreneurship. The lottery shock can encourage firm creation by reducing entrepreneurs' financing constraints, increasing local demand, or affecting individuals' risk aversion. We discuss whether any of these potential mechanisms are at play in our setting. We analyze how financial constraints interact with entrepreneurs' ability to pursue investment opportunities using different measures of external finance dependence and access to credit. Consistent with the view that financial constraints can restrict firm entry and post-entry growth, we find a larger impact of the lottery on sectors that rely more on external finance and provinces with poorer credit access.

We do not find evidence supporting the view that higher local demand or lower risk aversion are the main drivers of the increase in entrepreneurship. Indeed, the lottery effect is similar in industries that rely heavily on local demand (i.e., nontradable industries) and industries that rely less on local demand (i.e., tradable industries). In addition, we do not find that local sales growth drives the effect of lottery prizes on firm entry. One explanation for this result may lie in the low extent

to which lottery winners consume goods and services produced in their province of residence.[3] In addition, while lotteries with very large prizes can have an effect on an individual's risk aversion, the lottery prizes in our setting are relatively small per individual. Hence, the risk aversion channel is unlikely to be operative in our setting. Our evidence also does not support other alternative mechanisms, such as economic sentiment. Using individual-level survey data, we find that consumer confidence and economic expectations in awarded provinces are not affected after lottery awards. Thus, we conclude that local demand, risk aversion, and economic expectations do not seem to be the main drivers of our effects.

Next, we examine the characteristics of the newly created firms as a response to the lottery shock. We use novel and detailed firm-level data covering financial information on over 2.5 million public and private Spanish firms. We follow firms created in winning provinces and compare them with new firms created in the same year in non-winning provinces. Compared to new firms created in non-winning provinces, firms created in winning provinces are larger, pay higher wages, and are more profitable for at least 4 years after they are established. In addition, firms created in winning provinces survive longer, which supports the notion that the effects are persistent. In sum, a large cash windfall leads to more entrepreneurial activity, and the newly created firms in winning provinces are of higher quality than newly created firms in non-winning provinces.

We further explore the impact of local cash windfalls on incumbent firms. We show that cash windfalls do not affect the incumbent firms' profitability or their decisions to grow in terms of assets and employment. However, incumbents increase wages in response to the increase in labor demand driven by the newly created firms in the province. We perform a battery of tests to get a better understanding of the limited effects of the lottery on existing firms' growth. We argue that the relatively small size of the lottery prizes, their modest impact on local demand due to the economic openness of Spanish provinces, and the different characteristics of entrepreneurs who create new businesses as a response to lottery shocks, all contribute to this limited response. These findings suggest that, unlike with startup entry, the decision to expand an existing business depends more on the potential investment opportunities that arise after a local cash windfall.

Lastly, we study the effect of the lottery on self-employment and explore the characteristics of the individuals who react to these cash windfalls. We find that women, individuals above 40, those who hold a single job, and those who manage businesses with multiple employees are more responsive to lottery prizes. We also find a significant and positive effect on self-employment in the services sector, as well as in manufacturing, which is less sensitive to local demand. This analysis complements our main findings in two ways. It provides insights into the types of businesses and the unique characteristics of entrepreneurs that react to cash windfalls, and it offers additional evidence on the potential channels driving our results.

Our study contributes to several strands of the literature. First, the literature has shown that both a relaxation of financial constraints and an increase in local demand

[3]Bagues and Esteve-Volart (2016) do not find price increases in provinces awarded with the Spanish Christmas Lottery. They argue that the low impact of lottery prizes on local demand is because the majority of goods and services in Spain are imported from other regions.

may affect firm creation. Adelino, Schoar, and Severino (2015) and Schmalz, Sraer, and Thesmar (2017) show that financial constraints impair firm creation using shocks to the value of real estate collateral due to variations in housing prices. Our study differs as the lottery is a shock to *liquid* wealth. Thus, the response to our shock is expected to differ as it does not require a financial intermediary to lend to the entrepreneur against the increased value of her housing collateral.[4]

Second, we contribute to the literature that studies the impact of cash windfalls on entrepreneurial activity. Using a setting where retailers receive bonuses for selling jackpot-winning tickets, Cespedes, Huang, and Parra (2021) find a positive impact of these individual cash windfalls on both new business creation and the revenue and employment growth of existing businesses. Using a natural experiment in Denmark, Andersen and Nielsen (2012) show that businesses that started following a wealth windfall from inheritance exhibit poorer performance than otherwise similar entrepreneurs. Our study differs, as the Spanish Christmas Lottery players are more representative of the average citizen than small retailers or individuals who receive an inheritance. Bellon, Cookson, Gilje, and Heimer (2021) find that individual cash windfalls from shale oil and natural gas extraction in the United States increase business formation but do not affect transitions to self-employment. Instead, we find a significant effect on self-employment. The reason for the different results lies in the magnitude of the shock. Our article considers a large regional shock that increases the demand for labor and tightens the labor market. This, in turn, lowers the risk of transitioning to self-employment by facilitating a smoother re-entry into paid employment, should the need arise.

Third, other studies analyze the impact of economic shocks on business outcomes and employment growth (Adelino, Ma, and Robinson (2017), Bernstein, Colonnelli, Malacrino, and McQuade (2022)). Our study differs as our firm-level detailed data, combined with exogenous cash windfalls from the Spanish Christmas Lottery, provide us with a rich setting to compare the different responses by entrepreneurs, self-employees, and incumbent firms. More broadly, our study contributes to the literature on the link between economic activity and business activity. Bilbiie, Ghironi, and Melitz (2012) and Koellinger and Thurik (2012) show the role of firm creation in the amplification and propagation of exogenous economic shocks, and Sedláček and Sterk (2017) find that economic conditions at the time of entry influence firm growth and quality.[5]

[4]Our study is also closely related to the literature on the relationship between wealth and firm creation. There is evidence of a strong positive correlation between personal wealth and the propensity to start a business (Evans and Jovanovic (1989), Evans and Leighton (1989)). However, evidence on the mechanism underlying this result is mixed. Holtz-Eakin, Joulfaian, and Rosen (1994) find that the propensity to become an entrepreneur is higher following an inheritance, consistent with financial constraints. On the other hand, Hurst and Lusardi (2004) report a positive relationship between wealth and business entry only for individuals at the top of the wealth distribution, suggesting differences in wealth proxy for differences in ability.

[5]Our setting also shares similarities to that of place-based economic policies in which cash transfers are targeted toward particular geographic areas, rather than toward particular individuals (Busso, Gregory, and Kline (2013), Kline and Moretti (2014), and Criscuolo, Martin, Overman, and Van Reenen (2019)). We exploit exogenous cash transfers, rather than using the actual policies that usually depend on current or expected economic conditions. We use a clean counterfactual to show the potential effect that place-based monetary transfers can have on fostering entrepreneurship.

Lastly, we contribute to a growing literature that uses lottery data as an exogenous wealth shock to study several individual decisions. This literature focuses on the effects of lottery prizes on self-employment (Lindh and Ohlsson (1996)), labor supply (Imbens, Rubin, and Sacerdote (2001), Cesarini, Lindqvist, Notowidigdo, and Ostling (2017)), individual bankruptcy (Hankins, Hoekstra, and Skiba (2011)), consumption (Kuhn, Kooreman, Soetevent, and Kapteyn (2011)), and elections (Bagues and Esteve-Volart (2016)). One caveat about lottery settings is that the results may not represent the response to other unearned cash shocks, as lottery participants typically differ from the average individual. In contrast, most of the population participates in the Spanish Christmas Lottery, which provides a large wealth shock to several thousand households in the same geographic area. Thus, this lottery offers a unique setting to study how cash windfalls affect the real economy. To the best of our knowledge, we are the first to use this unique setting to study the effect of cash windfalls on entrepreneurial and business activity.[6]

II. Empirical Setting and Data

In this section, we describe the Spanish Christmas Lottery and the data used in our tests. We also provide summary statistics for our variables of interest.

A. Christmas Lottery

The Spanish Christmas Lottery (*Lotería del Gordo*) is a national lottery game held since 1812. The lottery takes place every year on Dec. 22 and is the biggest worldwide. Compared with more than 500 other lotteries held yearly in Spain, the Christmas Lottery represents one-fifth of total lottery sales. About 75% of the Spanish population participates, and about 70% of the participants play no other lottery. The amount of money spent is similar across individuals: 70% of individuals spend less than €60, and only about 9% spend more than €150.

The tickets have 5-digit numbers. There were 66,000 numbers played until 2004, 85,000 between 2005 and 2010, and 100,000 since 2011. Each number is typically sold by one lottery outlet, and the numbers allocated to each outlet are randomly assigned.[7] Each number is divided into 160 series, and each of these series is, in turn, divided into 10 fractions. These 1,600 fractions are the official *tickets* sold in lottery outlets at the cost of €20 each. Official tickets are commonly further split into shares. Unregulated associations further divide the €20 tickets into €5 and €2 *shares* to resell to the public or members of the associations. Thus, depending on the number of *shares* sold, there could be between 1,600 and 16,000 holders of each number.

The money allocated for prizes is 70% of the money collected. The remaining 30% is distributed as commissions for sales outlets, for internal revenue, and to cover administrative costs. Winners of the first prize get €20,000 per euro played;

[6]Using the Spanish Christmas Lottery setting, Bagues and Esteve-Volart (2016) find that incumbents receive significantly more votes in winning provinces.

[7]The main reason why each number tends to be sold only by one lottery outlet is that community members prefer to buy the same number to leave no one behind in case they win the lottery.

winners of the second prize get €6250 per euro; and winners of the third prize get €2500.[8]

B. Data

We obtain data on expenditures and monetary prizes of the Christmas Lottery from *Sociedad Estatal Loterias y Apuestas del Estado.* Our sample covers the period from 1994 to 2016. For each of the 50 provinces in Spain, we observe the total number of tickets sold, lottery expenditures, and the amount awarded to tickets sold in the province. We have information on the top three prizes, which account for about three-quarters of the total prizes. An important caveat is that we have information on the prizes received by tickets *sold* in the province, but not on the prizes received by *province residents.* However, most prizes are collected in the province where the tickets are sold, as we empirically show below.[9]

We use several sources of data for firms. First, to obtain the total number of firms and firm creation, we collect data at the province level for the 1994–2016 period from the *Spanish Central Mercantile Register.* The data come from the Spanish Central Directory of Enterprises (*Directorio Central de Empresas*, DIRCE), which is compiled by the Spanish National Statistics Office (*Instituto Nacional de Estadistica*, INE). To capture entrepreneurial activity not observable on these databases that include only formal firms, we use data on self-employment from the Ministry of Labor and Social Security (available for 2004–2015). To obtain detailed firm-level information, we rely on the Amadeus and Sabi databases. Amadeus is a commercial pan-European database provided by Bureau van Dijk. In Spain, Amadeus covers financial information on over 2.5 million public and private companies. The database includes detailed firm-level characteristics, such as financial and employment data. Amadeus also provides information on the year of incorporation, industry (3-digit NACE codes—the European standard of industry classification), and the postal code of the firm's headquarters. We also use the Sabi database because it covers a larger fraction of new and small firms across all industries and provides information, not only on active firms, but also on firms that have ceased operations.

We obtain information on macroeconomic variables at the province level from 1994 to 2016. The data on disposable income, gross domestic product (GDP),

[8]Prizes were €10,000, €4800, and €2400 per euro played between 1986 and 2004, and €15,000, €5000, and €2500 between 2005 and 2011. All lottery prizes were tax-exempt until 2013 when a 20% tax was imposed on prizes of more than €2500. See Bagues and Esteve-Volart (2016) for more details about the Spanish Christmas Lottery.

[9]While our focus is on provincial-level outcomes, a recent paper by Kent and Martínez-Marquina (2021) studies the effect of the lottery on economic outcomes at the municipal level. Following Bagues and Esteve-Volart (2016), we perform our analysis at the province level for several reasons. First, it is difficult to identify the municipality where the lottery winners reside as the data on the location where lottery tickets are sold is aggregated at the provincial level. Second, since municipalities in Spain are small (above 60% of them have a population of fewer than 1000 inhabitants), the municipality where the winning ticket is sold is not necessarily where the lottery winners reside. Indeed, people may work in the province's largest city, live in nearby municipalities, and go to nearby towns to purchase lottery tickets. This issue is substantially mitigated at the provincial level. Finally, macroeconomic variables are reported at the provincial, and not at the municipality, level.

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TABLE 1

Summary Statistics at the Province Level

Table 1 reports the mean, standard deviation, 25th percentile, median, 75th percentile, and number of observations for each variable by province and year. Panel A shows the lottery variables in all provinces. Panel B shows the lottery variables for the province with the maximum prize per capita each year. Panel C shows macroeconomic variables. Panel D shows entrepreneurship variables. All monetary variables are in constant 2010 euros. The sample covers the period of 1994 to 2016.

	Mean	Std. Dev.	25th Percentile	Median	75th Percentile	No. of Obs.
Panel A. Lottery Variables						
LOTTERY_EXPENDITURE (€ per capita)	58.48	28.38	41.64	53.78	69.01	1150
LOTTERY_PRIZE (€ per capita)	21.32	189.74	0.00	0.00	0.87	1150
NO_OF_WINNING_TICKETS	93.49	354.73	0.00	0.00	10.00	1150
LOTTERY_EXPENDITURE (% of GDP)	0.28	0.12	0.20	0.27	0.34	1150
LOTTERY_PRIZE (% of GDP)	0.18	1.42	0.00	0.00	0.01	1150
Panel B. Lottery Variables in Province with Maximum Prize						
LOTTERY_EXPENDITURE (€ per capita)	78.58	41.01	47.10	63.33	94.72	23
LOTTERY_PRIZE (€ per capita)	760.41	1117.30	143.97	354.40	655.06	23
NO_OF_WINNING_TICKETS	1531.74	843.33	1170.00	1457.00	1841.00	23
LOTTERY_EXPENDITURE (% of GDP)	0.33	0.16	0.22	0.31	0.40	23
LOTTERY_PRIZE (% of GDP)	5.65	8.04	1.11	2.05	5.90	23
Panel C. Macroeconomic Variables						
INFLATION_RATE (%)	2.44	1.62	1.64	2.82	3.56	1150
UNEMPLOYMENT_RATE (%)	16.63	8.05	10.19	15.53	21.78	1150
GDP (€ thousand per capita)	20.04	4.83	16.54	19.17	23.38	1150
POPULATION (thousand)	870.98	1060.95	348.27	578.14	983.13	1150
HOUSING_PRICES (€ per square meter)	1249.59	579.58	794.24	1181.58	1551.12	1150
BANK_LOANS (€ thousand per capita)	19.80	10.57	11.59	18.09	25.83	1150
DISPOSABLE_INCOME (€ thousand per capita)	13.46	2.68	11.55	12.98	15.31	850
Panel D. Entrepreneurship Variables						
NO._OF_FIRMS	24,787.64	41,315.87	7283.00	13,401.50	24,951.00	1150
NO_OF_NEW_FIRMS	2136.66	3691.64	505.00	1054.00	2018.00	1150
ENTRY_RATE (%)	8.70	4.34	5.14	8.04	10.89	1150
EXIT_RATE (%)	4.15	2.97	2.12	4.07	5.85	1150
EMPLOYMENT (average per firm)	13.26	7.53	8.60	11.28	15.47	1150
STARTUP_EMPLOYMENT (average per firm)	2.78	0.59	2.40	2.67	3.08	1150

consumer price index (CPI), unemployment, and population are from INE.[10] Data on house prices are from several sources.[11]

C. Summary Statistics

Table 1 presents summary statistics for the lottery, macroeconomic, and entrepreneurship variables at the province level in the 1994–2016 period. Panel A presents statistics for lottery expenditures, the number of winning tickets, and lottery prizes (top three) by province. The average yearly lottery expenditure per capita in a province is €58, representing about 0.28% of the provincial GDP. The average lottery prize is €21 per capita or about 0.18% of the provincial GDP.

[10]Data on disposable income are available for the period of 1994 to 2010.

[11]*ST Sociedad de Tasación* (the largest independent real estate valuation firm in Spain), and *Idealista* and *Fotocasa* (the two largest real estate web portals in Spain).

Panel B of Table 1 presents statistics for the province with the maximum prize per capita each year (i.e., winning province). Winning provinces spend €79 per capita on lottery tickets on average, which, not surprisingly, is above the average of €58 for all provinces. The average lottery prize per capita is €760, which represents 5.65% of provincial GDP. The number of *official* tickets awarded in winning provinces is about 1,532, representing approximately one for every 569 people. This figure represents a lower bound for the number of people receiving lottery prizes in a region because the €20 tickets are usually split into smaller shares of €5 and €2, and most individuals tend to share tickets with relatives and friends.

Panel C of Table 1 presents provincial macroeconomic variables. The average province has a GDP per capita of about €20,000, disposable income per capita of about €13,500, 2.4% inflation rate, 17% unemployment rate, and 871,000 inhabitants.

Panel D of Table 1 reports statistics for entrepreneurship variables at the province level. There is an average of about 24,800 firms per province, with an average of 13 employees per firm. There is an average of 2,137 firms created per province and year, with about three employees on average. The average annual firm entry and exit rates are 8.7% and 4.2%, respectively.

Figure 1 shows the average lottery expenditure per capita (Graph A) and average prize per capita (Graph B) by province during our sample period. There is large variation across provinces regarding where the lottery is awarded and the size of lottery prizes per capita. Our empirical setting exploits this geographical variation.

Table IA.1 in the Supplementary Material reports summary statistics of the characteristics of new firms in their first 5 years of existence. This table reports assets, employment, wages, and return on assets (ROA). By the fifth year, the average new firm has about €800,000 in assets, more than 5 employees, pays almost €125,000 in wages, and has an ROA above 0.6%.

III. Entrepreneurial Activity

In this section, we estimate the effect of lottery prizes awarded to many individuals clustered in a region on entrepreneurial activity. We also investigate the mechanisms driving the effects and track these new businesses over time to analyze their growth, profitability, and survival rates.

A. Empirical Strategy

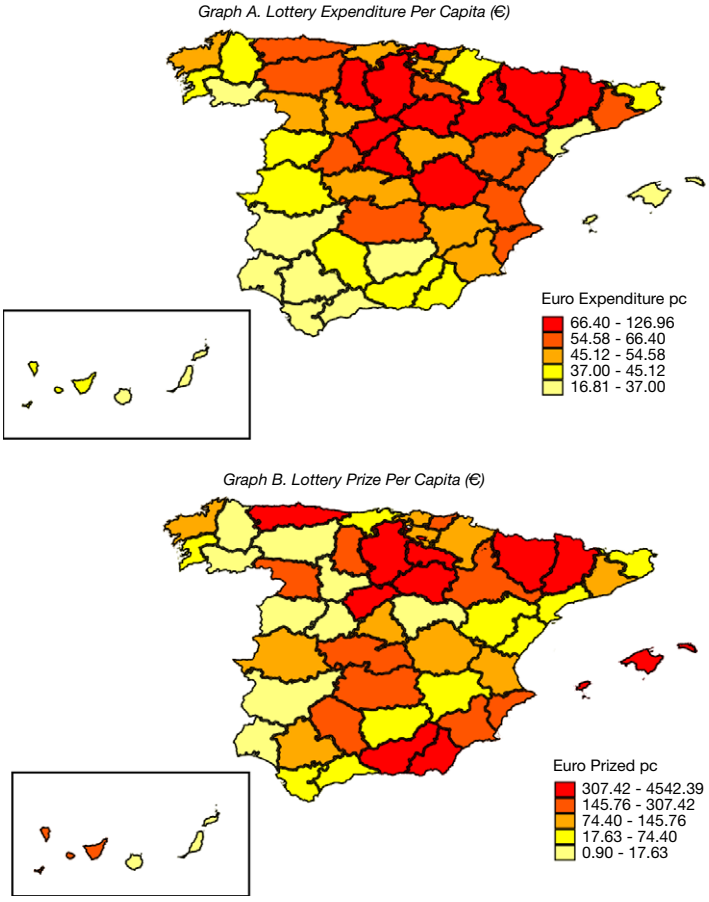
We analyze the impact of cash windfalls from a lottery on entrepreneurial activity. One concern with this strategy is that cash windfalls can be correlated with unobservable variables that impact entrepreneurship. For example, while the winning ticket number is randomly assigned, the number of tickets bought in each province is not. Moreover, the decision to buy lottery tickets might be influenced by local economic conditions and the characteristics of the population, which might also affect entrepreneurship.

In our setup, we find that lottery prizes are related to observable provincial characteristics. We estimate ordinary least squares (OLS) regressions of the lottery

FIGURE 1

Lottery Expenditures and Prizes by Province

Graph A of Figure 1 shows the average lottery expenditure per capita in euros in each province. Graph B shows the average lottery prize (top three prizes) per capita in euros in each province. The sample covers the period of 1994 to 2016.



prize per capita (LOTTERY_PRIZE) on several macroeconomic variables at the province level. Table 2 presents the estimates. Columns 1, 3, and 5 show that the inflation rate, the unemployment rate, and GDP per capita predict lottery prizes per capita. While we can control for these macroeconomic variables, the concern is that other variables could also be correlated with the award of the lottery prize.

Yet, since every ticket has the same probability of winning, conditional on lottery expenditures in a province, the winning province should be as good as randomly assigned. Indeed, columns 2, 4, 6, and 7 show that no macroeconomic variable has predictive power when we control for lottery expenditures (per capita). This indicates that conditional on lottery expenditures, lottery prizes are as good as randomly assigned. For this reason, we control for lottery expenditures in all tests in the paper and interpret the coefficient on lottery prizes as the causal effect of an exogenous cash windfall on entrepreneurship.

TABLE 2

Effect of Macroeconomic Variables on Lottery Prizes

Table 2 presents estimates of regressions of the lottery prize (in thousands of euros per capita) at the province level (LOTTERY_PRIZE). LOTTERY_EXPENDITURE is the lottery expenditure (in thousands of euros per capita). INFLATION_RATE is the growth of the CPI (consumer price index). UNEMPLOYMENT_RATE is the unemployment rate. POPULATION is the logarithm of the population (in thousands). GDP is the logarithm of GDP (in thousands of euros per capita). HOUSING_PRICE is the logarithm of the housing price index (in euros per square meter). BANK_LOANS are bank loans (in thousands of euros per capita). The sample covers the period of 1994 to 2016. Robust *t*-statistics clustered at the province level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	1	2	3	4	5	6	7
LOTTERY_EXPENDITURE		1.001***		1.088**		1.019**	0.972**
		(2.72)		(2.43)		(2.46)	(2.50)
INFLATION_RATE	0.016**	0.008					0.010
	(2.18)	(1.30)					(1.36)
UNEMPLOYMENT_RATE			−0.002**	0.001			0.002
			(−2.05)	(0.67)			(1.62)
POPULATION							−0.014
							(−1.61)
GDP					0.044**	−0.001	0.040
					(2.21)	(−0.07)	(1.23)
HOUSING_PRICES							−0.001
							(−0.06)
BANK_LOANS							0.000
							(0.07)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1150	1150	1150	1150	1150	1150	1150
Adj. R^2	−0.005	0.013	−0.003	0.013	−0.004	0.013	0.012

B. Effect of Cash Windfalls on Entrepreneurship

Our baseline specification exploits provincial variation in lottery prizes to estimate their effect on entrepreneurship. To this end, we estimate the following regression:

$$(1) \quad Y_{j,t} = \beta \text{LOTTERY\_PRIZE}_{j,t-1} + \theta \text{LOTTERY\_EXPENDITURE}_{j,t-1} + \gamma Z_{j,t-1} + \omega_t + \delta_j + \varepsilon_{j,t},$$

where $Y_{j,t}$ is a measure of entrepreneurial activity for province j in year t. $\text{LOTTERY\_PRIZE}_{j,t-1}$ is the lottery prize per capita that captures variation in lottery prizes across provinces and time; we lagged this variable 1 year, as it takes time for entrepreneurs to set up their firms. The coefficient of interest β measures the impact of the cash windfall on the outcome variable. For β to have a causal interpretation, we control for provincial lottery expenditure per capita $\text{LOTTERY\_EXPENDITURE}_{j,t-1}$. $Z_{j,t-1}$ includes several time-varying provincial characteristics such as the inflation rate (INFLATION_RATE), the unemployment rate (UNEMPLOYMENT_RATE), the logarithm of the population (POPULATION), the logarithm of GDP per capita (GDP), the logarithm of housing prices (HOUSING_PRICES), and the number of bank loans per capita (BANK_LOANS). We control for shocks to entrepreneurship that affect all provinces in the same year by including a year-fixed effect ω_t. Also, given the large heterogeneity of Spanish provinces, we control for time-invariant unobserved

TABLE 3

Effect of Lottery Prizes on Firm Entry and Startup Job Creation

Table 3 presents estimates of regressions of the entry rate (new firms in year t divided by the number of firms in year $t-1$ in percentage) and startup job creation (logarithm of the number of jobs created by startups in year t) at the province level. LOTTERY_PRIZE is the lottery prize (in thousands of euros per capita) in year $t-1$. LOTTERY_EXPENDITURE is the lottery expenditure (in thousands of euros per capita) in year $t-1$. INFLATION_RATE is the growth of the CPI (consumer price index) in year $t-1$. UNEMPLOYMENT_RATE is the unemployment rate in year $t-1$. POPULATION is the logarithm of the population (in thousands). GDP is the logarithm of GDP (in thousands of euros) per capita in year $t-1$. HOUSING_PRICE is the logarithm of the housing price index (in euros per square meter) in year $t-1$. BANK_LOANS are bank loans (in thousands of euros per capita) in year $t-1$. The sample covers the period of 1994 to 2016. Robust t-statistics clustered at the province level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Entry Rate			Startup Job Creation		
	1	2	3	4	5	6
LOTTERY_PRIZE	0.230***	0.232***	0.260***	0.024**	0.033**	0.035**
	(3.55)	(3.86)	(3.95)	(2.04)	(2.15)	(2.22)
LOTTERY_EXPENDITURE	22.932**	17.253***	23.587***	−1.329	−0.514	0.388
	(2.49)	(3.17)	(3.19)	(−0.99)	(−0.47)	(0.16)
INFLATION_RATE		0.393*	0.402*		−0.032	−0.038
		(1.98)	(1.99)		(−0.65)	(−0.79)
UNEMPLOYMENT_RATE		−0.072**	−0.074**		−0.002	−0.002
		(−2.46)	(−2.55)		(−0.45)	(−0.35)
POPULATION		−5.869*	−5.884*		1.144**	1.307**
		(−1.88)	(−1.82)		(2.10)	(2.19)
GDP		−3.558	−3.525		0.651	0.627
		(−1.49)	(−1.42)		(1.50)	(1.41)
HOUSING_PRICES		−0.742	−0.877		−0.002	0.054
		(−1.32)	(−1.43)		(−0.01)	(0.38)
BANK_LOANS		0.027	0.066		–0.013*	−0.021**
		(0.83)	(1.46)		(−1.72)	(−2.03)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sample	All	All	Excluding Madrid & Lleida	All	All	Excluding Madrid & Lleida
No. of obs.	1150	1150	1104	1150	1150	1104
Adj. R^2	0.883	0.891	0.889	0.935	0.936	0.932

heterogeneity by including a provincial fixed effect δ_j. Standard errors are clustered at the provincial level.

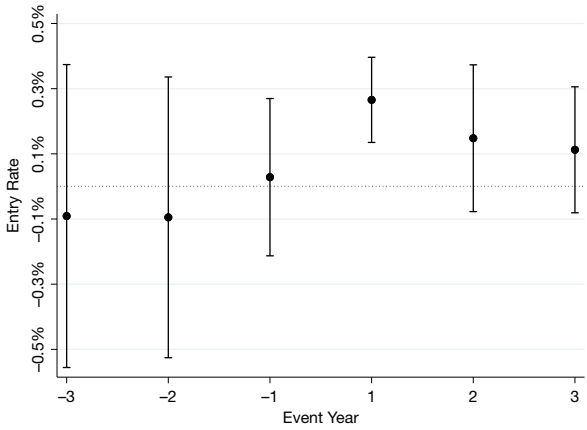
Table 3 shows the results for two measures of entrepreneurial activity. In columns 1–3, we use the number of new firms in year t divided by the number of established firms in year $t-1$ in province j (ENTRY_RATE). In columns 4–6, we use the logarithm of the number of jobs created by startups in year t in province j (STARTUP_JOB_CREATION).[12] We find a positive and significant effect of the lottery prize on the entry rate and startup job creation. The regressions in columns 1 and 4 control for lottery expenditures and include province and year-fixed effects. The estimates in column 1 indicate that the entry rate increases by about 0.23 percentage points for every €1000 of lottery prize per capita. The estimates in column 4 show that startup job creation increases by 2.4% for every €1000 of lottery prize per capita. In columns 2 and 5, we show that results are robust to including several macroeconomic variables as controls. Columns 3 and 6 show that

[12]The job creation by startups at the province level is estimated using firm-level data, as administrative data does not include employment information.

FIGURE 2

Dynamics of the Effect of Lottery Prizes on Firm Entry

Figure 2 shows point estimates and 95% confidence intervals of the effect of the lottery prize on the entry rate from 3 years before the lottery award up to 3 years after. Entry rate is the number of new firms created in each province and year divided by the number of existing firms in the previous year (in percentage). The estimates are from the regression in column 2 in Table 3, including yearly leads and lags of the LOTTERY_PRIZE variable (in thousands of euros per capita).



the results are robust to dropping Madrid and Lleida from the sample, as these two provinces have unique characteristics.[13]

Figure 2 shows the evolution of firm creation (ENTRY_RATE) from 3 years before the lottery award up to 3 years after. The estimates come from the regression in equation (1), including yearly leads and lags of the LOTTERY_PRIZE variable. Consistent with the result in Table 3, there is a significant increase in the number of new firms created after the lottery award in winning provinces. The effect is positive and significant in the year after the lottery award but dissipates afterward. Importantly, we do not find significant differential effects before the lottery award, mitigating concerns about preexisting differential trends.

C. Magnitude of the Effect

Our estimates in Table 3 show that lottery prizes have a positive and significant effect on entrepreneurial activity. While such results are interesting in their own right, the magnitude cannot be generalized beyond the lottery setup. To provide a more general result, we estimate the effect of disposable income on firm entry and job creation by startups using instrumental variables (IV) methods—we instrument disposable income with the lottery prize.

Table 4 shows instrumental variables estimates. Column 1 shows the results of the first-stage regression. Provincial disposable income (per capita) increases by 83 cents for every euro of a lottery prize. Since the lottery prize variable measures the

[13]Madrid is the capital and the largest city in Spain and the highest lottery expenditure and economic activity. The province of Lleida includes the small village of Sort, which has a strong Christmas Lottery tradition and attracts buyers from all over the country for reasons related to superstition (*sort* is the Catalan word for "luck").

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TABLE 4

Effect of Disposable Income on Firm Entry and Startup Job Creation

Table 4 presents estimates of the effect of disposable income on the entry rate (new firms in year t divided by the number of firms in year $t-1$ in percentage) and startup job creation (the logarithm of the number of jobs created in new firms in year t) at the province level using instrumental variables (IV) methods. LOTTERY_PRIZE is the lottery prize (in thousands of euros per capita) in year $t-1$. DISPOSABLE_INCOME is the disposable income (in thousands of euros per capita) in year $t-1$. LOTTERY_EXPENDITURE is the lottery expenditure (in thousands of euros per capita) in year $t-1$. INFLATION_RATE is the growth of the CPI (consumer price index) in year $t-1$. UNEMPLOYMENT_RATE is the unemployment rate in year $t-1$. POPULATION is the logarithm of the population (in thousands). HOUSING_PRICE is the logarithm of the housing price index (in euros per square meter) in year $t-1$. BANK_LOANS are bank loans (in thousands of euros per capita) in year $t-1$. Column 1 shows the first-stage estimates of the regression of DISPOSABLE_INCOME on LOTTERY_PRIZE at the province level. Columns 2 and 4 show the results of OLS regressions of entry rate and startup job creation on DISPOSABLE_INCOME at the province level. Columns 3 and 5 show the second-stage estimates of regression of entry rate and startup job creation on DISPOSABLE_INCOME instrumented with LOTTERY_PRIZE at the province level. The sample covers the period of 1994 to 2010. Robust t-statistics clustered at the province level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

		Entry Rate		Startup Job Creation	
	First Stage	OLS	IV	OLS	IV
	1	2	3	4	5
LOTTERY_PRIZE	0.827***				
	(22.61)				
DISPOSABLE_INCOME		0.336*	0.291***	0.023	0.043**
		(1.79)	(3.01)	(1.11)	(2.30)
LOTTERY_EXPENDITURE	−1.880	20.756***	20.638***	−0.259	−0.206
	(−0.70)	(2.93)	(2.82)	(−0.38)	(−0.30)
INFLATION_RATE	−0.095*	0.484**	0.480**	−0.010	−0.008
	(−1.68)	(2.43)	(2.29)	(−0.27)	(−0.22)
UNEMPLOYMENT_RATE	−0.029**	−0.024	−0.025	−0.012***	−0.012***
	(−2.41)	(−0.77)	(−0.83)	(−3.33)	(−3.25)
POPULATION	−6.276***	−4.067	−4.364	1.078*	1.210**
	(−5.96)	(−0.92)	(−1.02)	(1.98)	(2.26)
HOUSING_PRICES	0.352	−1.092	−1.077	−0.115	−0.122
	(0.90)	(−0.75)	(−0.74)	(−0.79)	(−0.82)
BANK_LOANS	0.052***	0.036	0.038	−0.012*	−0.013*
	(3.20)	(0.74)	(0.81)	(−1.72)	(−1.93)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes
No. of obs.	850	850	850	850	850
Adj. R^2	0.969	0.869	0.847	0.958	0.814

prizes awarded to tickets *sold* in the province, this result confirms that almost every euro of prize is received by an individual in the province where the tickets are sold. The F-statistic of this first-stage regression is 166, well above the conventional threshold for weak instruments (Stock and Yogo (2005)).

Column 2 presents an OLS regression of the entry rate on disposable income per capita without instrumenting disposable income with the lottery prize for comparison purposes. We find that the DISPOSABLE_INCOME coefficient is positive and significant in the OLS regression, indicating that a €1000 increase in disposable income increases firm entry by 0.34 percentage points.

Column 3 presents the second-stage results when disposable income is instrumented with the lottery prize. The effect of disposable income on firm creation is similar to that of the OLS estimate in column 2. We find that a €1000 increase in disposable income increases the entry rate by 0.29 percentage points. Using this estimate, we find that a one-interquartile-range increase in disposable income (€3760) increases firm entry by 1.1 percentage points (0.291×3.76). This effect

represents an increase of 271 firms (1.1% × 24,647) per province and year or about 13% (271/2,136) of the average number of new firms created in a province each year.[14]

Columns 4 and 5 show the estimates of OLS and IV regressions of the number of jobs created by startups on disposable income. We find that the OLS estimate is insignificant. When disposable income is instrumented in column 5, its effect is positive and significant and is significantly higher than the OLS estimate in column 4. We find that a €1000 increase in disposable income per capita increases startup job creation by 4.3%. This estimate implies that a one-interquartile-range increase in disposable income leads to an increase in startup job creation of 16% (0.043 × 3.76). Because new firms create about 2.8 jobs on average, this effect corresponds to 956 jobs (0.16 × 2.8 × 2,136) created by startups per province and year. The results presented in this section allow us to generalize the effects of disposable income on entrepreneurship beyond the specific context of the lottery.

D. Potential Channels

Changes in economic conditions are likely to affect entrepreneurship through several economic channels. We first consider a direct channel—financial constraints—and then explore other potential channels, such as local demand, risk aversion, and economic expectations.

1. Financial Constraints

We start with the relation between financial constraints and entrepreneurial activity by presenting three different tests. First, we provide preliminary evidence of the importance of financial constraints by using variation across provinces in their degree of access to credit. Next, since access to credit can be correlated to other provincial (unobserved) characteristics, our second and third tests rely on other sources of variation. Specifically, we use within-province variation in external finance dependence and financial constraints across industries and exogenous variation across provinces in credit supply due to bank bailouts (Bentolila, Jansen, and Jiménez (2018)).

The first set of tests analyzes the impact of the cash windfall in provinces with different degrees of access to credit.[15] We split the provinces according to the annual median of the number of bank loans per capita (BANK_LOANS), the number of bank branches per capita (BANK_BRANCHES), and the number of bank branches per square meter (BANK_BRANCHES_PER_M^2).[16] Table 5 shows that the estimates of the LOTTERY_PRIZE coefficient are significantly higher in the samples with below-median values for BANK_LOANS, BANK_BRANCHES, and BANK_BRANCHES_PER_M^2. The fact that the results are stronger in areas with poorer access to credit is consistent with financial

[14]As a comparison, Schmalz et al. (2017) find that a one-interquartile-range increase in house price growth (19%) leads to an increase in the number of newly created firms of 6%, which corresponds to about 400 new firms per region per year in France.

[15]Previous studies examine differences in local financial development (King and Levine (1993), Guiso, Sapienza, and Zingales (2004)) to explain differences in entrepreneurship across regions.

[16]Data on loans and bank branches are from the Bank of Spain.

TABLE 5

Access to Credit

Table 5 presents estimates of regressions of the entry rate (new firms in year t divided by number of firms in year $t-1$ in percentage) at the province level. LOTTERY_PRIZE is the lottery prize (in thousands of euros per capita) in year $t-1$. LOTTERY_EXPENDITURE is the lottery expenditure (in thousands of euros per capita) in year $t-1$. INFLATION_RATE is the growth of the CPI (consumer price index) in year $t-1$. UNEMPLOYMENT_RATE is the unemployment rate in year $t-1$. POPULATION is the logarithm of the population (in thousands). GDP is the logarithm of GDP (in thousands of euros) per capita in year $t-1$. HOUSING_PRICE is the logarithm of the housing price index (in euros per square meter) in year $t-1$. BANK_LOANS are bank loans (in thousands of euros per capita) in year $t-1$. BANK_BRANCHES is the number of bank branches per capita in year $t-1$. BANK_BRANCHES_PER_M^2 are the number of bank branches scaled by surface area in square meters in year $t-1$. The low and high groups consist of provinces below and above the yearly median of the distribution of BANK_LOANS, BANK_BRANCHES and BANK_BRANCHES_PER_M^2. The sample covers the period of 1994 to 2016. Robust t-statistics clustered at the province level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	BANK_LOANS		BANK_BRANCHES		BANK_BRANCHES_PER_M^2	
	Low	High	Low	High	Low	High
	1	2	3	4	5	6
LOTTERY_PRIZE	0.240***	−0.043	0.986*	0.158**	0.208**	−0.725
	(3.17)	(−0.10)	(1.83)	(2.62)	(2.27)	(−0.92)
LOTTERY_EXPENDITURE	30.331***	7.219	21.201	13.589*	13.101*	19.573
	(4.28)	(1.58)	(0.73)	(1.70)	(1.91)	(0.59)
INFLATION_RATE	0.475**	0.116	0.541**	0.207	0.337*	0.346
	(2.43)	(0.35)	(2.65)	(0.80)	(1.75)	(0.90)
UNEMPLOYMENT_RATE	−0.082**	−0.019	−0.111***	−0.059*	−0.030	−0.076
	(−2.26)	(−0.36)	(−3.18)	(−1.88)	(−1.51)	(−1.42)
POPULATION	−11.814**	−6.336*	−15.683***	2.219	−1.050	−11.356**
	(−2.15)	(−1.79)	(−3.51)	(1.02)	(−0.46)	(−2.22)
GDP	−4.104*	−0.524	−5.114*	1.544	−3.341	−7.051
	(−1.77)	(−0.19)	(−1.73)	(0.66)	(−1.58)	(−1.21)
HOUSING_PRICES	1.149	−1.033	−0.810	−0.314	0.137	−0.769
	(1.04)	(−0.74)	(−0.98)	(−0.43)	(0.17)	(−0.58)
BANK_LOANS	−0.100	−0.015	0.042	0.016	−0.013	0.064
	(−1.15)	(−0.50)	(1.30)	(0.38)	(−0.27)	(1.18)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	575	575	575	575	575	575
Adj. R^2	0.911	0.905	0.919	0.886	0.908	0.893

constraints driving our results. However, these results are not conclusive, as the measures of financial constraints we use may be correlated with time-varying unobserved provincial characteristics.

In the second set of tests, we examine the impact of the cash windfall using within-province variation in dependence on external finance and financial constraints at the industry level. Following Brown, Cookson, and Heimer (2017), we construct a time-varying index of external financial dependence at the industry level (FIN_DEP) by extracting the first principal components of the industry's fixed investment intensity (CAPEX); internal cash flow (CF); and external finance usage (EXT_FIN) in each year. EXT_FIN is equal to the median firm's ratio of total external financing, net stock, and long-term debt issues, to total assets for the past 5 years.[17]

[17]The weights of each variable in the first principal component are the following:
$\text{FIN\_DEP}_{st} = 0.69\text{EXT\_FIN}_{st} + 0.54\text{CAPEX}_{st} - 0.48\text{CF}_{st}$,

where subindex s stands for industry, and subindex t stands for year. Industries are classified using 2-digit NACE codes.

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TABLE 6

External Finance Dependence and Financial Constraints

Table 6 presents estimates of regressions of the entry rate (new firms in year t divided by the number of firms in year $t-1$ in percentage) at the province level. LOTTERY_PRIZE is the lottery prize (in thousands of euros per capita) in year $t-1$. LOTTERY_EXPENDITURE is the lottery expenditure (in thousands of euros per capita) in year $t-1$. INFLATION_RATE is the growth of the CPI (consumer price index) in year $t-1$. UNEMPLOYMENT_RATE is the unemployment rate in year $t-1$. POPULATION is the logarithm of the population (in thousands). GDP is the logarithm of GDP (in thousands of euros) per capita in year $t-1$. HOUSING_PRICE is the logarithm of the housing price index (in euros per square meter) in year $t-1$. BANK_LOANS are bank loans (in thousands of euros per capita) in year $t-1$. External Finance Dependence (FIN_DEP) is the first principal component of the industry's fixed investment intensity, internal cash flow and external finance usage in each year following Brown et al. (2017). Financial Constraints (SA_INDEX) at the industry-year level is the median firm's SA_INDEX of Hadlock and Pierce (2010). The low, middle, and high groups consist of industries in the low quintile (Q1), middle quintiles (Q2-Q4), and high quintile (Q5) of the FIN_DEP and the SA_INDEX distributions. The sample covers the period of 1994 to 2016. Robust t-statistics clustered at the province level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	External Finance Dependence (Fin Dep)			Financial Constraints (SA Index)		
	Low	Middle	High	Low	Middle	High
	1	2	3	4	5	6
LOTTERY_PRIZE	0.118	−0.184	0.644**	−0.040	−0.193	0.492**
	(0.58)	(−0.38)	(2.02)	(−0.16)	(−1.32)	(2.12)
LOTTERY_EXPENDITURE	−19.974	−2.865	14.031	−5.057	−2.288	9.394
	(−1.15)	(−0.20)	(0.92)	(−0.69)	(−0.35)	(0.64)
INFLATION_RATE	0.535*	0.021	0.265	0.051	0.518**	0.408
	(1.86)	(0.06)	(0.69)	(0.16)	(2.34)	(0.90)
UNEMPLOYMENT_RATE	−0.112**	−0.089**	−0.129***	−0.032	−0.028	−0.176**
	(−2.23)	(−2.02)	(−3.26)	(−0.91)	(−0.94)	(−2.61)
POPULATION	−3.739	−6.037*	−6.809	−13.136***	−6.191***	4.422
	(−1.18)	(−1.81)	(−1.40)	(−2.84)	(−3.27)	(0.80)
GDP_PC	1.759	−4.277	0.772	−11.352**	1.997	0.084
	(0.65)	(−1.25)	(0.16)	(−2.39)	(0.97)	(0.02)
HOUSING_PRICE	−1.310*	0.837	−2.154**	−2.372*	−3.131***	−0.020
	(−1.88)	(0.80)	(−2.22)	(−1.88)	(−5.18)	(−0.03)
BANK_LOANS	0.059*	0.011	0.100**	−0.006	0.071***	0.132***
	(1.87)	(0.35)	(2.66)	(−0.17)	(3.27)	(3.68)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	1150	1150	1150	1150	1150	1150
Adj. R^2	0.875	0.564	0.849	0.791	0.823	0.866

In addition, we construct a time-varying index of financial constraints at the industry level based on the SA index proposed by Hadlock and Pierce (2010). The SA_INDEX is a firm-level measure of financial constraints based on firm size (as proxied by total assets) and firm age (i.e., the number of years since the company was founded).[18] The industry's SA_INDEX is given by the median firm's SA_INDEX in each year.

We sort industries into quintiles based on either their FIN_DEP index or SA_INDEX in each year. We then form three industry groups for each index: low (Q1), middle (Q2, Q3, Q4), and high (Q5). Next, we calculate the firm entry rate per province and year as the number of new firms in year t divided by the number of established firms in year $t-1$ for each industry group.

Table 6 presents the results. We find a positive and statistically significant effect on the entry rate of new firms in sectors with high external finance dependence

[18]We use the same coefficients estimated in Hadlock and Pierce (2010) and construct the SA_INDEX for each firm i in year t as follows:

$$\text{SA\_INDEX}_{it} = -0.737\,\text{ASSETS}_{it} + 0.043\,\text{ASSETS}_{it}^{2} - 0.040\,\text{AGE}_{it}.$$

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(column 3), and a similar effect is observed in sectors with high financial constraints (column 6). The estimates for the other groups with lower and intermediate external finance dependence and financial constraints are statistically insignificant. These results confirm that a higher lottery prize promotes firm creation in sectors that rely more on external financing and are more likely to face financial constraints.

Next, we implement a third test that corroborates that the financial constraints mechanism drives the increase in entrepreneurial activity. We use exogenous variation in credit supply across provinces driven by banks bailed out by the Spanish government during the Great Recession (2007–2011). Specifically, we use the list of weak banks from Bentolila et al. (2018), which shows that these banks reduced credit supply even before their bailout in 2009. These weak banks are rural banks, and their activity is focused on specific regions. To measure the provincial exposure to weak banks, we calculate the ratio of the number of branches of weak banks to GDP per capita in each province in 2006 (WEAK_BANKS). CRISIS is a dummy variable that takes a value of 1 for the period of 2007 to 2011 and 0 for the period of 1995 to 2006. We interact the WEAK_BANKS variable with the LOTTERY_PRIZE variable and the CRISIS dummy variable. This triple interaction captures the effect of the lottery prize for individuals more exposed to weak banks (who are more likely to face financial constraints) during the crisis period versus the non-crisis period.

Table IA.2 in the Supplementary Material shows that the estimates of the triple interaction coefficient are positive and significant, which indicates that the effect of the lottery prize on firm entry was significantly larger during the Great Recession in provinces that had higher exposure to weak banks. In contrast, the estimate of the LOTTERY_PRIZE × WEAK_BANKS interaction is insignificant, which indicates that the effect of the lottery prize is similar in provinces with high and low exposure to weak banks in non-crisis periods. Indeed, financial constraints are likely to be lower in non-crisis periods as individuals can substitute the reduction in credit supply from weak banks.

Lastly, we provide additional results consistent with the idea that financial constraints are the main driver of our results. Our setting allows us to estimate the effect of cash windfalls on firm entry along different stages of the business cycle. Table IA.3 in the Supplementary Material shows the results. We find that the effect of the lottery prize on entrepreneurship is more pronounced during recessions and when business and consumer confidence is low, precisely when financial constraints should be tighter. Overall, the results of these tests indicate that the lottery cash windfall relaxes financial constraints and leads to more entrepreneurial activity.

2. Local Demand

We now study whether an increase in local demand is an important channel in explaining our results. As preliminary evidence, we test whether there is an increase in local demand following the lottery award. We proxy for local demand using provincial sales growth. In Table IA.4 in the Supplementary Material, we find that lottery prizes do not have a significant impact on local sales growth.[19]

[19]Bagues and Esteve-Volart (2016) reach the same conclusion by analyzing how individuals react to winning the Spanish Christmas Lottery. They do not find any significant effect on GDP and prices, which suggests a mild effect of lottery prizes on local demand.

Yet, it is possible that local sales growth does not fully capture the effect of the lottery prize on local demand. For this reason, we rely on a test that does not depend on this proxy. Specifically, we analyze the effect of the cash windfall on entrepreneurship across different industries. If the cash windfall increases local demand and this, in turn, encourages entrepreneurship, we will expect the lottery prize to have a larger effect on industries that rely more on local demand, such as non-tradable and construction industries. We classify firms into non-tradable, tradable, and construction industries using 4-digit NAICS following Mian and Sufi (2014). Table 7 presents the estimates of equation (1) by industry. We use firm-level data to construct our variables in this table as the provincial-level data do not provide industry information. In column 1, we show that our estimates using the provincial entry rate based on firm-level data are of similar magnitude to those in Table 3.

Column 2 shows that the effect of the lottery prize on the entry rate is slightly reduced to 0.19 when we exclude non-tradable and construction industries from the sample, but it remains positive and significant. Column 3 shows that the effect is stronger at 0.34 in construction and non-tradable industries, and column 4 shows that the effect remains positive and significant at 0.23 in tradable industries. In column 5, we find that the lottery prize has a positive and significant effect on firm creation at 0.33 in manufacturing. Overall, our estimates for the LOTTERY PRIZE coefficient are of similar magnitude across all industries regardless of their dependence on local demand, supporting the idea that local demand is not the main driver of our results.

An alternative way to explore the role of local demand is to examine the effect of the lottery prize on firm entry as a function of local sales growth measured as the annual percentage change in firms' sales in a given province and year. We define HIGH_SALES_GROWTH as a dummy variable that takes the value of 1 for provinces in the highest tercile of local sales growth each year, and 0 otherwise. We re-estimate the regression in equation (1) including HIGH_SALES_ GROWTH, and the interaction between LOTTERY_PRIZE and HIGH_SALES_ GROWTH. Table IA.5 in the Supplementary Material presents the results. The estimate of the HIGH_SALES_GROWTH is positive and significant, indicating that provinces with higher annual sales growth tend to exhibit increased entrepreneurial activity. This suggests regions with stronger business sales growth create a favorable environment for new firms. In addition, the estimate of the LOTTERY_PRIZE coefficient is positive and significant even when we control for the provincial sales growth. More importantly, the interaction term LOTTERY_PRIZE × HIGH_SALES_GROWTH is insignificant, which indicates that the effect of lottery prizes on entrepreneurship is similar in provinces with higher and lower sales growth. We conclude that the degree of local sales growth does not seem to mediate the effect of the lottery prizes on firm entry.

3. Alternative Channels

In this section, we discuss other channels that can be at play, such as economic expectations and risk aversion.

We explore the effect of lottery prizes on individual economic expectations. Individuals may feel lucky or more optimistic about future economic conditions if their province has been awarded the lottery. We use a large-scale survey to

TABLE 7

Tradable and Non-Tradable Industries

Table 7 presents estimates of regressions of the entry rate (new firms in year t divided by number of firms in year $t-1$ in percentage) at the province level. LOTTERY_PRIZE is the lottery prize (in thousands of euros per capita) in year $t-1$. LOTTERY_EXPENDITURE is the lottery expenditure (in thousands of euros per capita) in year $t-1$. INFLATION_RATE is the growth of the CPI (consumer price index) in year $t-1$. UNEMPLOYMENT_RATE is the unemployment rate in year $t-1$. POPULATION is the logarithm of the population (in thousands). GDP is the logarithm of GDP (in thousands of euros) per capita in year $t-1$. HOUSING_PRICE is the logarithm of the housing price index (in euros per square meter) in year $t-1$. BANK_LOANS are bank loans (in thousands of euros per capita) in year $t-1$. The sample in column 1 includes all industries. The sample in column 2 excludes firms in construction (NACE 4110–4399) and non-tradable industries. The sample in column 3 includes firms in construction (NACE 4110–4399) and non-tradable industries. The sample in column 4 includes firms in tradable industries. The sample in column 5 includes firms in manufacturing industries (NACE 1011–3220). Firms are classified into tradable and non-tradable industries following the Mian and Sufi (2014) classification. The sample covers the period of 1994 to 2016. Robust t-statistics clustered at the province level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	All Industries	Exclude Non-Tradable and Construction	Non-Tradable and Construction	Tradable	Manufacturing
	1	2	3	4	5
LOTTERY_PRIZE	0.253**	0.194**	0.337*	0.226**	0.331***
	(2.28)	(2.24)	(1.94)	(2.38)	(3.89)
LOTTERY_EXPENDITURE	1.489	−4.089	10.400	5.805	10.058
	(0.31)	(−0.87)	(1.27)	(0.96)	(1.42)
INFLATION_RATE	0.019	0.094	−0.148	−0.137	−0.263
	(0.13)	(0.64)	(−0.66)	(−0.88)	(−1.44)
UNEMPLOYMENT_RATE	−0.070***	−0.036	−0.121***	−0.036	−0.040
	(−2.97)	(−1.67)	(−3.34)	(−1.16)	(−1.21)
POPULATION	−0.538	−2.135	2.611	−1.295	−0.247
	(−0.23)	(−1.00)	(0.93)	(−0.44)	(−0.08)
GDP	0.767	−1.716	5.343*	−1.243	−0.458
	(0.35)	(−0.85)	(1.69)	(−0.46)	(−0.16)
HOUSING_PRICES	−0.668	−0.450	−1.095*	−1.098**	−1.151*
	(−1.45)	(−1.06)	(−1.86)	(−2.14)	(−2.00)
BANK_LOANS	0.093***	0.076***	0.109***	0.123***	0.132***
	(4.36)	(3.89)	(3.79)	(4.69)	(4.85)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes
No. of obs.	1150	1150	1150	1150	1150
Adj. R^2	0.922	0.918	0.890	0.869	0.870

investigate if individuals in winning provinces are more likely to start up a business because they believe the local economy is stronger and have better expectations about future personal finances and employment.

To test this alternative mechanism, we collect information from 138 monthly surveys conducted during our sample period (1994–2016), covering more than 300,000 individuals in Spain. In particular, we use individual-level data on economic and personal information collected from surveys conducted by the Center of Sociological Research (Centro de Investigaciones Sociológicas-CIS). About 2000–2500 representative households across Spain are asked questions about the economic situation of the Spanish economy and their own personal finances each month.[20]

[20]The questions are as follows (translated into English): i) would you say the state of the Spanish economy a year from now will be better, worse, or about the same compared to now?; ii) in a year from now, do you expect your financial situation to be better, worse, or about the same compared to now?; and iii) if you are currently working, how likely do you think it is that in the next 12 months, you will lose your job: unlikely, not very likely, quite likely, or very likely? Or if you are currently unemployed, how

Following Bagues and Esteve-Volart (2016), we run an ordered logit at the individual-month level in which the point scale answer to each of the three questions is the dependent variable. All regressions include controls for province characteristics (inflation, unemployment rate, population, GDP per capita, housing prices, and bank loans) and individual characteristics (age, gender, education, and occupation). To compare survey responses in the same province shortly before and after Christmas, we include province-by-year fixed effects where the period is each 6 months around Christmas (October–March). We drop survey responses in the April–September period. Table IA.6 in the Supplementary Material presents the results. We find lottery prizes do not have a significant effect on any of these three survey questions.

These results are consistent with those in Bagues and Esteve-Volart (2016) and suggest that individuals can separate lottery winnings from their assessment of personal economic conditions. We conclude that economic sentiment is not significantly affected by lottery prizes. Overall, we do not find support for an alternative mechanism in which individuals who feel lucky would be driving firm creation.[21]

In addition, there is a large literature examining how households react to changes in wealth. This literature finds individual portfolio risk aversion to be either constant or slightly decreasing (Calvet, Campbell, and Sodini (2007), Brunnermeier and Nagel (2008), and Chiappori and Paiella (2011)). Hurst and Lusardi (2004) show that only households in the top distribution of wealth display a higher propensity to take on risk. This reduction in risk aversion is more likely in standard lotteries, which typically provide big prizes to a few individuals. The wealth effect may exist in lotteries with big enough prizes to decrease individuals' risk aversion. However, prizes in the Spanish Christmas lottery are small per individual (but large within a winning province), so the risk aversion channel is unlikely to be operative in our setting.[22]

E. Characteristics of Newly Created Firms

In the previous section, we show that the cash windfall resulting from the lottery causes an increase in entrepreneurial activity. A natural question is whether the firms created due to the lottery shock are of better quality and for how long they survive relative to other firms created in non-winning provinces. To this end, we analyze the evolution of assets, employment, wages, profitability, and survival rate following the lottery award.

We study how firms created as a response to the lottery shock grow and perform over their first 5 years of life vis-a-vis firms created in non-winning

likely do you think it is that in the next 12 months, you will find a job: very likely, quite likely, not very likely, or unlikely?

[21]In addition, Bagues and Esteve-Volart (2016) do not find any significant effect on bank lending, which suggests that the effect of the lottery on entrepreneurship is not operating through an increase in credit supply.

[22]The median prize in our sample is €5750 per euro played, while the biggest prize is €20,000 per euro played.

TABLE 8

New Firm Outcomes

Table 8 presents estimates of regressions of outcomes of new firms in their first 5 years of life (firms are created in year t) at the firm level. Firm outcomes are the logarithm of assets, the logarithm of the number of employees, the logarithm of wages, and return on assets (ROA) in year t, year $t+1$, year $t+2$, year $t+3$, and year $t+4$. LOTTERY_PRIZE is the lottery prize (in thousands of euros per capita) in year $t-1$. All regressions include the lottery expenditure (in thousands of euros per capita) in year $t-1$ (LOTTERY_EXPENDITURE) (coefficient not shown) and time-by-industry and province-by-industry fixed effects. The sample covers the period of 1994 to 2016. Robust t-statistics clustered at the province level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	log(ASSETS)				
	t	$t+1$	$t+2$	$t+3$	$t+4$
LOTTERY_PRIZE	0.070	0.111**	0.132***	0.113**	0.121**
	(0.94)	(2.22)	(3.28)	(2.37)	(2.31)
No. of obs.	187,162	187,162	187,162	187,162	187,162
Adj. R^2	0.111	0.156	0.176	0.180	0.176
	log(EMPLOYMENT)				
	t	$t+1$	$t+2$	$t+3$	$t+4$
LOTTERY_PRIZE	0.035*	0.039*	0.050**	0.050**	0.053**
	(1.96)	(1.75)	(2.04)	(2.11)	(2.24)
No. of obs.	187,162	187,162	187,162	187,162	187,162
Adj. R^2	0.089	0.117	0.119	0.121	0.125
	log(WAGES)				
	t	$t+1$	$t+2$	$t+3$	$t+4$
LOTTERY_PRIZE	0.073*	0.056*	0.056	0.071**	0.078**
	(1.86)	(1.83)	(1.62)	(2.27)	(2.12)
No. of obs.	133,376	133,376	133,376	133,376	133,376
Adj. R^2	0.083	0.105	0.104	0.102	0.098
	RETURN_ON_ASSETS				
	t	$t+1$	$t+2$	$t+3$	$t+4$
LOTTERY_PRIZE	0.006	0.006	0.008**	0.011**	0.009*
	(0.60)	(1.36)	(2.01)	(2.61)	(1.75)
No. of obs.	139,907	139,907	139,907	139,907	139,907
Adj. R^2	0.025	0.022	0.026	0.027	0.028

provinces. Specifically, we estimate the following equation for firm i, in industry s, located in province j, n years after its creation (year of creation of firm i is t_i) separately for values of n from year 0 to year 4:

$$(2)\quad Y_{i,s,j,t_i+n} = \beta_n \text{LOTTERY\_PRIZE}_{j,t_i-1} + \theta_n \text{LOTTERY\_EXPENDITURE}_{j,t_i-1} + \gamma_n Z_{j,t_i-1} + \eta_{st} + \delta_{sj} + \varepsilon_{i,s,j,t_i+n},$$

where Y_{i,s,j,t_i+n} is the logarithm of assets, the logarithm of employment (number of employees), the logarithm of wages, or return on assets (ROA). The regressions include industry-by-year fixed effects (η_{st}) and province-by-industry fixed effects (δ_{sj}) that control for the unobserved industry- and provincial-level heterogeneity that affect firms in a given period.

Table 8 presents the estimates at firm creation (t), and one ($t+1$), two ($t+2$), three ($t+3$), and 4 years ($t+4$) after firm creation. We find positive and significant effects of the cash windfall on firm size as proxied by assets and employment. Firms created in provinces awarded with a lottery prize of €1000 per capita have about 13% more assets and create about 5% more jobs 2 years after they are established relative to firms created in non-winning provinces. We also find that lottery prizes

have a positive and significant effect on wages paid and profitability (ROA) of new firms. These effects are particularly strong 3 and 4 years after creation. Overall, these results indicate that the lottery prize contributes to the creation of, not only more firms, but, also, larger and more profitable businesses.

To get preliminary evidence of the survival rate of firms, we estimate and graphically compare the survival functions $S(t)$ for firms created in winning provinces in the year after the lottery was awarded (lottery firms) and firms created in non-winning provinces (non-lottery firms) using the Kaplan and Meier (1958) estimator. The Kaplan–Meier estimator is a simple frequency non-parametric estimator; it does not require any ex ante assumption about the distribution of exit times or how regressors shift the hazard function. The estimated Kaplan–Meier survival function (i.e., the probability of surviving at least up to age t) is given by: $\widehat{S}(k) = \prod_{g:k_g \leq k}\left[1 - \frac{e_g}{n_g}\right]$, where e_g is the number of exiting firms at time k_g and n_g is the number of firms that survive up to time k_g.

Figure IA.1 in the Supplementary Material plots the estimates of the survival function for firms created during the period of 1994 to 2016. The figure plots the probability of surviving at least up to age t for lottery firms (i.e., firms created as a response to the lottery shock in winning provinces) and non-lottery firms (i.e., firms created in non-winning provinces). The figure suggests that lottery firms (i.e., firms created as a response to the lottery shock) survive longer. This survival gap is rather small in the first years of activity, but it becomes larger and stable in the age group from 12 years onwards. The log-rank test for the equality of survival functions between the two groups confirms that lottery firms are more likely to survive longer than non-lottery firms.

We also estimate hazard functions using four distinctive models: Cox Proportional, Exponential, Weibull, and Gompertz. Each of the four models used in this analysis carries different assumptions regarding the underlying hazard function.[23] Table 9 presents the estimates of hazard functions. We find that LOTTERY_PRIZE has a hazard ratio under one and is statistically significantly different from zero at the 1% level across all the models. This suggests that an increase in the lottery prize implies a lower probability of firm exit (i.e., a higher probability of firm survival).

Overall, these results highlight the long-lasting impact that unexpected cash windfalls can have on the real economy. Such windfalls can significantly influence factors like the firm's asset growth, employment, profitability, and even its survival rate, thereby contributing to the improvement of business conditions.

[23]The Cox Proportional Hazard Model, a non-parametric model, makes no assumptions about the baseline hazard function's shape, providing a certain level of flexibility. However, this may result in less precise estimates if the actual hazard function has a specific form. The Exponential Model, a parametric model, presumes a constant hazard over time, which may be overly simplistic for real-world scenarios where the risk of firm exit varies over time. The Weibull Model, another parametric model, allows for an increasing or decreasing hazard over time, providing a more accurate portrayal of scenarios where the risk of firm exit changes as the firm ages. The Gompertz Model, another parametric model, assumes that the hazard function increases or decreases exponentially over time, which is suitable for scenarios where the risk of firm exit changes at a decelerating or accelerating rate.

TABLE 9

New Firm Survival

Table 9 presents the hazard estimates of firm survival. The dependent variable is the time (in years) since the firm was created. LOTTERY_PRIZE is the lottery prize awarded in the year before the firm was created. All regressions include the lottery expenditure (in thousands of euros per capita) in year $t-1$ (LOTTERY_EXPENDITURE), INFLATION_RATE, UNEMPLOYMENT_RATE, POPULATION, GDP, HOUSING_PRICE, and BANK_LOANS (coefficients not shown). The sample covers firms created in the period of 1994 to 2016. *P*-values are shown in parentheses. Standard errors are computed using the Huber-White sandwich estimator. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Cox Proportional	Exponential	Weibull	Gompertz
	1	2	3	4
LOTTERY_PRIZE	0.850***	0.782***	0.810***	0.799***
	(0.00)	(0.00)	(0.00)	(0.00)
No. of obs.	9,292,649	9,292,649	9,292,649	9,292,649
Model *p*–value	0.00	0.00	0.00	0.00

IV. Incumbent Firms

While we document a strong impact of local cash windfalls on firm creation and the post-entry dynamics of startups, the extent to which such windfalls affect incumbent firms remains unclear. In this section, we analyze whether cash windfalls impact firms that exist before the lottery award. Specifically, we use equation (2) to study the effect of lottery prizes on total assets, employment, wages, and ROA of incumbent firms up to 4 years after the lottery award. The results are reported in Table 10.

We find that incumbent firms in winning provinces do not grow faster than those in non-winning provinces after the lottery award. Indeed, the assets and employment of these two groups of firms are not statistically different in any year following the award. In addition, there are no significant differential effects on profitability. However, we find incumbent firms increase wages 2 years after the lottery award, potentially driven by a tighter local labor market due to hiring by newly created firms. This is consistent with Bagues and Esteve-Volart (2016), who found no effect on GDP, but a significant decrease in unemployment following the lottery award.[24] This decrease in unemployment likely contributes to a tighter labor market in winning provinces.

Next, we discuss the potential explanations for the muted growth reaction of incumbent firms. In Section III.D.1, we show that financial constraints are a primary driver in explaining the effect of lottery prizes on firm creation. However, several reasons might prevent lottery prizes from alleviating financial constraints for incumbent firms. First, financial constraints are arguably more pronounced when starting a business than investing in an established firm, as market entry often requires significant upfront capital without guaranteed returns. In contrast, established businesses can leverage their track record, use retained earnings, and pledge collateral to borrow. In addition, while the size of lottery prizes is sufficient to encourage individuals to become entrepreneurs, it may not be large enough to

[24]This result aligns with our findings of increased job creation by startups in Table 3. While lottery winners are known to decrease their labor supply (Imbens et al. (2001), Cesarini et al. (2017)), the rise in firm entry and job creation by startups can offset the effect on aggregate labor participation.

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TABLE 10

Incumbent Firm Outcomes

Table 10 presents estimates of regressions of outcomes of incumbent firms. Firm outcomes are the logarithm of assets, the logarithm of the number of employees, the logarithm of wages, and return on assets (ROA) in year t, year $t+1$, year $t+2$, year $t+3$, and year $t+4$. LOTTERY_PRIZE is the lottery prize (in thousands of euros per capita) in year $t-1$. All regressions include the lottery expenditure (in thousands of euros per capita) in year $t-1$ (LOTTERY_EXPENDITURE) (coefficient not shown) and time-by-industry and province-by-industry fixed effects. The sample covers the period of 1994 to 2016. Robust t-statistics clustered at the province level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	log(ASSETS)				
	t	$t+1$	$t+2$	$t+3$	$t+4$
LOTTERY_PRIZE	−0.003	0.005	0.006	0.008	0.010
	(−0.26)	(0.48)	(0.59)	(0.91)	(1.07)
No. of obs.	6,565,590	6,565,590	6,565,590	6,565,590	6,565,590
Adj. R^2	0.165	0.171	0.174	0.174	0.173
	log(EMPLOYMENT)				
	t	$t+1$	$t+2$	$t+3$	$t+4$
LOTTERY_PRIZE	−0.001	0.002	0.008	0.008	0.005
	(−0.10)	(0.31)	(1.31)	(1.25)	(0.86)
No. of obs.	4,361,537	4,361,537	4,361,537	4,361,537	4,361,537
Adj. R^2	0.153	0.162	0.168	0.173	0.176
	log(WAGES)				
	t	$t+1$	$t+2$	$t+3$	$t+4$
LOTTERY_PRIZE	0.000	0.009	0.016**	0.017*	0.018*
	(0.06)	(1.20)	(2.05)	(1.87)	(1.88)
No. of obs.	5,535,337	5,535,337	5,535,337	5,535,337	5,535,337
Adj. R^2	0.138	0.147	0.154	0.160	0.163
	RETURN_ON_ASSETS				
	t	$t+1$	$t+2$	$t+3$	$t+4$
LOTTERY_PRIZE	0.000	0.002	−0.001	−0.001	−0.000
	(0.21)	(1.41)	(−0.24)	(−0.65)	(−0.24)
No. of obs.	5,598,474	5,598,474	5,598,474	5,598,474	5,598,474
Adj. R^2	0.040	0.045	0.048	0.048	0.046

promote business growth among existing firms. In fact, the average lottery prize (between €20,000 and €2500 per euro played) is sizable compared with the minimum legal capital required to launch a limited liability company (€3000), but it is small compared with the average size of incumbent firms (over €1.1 million in assets). These figures suggest that lottery prizes should affect potential entrepreneurs and incumbent firms differently.

We also analyze the effect of local demand on incumbent firms. As discussed in Section III.D.2, Bagues and Esteve-Volart (2016) explore the economic openness of Spanish provinces and report that the majority of goods and services consumed in Spanish provinces tend to be imported from other regions. We hypothesize that incumbent firms will have a more muted response to cash windfalls if they operate in regions with greater economic openness. To further explore this hypothesis, we focus on incumbent firms that operate in provinces with less economic openness. We argue that these firms should be more exposed to local demand shocks and, thus, we should observe a stronger response to cash windfalls. We define a "closed economy" as a province in the bottom decile in terms of trading activity (exports plus imports over GDP). Table IA.7 in the Supplementary Material reports the results. Consistent with our conjecture, we observe an effect on firm growth for incumbent firms operating in regions with a closed local economy. Incumbent firms

in closed economy provinces that are awarded with lottery prizes grow more in terms of assets and pay higher wages than incumbent firms in non-winning provinces with a closed economy. However, the effects on employment and profitability are statistically insignificant.

These results suggest a mild effect of lottery prizes on local demand, consistent with the findings discussed in Section III.D.2. To further explore whether lottery prizes affect incumbent firms, we estimate the regression in equation (1) using the exit rate as the dependent variable. The results in Table IA.8 in the Supplementary Material indicate that the lottery shock does not significantly affect the exit rate of incumbent firms. This finding also supports the notion that cash windfalls have a limited effect on incumbent firms. Another approach to examining the impact of lottery prizes on incumbent firms is to estimate the effect on exit rates of incumbent firms across different industries. If local demand increases due to the cash windfall, we should observe a decrease in exit rates in industries that rely more on local demand. The analysis of exit rates across different industries is shown in Table IA.9 in the Supplementary Material. We find that the effect of the lottery prize on the exit rate is not statistically significant and is similar in magnitude in both the tradable and non-tradable sectors. Again, these results support the idea that local demand and, consequently, incumbent firms, do not significantly respond to the cash windfall.

Lastly, because startups inherently differ from incumbent firms (Haltiwanger et al. (2013)), there might be unobservables that make these two groups difficult to compare. To deal with this empirical concern, we analyze the subset of incumbent firms that are more similar to the new firms. That is, we focus on the *youngest* incumbent firms–firms created in winning provinces the year before the lottery award. If we find that young incumbent firms do not react to cash windfalls, this would corroborate that lottery awards do impact the decision to start a firm, but do not affect the decision to expand a firm. In Table IA.10 in the Supplementary Material, we examine the effects of lottery prizes on total assets, employment, wages, and ROA of young incumbent firms up to 4 years after the lottery award. We find that young incumbent firms in winning provinces do not significantly react to the cash windfall relative to young incumbent firms in non-winning provinces. An important distinction relative to our analyses in Table 8 is that young incumbent firms are not created in response to the lottery prizes, unlike new firms. One explanation for the muted response of incumbent firms is that entrepreneurs who create a firm in response to lottery prizes may exhibit different characteristics relative to existing ones. In the next section, we explore the characteristics of entrepreneurs in order to further understand the heterogeneous response across new and incumbent firms.

We conclude that the relatively small size of the lottery prizes at the individual level and their modest impact on local demand due to the economic openness of Spanish provinces contribute to this heterogeneous response.

V. Self-Employment

We extend our analysis to explore whether entrepreneurial characteristics may help to explain the different reactions of new and incumbent firms. Specifically, we

examine the effect of lottery prizes on self-employment and the characteristics of those individuals who respond to the lottery shock. Self-employed individuals do not incorporate their businesses, so our measure of firm creation does not capture their activity. Thus, the self-employment tests serve as an independent test of our main results in Table 3. Moreover, the data on self-employed individuals includes information on the characteristics of entrepreneurs and the sectors of their businesses. This allows us to analyze the heterogeneous effect of cash windfalls on self-employment across individuals' characteristics and sectors, which may shed additional light on potential channels that drive our effects.

We estimate the regression in equation (1) using as the dependent variable the growth rate of the number of self-employed individuals (i.e., net entry rate) between year t and year $t-1$.[25] Table 11 presents the results. Columns 1 and 2 show that the lottery shock has a positive and significant effect on self-employment. This result is in contrast to that of Bellon et al. (2021), who find that cash windfalls from shale oil and natural gas extraction increase business formation, but do not affect transitions to self-employment. The magnitude of the cash windfall could explain the difference in results. It is unlikely that cash windfalls that affect a small number of people, such as those in Bellon et al. (2021), affect the local labor market. In contrast, we find that large local cash windfalls that affect a large number of people increase employment. This increase makes it easier for people to transition to self-employment as they expect it will be easier to return to the labor market in case their business fails.

Columns 3–8 of Table 11 examine the effect of the lottery prize on self-employed individuals working in different sectors. We find a significant and positive effect on self-employment in the services sector, as well as in manufacturing, which is less sensitive to local demand. This result is consistent with the idea that changes in local demand do not primarily drive the decision to become an entrepreneur following a cash windfall.

In Table IA.11 in the Supplementary Material, we explore whether entrepreneurs who respond to cash windfalls have differential characteristics compared to the average entrepreneur in our sample. We find that women, individuals above 40 years old, those who hold a single job, and those who manage businesses with multiple employees are more responsive to lottery prizes. These findings suggest that individuals who react to the lottery shock exhibit distinctive characteristics compared to the average entrepreneur. The characteristics of the individuals who decide to become entrepreneurs as a response to lottery prizes might also explain why the characteristics of the newly created firms are different from those of incumbent firms.

VI. Conclusion

This article uses a unique randomized natural experiment—the Spanish Christmas Lottery—to study the causal effect of exogenous cash windfalls on

[25]We use the net entry rate instead of the entry rate (in equation (1)) because we do not have information on the number of newly self-employed individuals. We only have the total number of self-employed individuals per year.

TABLE 11

Self-Employment

Table 11 presents estimates of regressions of the growth rate of self-employed individuals between year $t-1$ and year t (net entry rate) at the province level. LOTTERY_PRIZE is the lottery prize (in thousands of euros per capita) in year $t-1$. LOTTERY_EXPENDITURE is the lottery expenditure (in thousands of euros per capita) in year $t-1$. INFLATION_RATE is the growth of the CPI (consumer price index) in year $t-1$. UNEMPLOYMENT_RATE is the unemployment rate in year $t-1$. POPULATION is the logarithm of the population (in thousands). GDP is the logarithm of GDP (in thousands of euros) per capita in year $t-1$. HOUSING_PRICE is the logarithm of the housing price index (in euros per square meter) in year $t-1$. BANK_LOANS are bank loans (in thousands of euros per capita) in year $t-1$. Columns 1 and 2 present estimates for the full sample of self-employed individuals. Columns 3 and 4 present estimates for self-employment in the agriculture sector. Columns 5 and 6 present estimates for self-employment in the manufacturing sector. Columns 7 and 8 present estimates for self-employment in the services sector. The sample covers the period of 2004 to 2015. Robust t-statistics clustered at the province level are shown in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	All		Agriculture		Manufacturing		Services	
	1	2	3	4	5	6	7	8
LOTTERY_PRIZE	0.330**	0.263*	0.087	−0.025	0.748***	0.701***	0.490***	0.495***
	(2.57)	(1.85)	(0.58)	(−0.27)	(4.92)	(3.71)	(3.39)	(3.59)
LOTTERY_EXPENDITURE	19.947***	16.943***	10.753	15.818**	14.172	23.462*	14.469***	16.049***
	(4.34)	(4.13)	(1.29)	(2.63)	(0.92)	(1.79)	(4.17)	(4.26)
INFLATION_RATE		0.176		0.957**		0.601		0.024
		(0.84)		(2.50)		(1.65)		(0.12)
UNEMPLOYMENT_RATE		−0.011		0.125**		0.051		−0.047**
		(−0.48)		(2.61)		(1.32)		(−2.13)
POPULATION		−12.738***		−6.051		1.050		−3.322
		(−4.75)		(−0.98)		(0.21)		(−1.36)
GDP		0.435		−0.999		1.086		0.739
		(0.16)		(−0.29)		(0.23)		(0.37)
HOUSING_PRICES		−2.828***		−3.859***		−3.581***		−1.741***
		(−4.56)		(−2.94)		(−3.26)		(−2.91)
BANK_LOANS		−0.089***		−0.039		−0.098*		−0.018
		(−3.23)		(−0.68)		(−1.77)		(−0.74)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of obs.	550	550	550	550	550	550	550	550
Adj. R^2	0.773	0.791	0.571	0.589	0.555	0.574	0.701	0.711

entrepreneurial activity. We show that lottery-winning provinces benefit from a positive effect on firm creation, job creation, and self-employment. In addition, we provide evidence that better economic conditions have long-term effects on entrepreneurial activity. Newly created firms in winning provinces are larger, more profitable, likely to survive longer, and pay higher wages. Our findings support that the financial constraints channel is important in explaining the effect of cash windfalls on entrepreneurship. In contrast, the local demand, the economic expectations, and the risk aversion channels do not seem to be the main drivers of our effects.

Unlike new firms, we find that lottery prizes have a limited effect on the growth and profitability of incumbent firms. These firms only respond by raising wages, suggesting a tightening in local labor markets due to the increased competition from newly established firms. Our results further suggest that the relatively small size of the lottery prizes at the individual level, their modest impact on local demand due to the economic openness of Spanish provinces, and the different characteristics of entrepreneurs who create new businesses in response to lottery prizes, all contribute to this muted response.

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Overall, our study provides insights into how business activity is affected by place-based economic policies, such as unconditional cash transfers targeted to specific regions. Our findings suggest that these policies have a limited effect on incumbent firms, but can effectively promote entrepreneurship and job creation by startups, especially in regions with poorer access to credit and sectors that rely more on external finance.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109024000371.

References

Adelino, M.; S. Ma; and D. Robinson. "Firm Age, Investment Opportunities, and Job Creation." *Journal of Finance*, 72 (2017), 999–1038.

Adelino, M.; A. Schoar; and F. Severino. "House Prices, Collateral, and Self-Employment." *Journal of Financial Economics*, 117 (2015), 288–306.

Andersen, S., and K. Nielsen. "Ability or Finances as Constraints on Entrepreneurship? Evidence from Survival Rates in a Natural Experiment." *Review of Financial Studies*, 25 (2012), 3684–3710.

Bagues, M., and B. Esteve-Volart. "Politicians' Luck of the Draw: Evidence from the Spanish Christmas Lottery." *Journal of Political Economy*, 124 (2016), 1269–1294.

Bellon, A.; J. Cookson; E. Gilje; and R. Heimer. "Personal Wealth, Self-Employment, and Business Ownership." *Review of Financial Studies*, 34 (2021), 3935–3975.

Bentolila, S.; M. Jansen; and G. Jiménez. "When Credit Dries Up: Job Losses in the Great Recession." *Journal of the European Economic Association*, 16 (2018), 650–695.

Bernstein, S.; E. Colonnelli; D. Malacrino; and T. McQuade. "Who Creates New Firms when Local Opportunities Arise?" *Journal of Financial Economics*, 143 (2022), 107–130.

Bilbiie, F.; F. Ghironi; and M. Melitz. "Endogenous Entry, Product Variety, and Business Cycles." *Journal of Political Economy*, 120 (2012), 304–345.

Brown, J.; J. Cookson; and R. Heimer. "Law and Finance Matter: Lessons from Externally Imposed Courts." *Review of Financial Studies*, 30 (2017), 1019–1051.

Brunnermeier, M., and S. Nagel. "Do Wealth Fluctuations Generate Time-Varying Risk Aversion? Micro-Evidence on Individuals." *American Economic Review*, 98 (2008), 713–736.

Busso, M.; J. Gregory; and P. Kline. "Assessing the Incidence and Efficiency of a Prominent Place Based Policy." *American Economic Review*, 103 (2013), 897–947.

Calvet, L.; J. Campbell; and P. Sodini. "Down or Out: Assessing the Welfare Costs of Household Investment Mistakes." *Journal of Political Economy*, 115 (2007), 707–747.

Cesarini, D.; E. Lindqvist; M. Notowidigdo; and R. Ostling. "The Effect of Wealth on Individual and Household Labor Supply: Evidence from Swedish Lotteries." *American Economic Review*, 107 (2017), 3917–3946.

Cespedes, J.; X. Huang; and C. Parra. "More Money, More Options? The Effect of Cash Windfalls on Entrepreneurial Activities in Small Businesses." Working Paper, University of Minnesota (2021).

Chiappori, P., and M. Paiella. "Relative Risk Aversion Is Constant: Evidence from Panel Data." *Journal of the European Economic Association*, 9 (2011), 1021–1052.

Clementi, G., and B. Palazzo. "Entry, Exit, Firm Dynamics, and Aggregate Fluctuations." *American Economic Journal: Macroeconomics*, 8 (2016), 1–41.

Criscuolo, C.; R. Martin; H. Overman; and J. Van Reenen. "Some Causal Effects of an Industrial Policy." *American Economic Review*, 109 (2019), 48–85.

Evans, D., and B. Jovanovic. "An Estimated Model of Entrepreneurial Choice Under Liquidity Constraints." *Journal of Political Economy*, 97 (1989), 808–827.

Evans, D., and L. Leighton. "Some Empirical Aspects of Entrepreneurship." *American Economic Review*, 79 (1989), 519–535.

Guiso, L.; P. Sapienza; and L. Zingales. "Does Local Financial Development Matter?" *Quarterly Journal of Economics*, 119 (2004), 929–969.

Hadlock, C., and J. Pierce. "New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index." *Review of Financial Studies*, 23 (2010), 1909–1940.

Haltiwanger, J.; R. Jarmin; and J. Miranda. "Who Creates Jobs? Small Versus Large Versus Young." *Review of Economics and Statistics*, 95 (2013), 347–361.
Hankins, S.; M. Hoekstra; and P. Skiba. "The Ticket to Easy Street? The Financial Consequences of Winning the Lottery." *Review of Economics and Statistics*, 93 (2011), 961–969.
Holtz-Eakin, D.; D. Joulfaian; and H. Rosen. "Sticking It Out: Entrepreneurial Survival and Liquidity Constraints." *Journal of Political Economy*, 102 (1994), 53–75.
Hurst, E., and A. Lusardi. "Liquidity Constraints, Household Wealth, and Entrepreneurship." *Journal of Political Economy*, 112 (2004), 319–347.
Imbens, G.; D. Rubin; and B. Sacerdote. "Estimating the Effect of Unearned Income on Labor Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players." *American Economic Review*, 91 (2001), 778–794.
Kaplan, E., and P. Meier. "Nonparametric Estimation from Incomplete Observations." *Journal of the American Statistical Association*, 53 (1958), 457–481.
Kent, C., and A. Martínez-Marquina. "When a Town Wins the Lottery: Evidence from Spain." Working Paper, Stanford University (2021).
King, R., and R. Levine. "Finance, Entrepreneurship and Growth: Theory and Evidence." *Journal of Monetary Economics*, 32 (1993), 513–542.
Kline, P., and E. Moretti. "Local Economic Development, Agglomeration Economies, and the Big Push: 100 Years of Evidence from the Tennessee Valley Authority." *Quarterly Journal of Economics*, 129 (2014), 275–331.
Koellinger, P., and R. Thurik. "Entrepreneurship and the Business Cycle." *Review of Economics and Statistics*, 94 (2012), 1143–1156.
Kuhn, P.; P. Kooreman; A. Soetevent; and A. Kapteyn. "The Effects of Lottery Prizes on Winners and Their Neighbors: Evidence from the Dutch Postcode Lottery." *American Economic Review*, 101 (2011), 2226–2247.
Lee, Y., and T. Mukoyama. "Entry and Exit of Manufacturing Plants over the Business Cycle." *European Economic Review*, 77 (2015), 20–27.
Lindh, T., and H. Ohlsson. "Self-Employment and Windfall Gains: Evidence from the Swedish Lottery." *Economic Journal*, 106 (1996), 1515–1526.
Mian, A., and A. Sufi. "What Explains the 2007–2009 Drop in Employment?". *Econometrica*, 82 (2014), 2197–2223.
Schmalz, M.; D. Sraer; and D. Thesmar. "Housing Collateral and Entrepreneurship." *Journal of Finance*, 72 (2017), 99–132.
Sedláček, P., and V. Sterk. "The Growth Potential of Startups over the Business Cycle." *American Economic Review*, 107 (2017), 3182–3210.
Stock, J., and M. Yogo. "Testing for Weak Instruments in Linear Iv Regression. Identification and Inference for Econometric Models." *Essays in Honor of Thomas Rothenberg*, 80 (2005), 1.