Income and Migration: Evidence from a Century of Windfall Income Shocks

Erik Haustein*† Sebastian S. Leue*†‡

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Abstract

This article studies the effect of windfall income shocks on emigration, conditionally on economic development. The theory of relative income differences between countries assumes that migration decreases with economic development. A growing literature, however, supports the existence of a mobility transition, promoting an inverse U-shaped relationship between income and migration. We provide novel empirical evidence by exploiting the Spanish national Christmas lottery as a natural experiment to study the effect of windfall income on local emigration from 1877 to 1970. We find that a positive income shock increases international emigration for relatively poor regions within Spain, but not for the most economically developed regions. The results suggest that a windfall income shock may be a way to alleviate the financial constraints associated with pre-funding migration costs. Our findings add to the literature on the causes of migration by adding a microfounded but long-run perspective.

JEL Classification: F22, O15, R23, N33, N34, N12, N13

Keywords: Migration, Windfall Income, Economic Development, Economic History, Christmas Lottery, Spain, Natural Experiment

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* Helmut Schmidt University Hamburg & Hamburg Institute of International Economics

† University of Göttingen & Kiel Institute for the World Economy

‡ Corresponding author. Address: Helmut Schmidt University, Department of Economics, Holstenhofweg 85, 22043 Hamburg, Germany; E-mail: leue@hsu-hh.de.

1 Introduction

Income differences are regarded as a fundamental driver of migration. Yet, understanding the effect of income on migration remains ambiguous, despite being studied thoroughly theoretically as well as empirically. The theory of self-selection regards relative income differences between countries as the main driver of international migration (Roy, 1951, Borjas, 1987). Once these income differences decrease, migration flows are expected to fall as well. Recent empirical studies, however, find that income gains may in fact induce emigration, particularly from low- and middle-income countries (Clemens, 2011, 2022, Dao et al., 2018). These studies argue that migration is subject to a budget constraint that reduces as origin countries develop, an empirical phenomenon also described as mobility transition (Zelinsky, 1971). The challenge in examining the effect of income on migration arises from the complexity of identifying the causal mechanism. Income and mobility are endogenous variables and underlying factors may influence their actual interrelationship. Moreover, understanding the direction of this relationship requires a long-run perspective, as it is best comprehended in the context of economic development.

This paper studies the effect of windfall income shocks on emigration, conditionally on economic development, in Spain between 1877 and 1970. We exploit the Spanish Christmas lottery as a natural experiment to study the causal effect of windfall income on local emigration, while allowing for a large set of fixed effects that control for potential confounding regional economic trends and local institutional settings. Lottery tickets are usually sold by the same ticket office, allowing for locally clustered syndicate play. This mechanism randomly allocates winnings to an entire town. Overall, we show that the decision to relocate is not only determined by relative income differences between countries, but also between regions. The effect is particularly pronounced between urban agglomerations and the rural periphery within the country of origin. Liquidity constrains are a decisive factor in earlier decades, when the costs to relocate are significantly larger relative to current income (McKenzie and Rapoport, 2007). This dynamic reverses for relatively richer urban areas as well as in later decades, when the gains from migration are lower (Borjas, 1987, McKenzie and Rapoport, 2010, Dustmann and Okatenko, 2014, Jedwab et al., 2017).

Recent work provides ample evidence on the decision to migrate in the short run through findings from natural and field experiments (Clemens, 2014, Angelucci, 2015, Bazzi, 2017, Dao et al., 2018, Majlesi and Narciso, 2018, Gazeaud et al., 2023). Other studies use the European Age of Mass Migration to draw conclusions from past migration patterns in the Global North to recent developments in the Global South (Hatton and Williamson, 1994, Abramitzky et al., 2012). However, there is little evidence on the effect of income on migration, conditional on economic development. We address this gap in the literature by providing novel microfounded but long-run evidence on the causes of emigration, conditional on economic development

Clemens (2020) finds, that emigration from low- and middle-income countries rises their GDP per capita reaches US$ 5,000 at purchasing power parity. The effect of the liquidity constraint then begins to decrease before emigration reverses after around US$ 10,000. Bazzi (2017) provides recent evidence from Indonesia, showing that wealth may promote or deter migration, depending on the relative income level for the observed individual. Overall, the study finds that unforeseen income gains from agricultural production lead to more migration from rural areas, while urban areas remain unaffected. Dustmann and Okatenko (2014) observe several low- and middle-income countries simultaneously and find a similar pattern. Income gains in low income countries, mainly in Sub-Saharan Africa, lead to more emigration from these countries, while income gains in relatively richer Latin-American countries have a deterring effect on emigration. The authors argue, that migration may indeed be subject to liquidity constraints for low- and lower-middle-income countries, while for upper-middle-income countries the effect of improving amenities at home may be more appealing.

Similar results are found when studying urban and rural areas separately (Jedwab et al., 2017), or immigrant flows to high-income countries (Dao et al., 2018). Policy interventions using cash transfers offer another microfounded possibility to evaluate the effects of windfall income on migration in the short-run. Analyzing the PROGRESA program in Mexico, Angelucci (2015) provides evidence for an inverse U-shaped pattern of income and migration. The study finds that cash transfers induce migration for the very poor. On the contrary, Imbert and Papp (2019) show for an Indian cash transfer program, that treated households yield lower migration rates, while increasing for neighboring non-treated households. Gazeaud et al. (2023) use a policy intervention in the Comoros to study the effect of randomized cash transfers on emigration. The authors conclude that the cash for work program reduced liquidity and risk concerns, and, thus, increased emigration from treated communities by 38%. All these recent microfounded studies are subject to short-term observations, such that concerns remain the inverse U-shaped pattern of income and migration is a mere cross-sectional phenomenon (Benček and Schneiderheinze, 2019).

To better understand the long-term determinants of migration, a large literature turns to the Era of Mass Migration from Europe to the "New World" during the late 19th and early 20th century (Hatton and Williamson, 1998, Hatton, 2010). Overall, these studies find a similar dynamic between liquidity constraints and relative incomes depending on the local institutional setting, such a specific inheritance law in the case of Norway (Abramitzky et al., 2012, 2013), whether it was driven by rural or urban migration as in the case of Italy (Spitzer and Zimran, 2018), or cultural similarity and existing migrant networks in the case of Ireland (Connor, 2019) and Spain (Sánchez-Alonso, 2000b, Sanchez, 2023). Research on the introduction of steam ships shows that lower costs of sea passages significantly increased migration during the 19th century (Keeling, 1999). Historic studies provide a good case to study the long-run effects of migration and help to understand today's pattern. Yet, they are subject to country-specific institutions and thus results may be difficult to relate to recent migration dynamics.

Our results also provide new insights to the discussion in economic policy whether foreign aid is a useful tool to deter emigration by addressing its "root causes" (Clemens and Postel, 2018, Dreher et al., 2019).[1]

Finally, our paper adds to a growing literature which exploits the unique setup of the Spanish Christmas lottery as a nationwide and repeated randomized income shock. While studies use this mechanism to study the recent effects on regional elections (Bagues and Esteve-Volart, 2016), macroeconomic aggregates and sentiment (Ghomi et al., 2023), household consumption (Cabanillas-Jiménez, 2021), outbound tourism (Boto-García et al., 2023), and local housing prices (Kent and Martínez-Marquina, 2022), we are the first to systematically study the effect of local windfall incomes, induced by the lottery, on emigration in the long run.

Our paper proceeds as follows. Section 2 provides an overview on Spanish migration history and economic development. In Section 3, we develop a simple theoretical framework that shows unexpected income gains affect the decision to migrate in the course of economic development. Section 4 presents our measures for local emigration and explain our identifying mechanism of windfall incomes by the Spanish Christmas lottery. We give a detailed explanation of our empirical strategy in Section 5, while Section 6 presents our results. Here, we further explore the mechanism driving the effect of income on the different levels and forms of migration and show that our results are detached from other confounding factors. Section 7 concludes.

[1] For example, the European Union issued 79.5 Billion EUR in development assistance through its "Neighbourhood, Development and International Cooperation Instrument" for the years 2021 to 2027 (https://international-partnerships.ec.europa.eu/funding-and-technical-assistance/funding-instruments/global-europe-neighbourhood-development-and-international-cooperation-instrument_en, last accessed May 10, 2023) and the US Government issued 4 Billion USD through its U.S. Citizenship Act of 2021 to Central American countries for the years 2021 to 2025 (https://www.congress.gov/bill/117th-congress/senate-bill/348, last accessed September 13, 2023).

2 Background

2.1 Economic Development and Emigration of Spain

Between 1870 and 1970 Spain's GDP per capita increased more than five times and had an average growth rate of 2.03%. At the same time, Spain's population more than doubled from 16.7 million to 33.9 million inhabitants. During this time, Spain, like all other high-income countries today, underwent a structural transformation from a largely agrarian society by the end of the 19th century to an industrialized and service oriented economy (Diez-Minguela et al., 2018). Yet, this transformation took place much later than for other high-income countries.

Figure 1 shows the evolution of Spanish GDP per capita in constant 2011 US$ between 1870 and 1980. Economic growth remained low until World War I. In fact, the gap between Spain and other industrialized countries even widened between 1883 and 1913 (Hatton and Williamson, 1998, Prados de la Escosura and Sánchez-Alonso, 2019). After a short period of prosperity in the 1920s, Spain fell into a deep recession caused by the turmoil of the Spanish Civil War (1936 – 1939) and the aftermath of World War II that lasted for Spain until the mid 1950s. It was not until the 1960s and 1970s that Spain managed to score more rapid and constant growth rates and began to converge towards other industrialized economies, a time also considered the *Golden Age* (1950 – 1974) of economic growth in Spain (Diez-Minguela et al., 2018). This pattern is in line with other countries in the European periphery, such as Greece, Portugal, or Ireland (Prados de la Escosura and Sánchez-Alonso, 2019). If we apply the World Bank's country income group classification for the year 2011, Spain remains a lower-middle-income country up to the mid-1950s, an upper-middle-income country from 1955 to the mid-1970s, before being classified a high-income country. A reason for the failure to compete with other Western economies is the large and unproductive agrarian sector, mainly in southern regions of Spain, and low levels of industrialization (Prados de la Escosura and Sánchez-Alonso, 2019). Industrial centers were mainly found in the North, particularly in Catalonia around Barcelona and the Basque Country near Bilbao. In addition, the industrial sector focused mainly on domestic demand as it was kept from international competition through strong protectionist policies. Spain's macroeconomic instability caused a further devaluation of the already volatile domestic peseta, further isolating the country from the world market (Prados de la Escosura and Sánchez-Alonso, 2019). Taken together, these attributes of the Spanish Economy are very similar to those of low- and middle-income countries today.

Spain's migration history follows broadly the same pattern as of other southern European countries, such as Italy or Portugal. It may be separated into two phases, the first phase was the time between the late 19th century and World War II. During this time, Spanish migrants overwhelmingly migrated to Latin American countries,

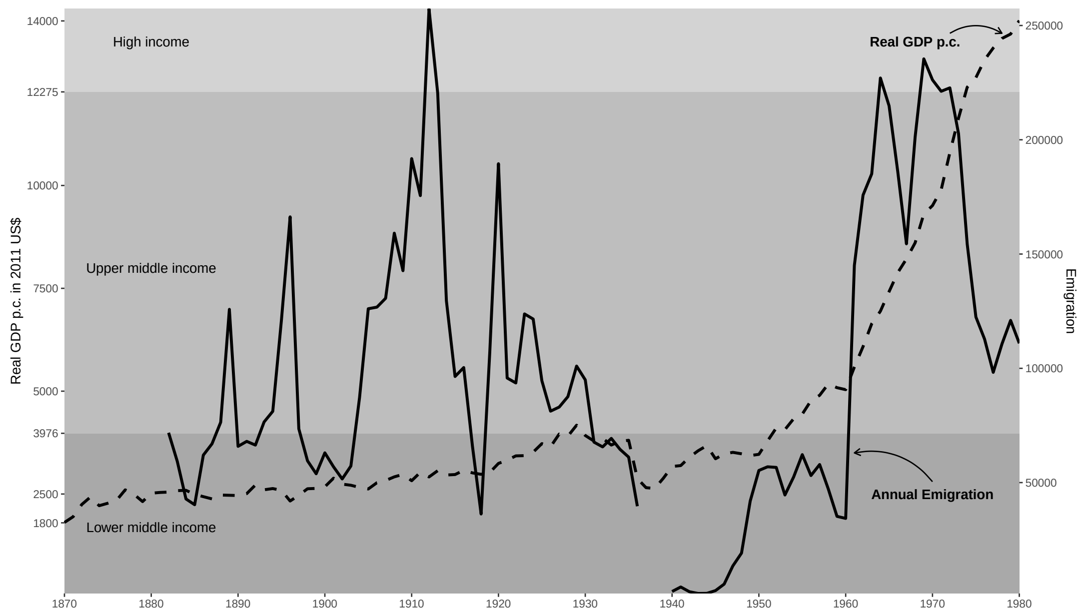


Figure 1 – Annual Spanish real GDP p.c. in 2011 US$ and Emigration, 1870 to 1980

Notes: The dashed line shows real GDP p.c. in 2011 US$, the solid line shows annual emigration. The gray shaded areas represent the country income group classification by the World Bank for the year 2011. GDP data are taken from Bolt and Van Zanden (2020). Emigration data come from Carreras and Tafunell Sambola (2005). No official emigration data is available for the years 1936 to 1939 during the Civil War in Spain.

particularly Argentina, Cuba, and Brazil (Sánchez-Alonso, 2000b). As Figure 1 shows, this first wave climaxed in the 1910s and 1920s and was only interrupted somewhat by World War I. As Sánchez-Alonso (2000a) argues, this relatively late take-off of Spanish emigration resulted from income constraints for potential migrations due to the strong deprecation of the Spanish currency in the late 19th century. In addition, the main reason to leave Spain was economic failure rather than rapid population growth during this time (Hatton and Williamson, 1998). A second less severe wave of emigration occurred after World War II, mainly to core European countries such as Germany, France, or Switzerland (Diez-Minguela et al., 2018). During the first wave, emigrants mainly came from coastal provinces of the north-west such as Galicia and the south-east, while in later decades mainly people from the relatively poorer south, particularly from Andalusia, migrated to other European countries.[2] Overall, the majority of Spanish migrants were young male adults. Female migrants only played a minor role and were more destined towards countries that favored family migration such as Brazil (Sánchez-Alonso, 2000b). Accordingly, return migration was relatively high compared to Northern European countries, as it was the case for other Southern European countries too (Hatton

[2]Official emigration statistics are likely to overestimate regional migration patterns since they record the last place of residence rather than the place of birth (Sánchez-Alonso, 2000b). In fact, Taboada (1979) points out, that over 40 % of emigrants leaving Spain from Galician ports were born in a different Autonomous Community.

and Williamson, 1998). In addition, Spanish migrants were better educated than the average Spanish population (Sánchez-Alonso, 2000b, Sanchez, 2023).

2.2 Spanish Christmas Lottery

The Spanish Christmas lottery was introduced in 1812 to raise money for Spain's war against Napoleonic France. It has been played annually as a centralized lottery on December 22 ever since.[3] Playing the Christmas lottery is very popular among the Spanish population. It is considered to be a social custom inaugurating the Festive Season rather than actual gambling. Most play the lottery in syndicates, allowing to invest only small amounts. While lottery spending usually increases with income, syndicate players share tickets out of social cohesion, rather than economic reasons (Guillén et al., 2012), making it inelastic to individual incomes, which normally would be the case for regular gambling (Garvía, 2007). Beckert and Lutter (2013) show that the player's social network, spurred by syndicate play, is the key driver for the society as a whole to engage in lottery play. In fact, the Spanish Christmas lottery is one of the world's largest lotteries. During our time of observation, players spent between 0.7% and 1% of annual GDP on tickets, of which the lottery redistributes between 70% and 75% as prices (Garvía, 2007).

In 1862, the Christmas lottery system was reformed to its current system, consisting of a fixed number of relatively expensive tickets. Tickets are split into tenth (*decimos*). The entire ticket is usually sold by the same local ticket store, while the ticket numbers are randomly distributed countrywide across stores (Bermejo et al., 2022). The lottery reform was undertaken to prevent gambling abuse among the poor population, which no longer could afford to buy relatively more expansive tickets by themselves. The lottery's revenues, however, steadily increased over the years, as players began to play in syndicates, subdividing the official shares of tenth further among their local social network such as family, relatives, and work colleagues. Today, 87% of all tickets are played in syndicates (Bagues and Esteve-Volart, 2016). Moreover, the formation of syndicates, in combination of the timing of the draw at the beginning of the Festive Season, created a system in which playing the Christmas lottery became a social norm in which even wealthy Spaniards, who easily could afford to buy entire tickets just for themselves, preferred to distribute shares among their employees relatively to their social status and income. Figure C.1 in Appendix B visualizes an exemplary syndicate which became public due to famous members.

Bagues and Esteve-Volart (2016) summarize recent survey data on players' characteristics showing that the Christmas lottery is very popular across the entire population of Spain (75 % of the above population above 18 buys tickets on average).

[3] The only exception for when there were two separate lotteries was during the Spanish Civil War (1936 – 1939).

This includes those who usually do not play any other lottery (62% of all players only play El Gordo and only ten % regularly purchase tickets for other lotteries). 87% play in syndicates, consisting of local clusters (64% of all tickets are shared with relatives, 33% with friends and 28% with colleagues) and tickets are bought locally. In addition, local lottery shops usually distribute all predefined shares of tenths of an entire ticket. Since 2014, even the official slogan of the lottery is “El mayor premio es compartirlo” which translates to “the greatest prize is sharing” (El Confidencial, 2014).

3 Theoretical Framework

A simple theoretical framework allows us to highlight the mechanisms underlying the effect of windfall income on migration conditional on economic development. We adopt an adjusted version of the Roy-Borjas model (Roy, 1951, Borjas, 1987) previously used in Cattaneo and Peri (2016), which aimed at investigating the effect of climate shocks on emigration rates, while considering income levels as a conditional variable.[4] In brief, the model is based on a two-period framework and follows the idea that income in the form of wages is necessary to finance migration decisions prior to the actual migration. To reduce the complexity of potential migration decisions and to emphasize the importance of an income shock for the general decision to leave, we only focus on the decision to stay in the home region or to emigrate abroad. The model assumes that the wage of individual i in home region o consists of two parts.[5] The first component is the wage earned by an individual with median skill level μ_o in their home region o. The second component reflects the individual skill level of person i and is defined by ϵ_i, which enters the model as a random variable.[6] The skill level affects the wage of individual i via the return to skill β_o resulting in the following wage equation:

$$w_{i,o} = \mu_o + \beta_o \times \epsilon_i \tag{1}$$

To make an informed migration decision, individual i must compare their domestic wage with that in the destination country. The model hypothesizes a matching wage equation in the destination country, indexed by d, but with destination specific median wage level, represented by μ_d, and return to skill, represented by β_d.[7]

$$w_{i,d} = \mu_d + \beta_d \times \epsilon_i \tag{2}$$

The model assumes two types of migration costs: monetary costs (c_{mon}) and non-monetary costs (c_{non}).[8] Given the monetary costs and non-monetary costs of migration, as well as linear preferences in net wages, as in Grogger and Hanson (2011), and no financial constraint, a person would migrate if the earnings in the destination country

[4]The theoretical considerations of McKenzie and Rapoport (2007) and Dustmann and Okatenko (2014) are closely related.

[5]The terms region and country are used interchangeably in the theory section.

[6]In Cattaneo and Peri (2016), ϵ_i is i.i.d. from a standard normal distribution. We do not impose any specific distributional assumption on ϵ_i.

[7]We assume equal skill distribution in both the source and destination region, indicating perfect skill transferability.

[8]The non-monetary costs of migration are often referred to as psychological costs, while monetary costs pertain to expenses associated with traveling, relocating, and searching.

minus the costs of moving would exceed the earnings in the home country. Formaly, individual i migrates if

$$\mu_d + \beta_d \times \epsilon_i - c_{mon} - c_{non} > \mu_o + \beta_o \times \epsilon_i. \tag{3}$$

However, the model assumes that monetary costs must be financed in advance. If previously earned income does not cover the migration costs, optimization of utility through migration may not be possible, resulting in the following binding financial constraint:

$$\mu_o + \beta_o \times \epsilon_i > c_{mon} \tag{4}$$

Winning a substantial amount in the Spanish Christmas lottery may help ease financial constraints for individuals, thus increasing the likelihood of emigrating. The winning individual or their local community may be able to provide economic support through social networks, using the windfall income gained from the lottery. We label this windfall income as L, which is equally available to all residents of the region of origin. Besides loosening a binding financial constraint it can also influence the wage equation. One way for random income shocks to enter Equation (1) would be to shift the median income $\mu_o(L)$. Kent and Martínez-Marquina (2022) show that locally concentrated lottery winnings do indeed have local economic equilibrium effects, although the effects are somewhat ambiguous. If lottery winnings are used to finance investments, labor productivity may increase, thus, increasing the median income level.

We, therefore, update Equation (3) for the migration decision and the financial constraint Equation (4) by including L:

$$\mu_d + \beta_d \times \epsilon_i - c_{mon} - c_{non} > \mu_o(L) + \beta_o \times \epsilon_i \tag{5}$$

$$\mu_o(L) + \beta_o \times \epsilon_i + L > c_{mon} \tag{6}$$

The lottery winning in Equation (5) influences the migration decision thus only indirectly via μ_o.[9] For the financial constraint L enters directly and indirectly via μ_o. Based on those two Equations, the proportion of persons emigrating can be obtained by

[9]Introducing L only via μ_o assumes that a lottery win for an individual is perfectly transferable to the destination country and does not increase opportunity costs by being locally bounded for spending.

rearranging both equations with respect to ϵ_i.

$$\epsilon_i > \frac{\mu_o(L) + c_{mon} + c_{non}}{\beta_d - \beta_o} \tag{7}$$

$$\epsilon_i > \frac{c_{mon} - L - \mu_o(L)}{\beta_o} \tag{8}$$

We obtain the proportion of people emigrating by inserting these thresholds into the cumulative distribution function corresponding to ϵ_i.

$$\frac{Emi}{Pop} = 1 - F\left(\frac{\mu_o(L) + c_{mon} + c_{non}}{\beta_d - \beta_o}\right) \tag{9}$$

$$\frac{Emi}{Pop} = 1 - F\left(\frac{c_{mon} - L - \mu_o(L)}{\beta_o}\right) \tag{10}$$

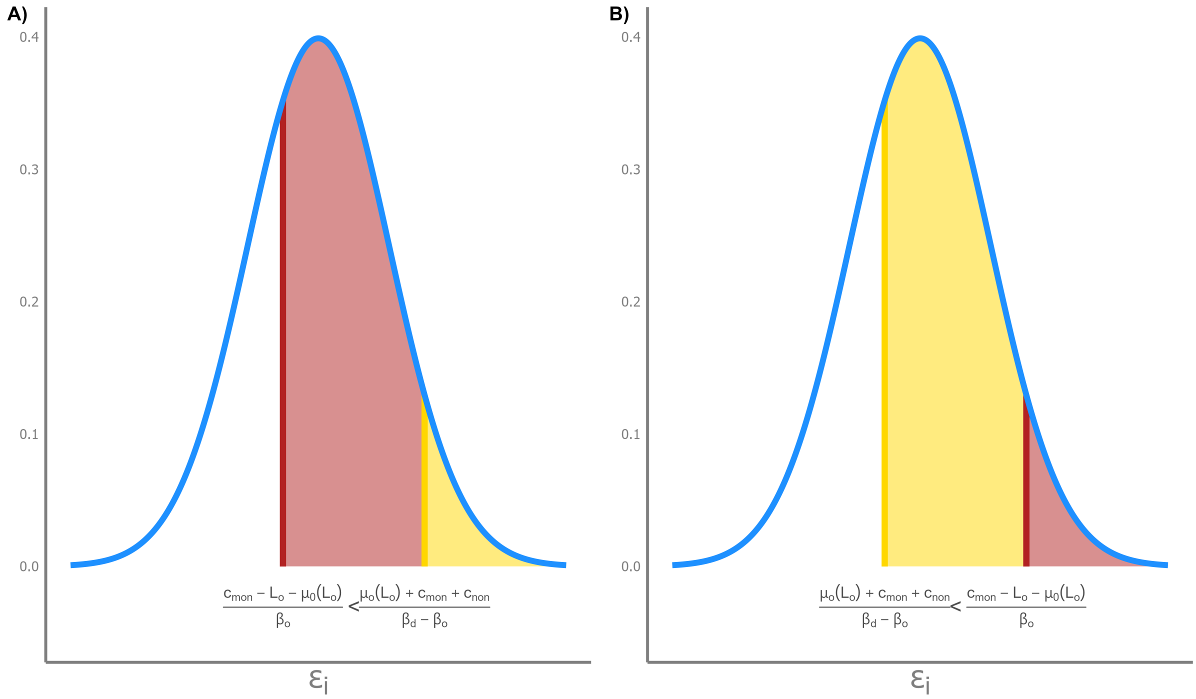
Equation (9) then gives the emigration rate for the country of origin, if financial constraints do not prevent people from migrating. Equation (10) gives the proportion of people who can afford to finance migration upfront. Hence, a situation of a financially constrained home region occurs whenever $\frac{c_{mon}-L_o-\mu_o(L_o)}{\beta_o} > \frac{\mu_o(L_o)+c_{mon}+c_{non}}{\beta_d-\beta_o}$ holds. As a result, fewer people are emigrating with constraints than would have desired. This situation may be particularly true in poorer regions, where income from wages is not sufficient to finance costs in advance. Thus, we think about the role of economic development as either inducing a situation of financial constraints or not for individual i via the level of μ_o.

Figure 2 illustrates the interaction between the emigration rate, the skill distribution, the lottery winnings, and the financial constraints. The blue line represents the skill distribution of the origin country's population.[10] Panel A then describes a situation where the financial constraint is not binding and it holds that $\frac{c_{mon}-L_o-\mu_o(L_o)}{\beta_o} < \frac{\mu_o(L_o)+c_{mon}+c_{non}}{\beta_d-\beta_o}$. The yellow area in panel A then represents the fraction of people who emigrate, while the red area corresponds to people who could finance a migration decision but decide not to, since their net utility gain would be negative. Panel B describes a situation where the liquidity constraint is binding and some people who would like to migrate cannot afford to do so. In this situation it holds that $\frac{c_{mon}-L_o-\mu_o(L_o)}{\beta_o} > \frac{\mu_o(L_o)+c_{mon}+c_{non}}{\beta_d-\beta_o}$, and the fraction of people who migrate is described by the red area in panel B. The yellow area then reflects the fraction of people who would have a positive utility gain from migrating but are

[10] We use a standard normal distribution for illustration purposes.

unable to finance it in advance. Based on this model, it follows that the emigration rate is governed by the equation (10) under financial constraints and that a lottery increases the proportion of people who move abroad by directly reducing financial constraints, but also indirectly increasing μ_o. However, the magnitude remains ambiguous and depends on the distributional assumption of ϵ_i. When financial constraints are no longer binding, the effect of L will only negatively affect the emigration rate through an indirect effect in μ_o, by increasing opportunity costs (see equation (9)).

Figure 2 – Emigration Rate without and with Financial Constraints



Notes: Panel A displays the percentage of people who emigrate without financial constraints, while panel B shows the percentage for those emigrating with financial constraints. The red line corresponds to the emigration threshold resulting from the liquidity constraint, while the yellow line corresponds to the emigration threshold based on positive net gain in utility if ones emigrates. The red line represents the threshold for emigration that results from the liquidity constraint. In comparison, the yellow line represents the threshold for emigration that is based on a positive net gain in utility upon leaving. When the yellow threshold exceeds the red threshold, the yellow display indicates the proportion of people who have emigrated. However, if the red threshold is larger than the yellow one, the red display represents the proportion of people emigrating due to financial constraints.

4 Data

4.1 Local Emigration from Spanish Municipalities

We collect local emigration data for over 9,000 Spanish municipalities, using the Spanish census that is published roughly every ten years between 1877 and 1970.[11] Since official emigration data is not available at this granularity, we rely on the absent population as a proxy for local emigration (Sanchez, 2023). The main population count includes three variables, whether a man or woman was present (*presentes*), absent (*aussentes*), or traveling (*transuentes*) on December 31 of the respective year. These variables are available for all census waves at the municipality level and were consistently measured for all census waves in our sample. Our main variable of interest is absent population. This variable is defined as everyone who is not to be found at their dwelling or anywhere within Spain. Accordingly, present is everyone who resided at their dwelling the night before the census was conducted, while traveling were those not found at home but in another municipality within Spain. To increase the probability that all residents are at home, the census was conducted on December 31. Sanchez (2023) introduces absent population as a proxy for emigration at the municipality level for the Autonomous Region of Galicia and proofs in detail the validity of this proxy.[12]

Figure 3 plots the correlation between official emigration data at the province level (NUTS3) and absent population aggregated to the province level. Overall, the correlation between both variables is 0.74 and highly, positively significant. In addition, Sanchez (2023) shows that the absent population is not correlated with other reasons to be abroad, such as being drafted by the military. Since absent population correlates with casualties of the Spanish Civil War (see Table A.5 in Appendix A), we exclude the 1940 census from our sample. Another reason to not consider this census wave is that it was conducted separately by the Republican and the Nationalist faction during the Civil War.

Spain's administrative boundaries remain largely unchanged during our sample period, at least for mainland Spain and the Canary Islands. However, consistency for our set of fixed effects only holds true if the administrative boundaries remain constant over time. To ensure this consistency, we exclude Spain's then colonies and its enclaves on the African continent, Melilla and Ceuta. In addition, we harmonize all municipalities to their current aggregates from Spain's communal reform of 2011, using a harmonization dataset by Gisbert et al. (2015). This way, we make sure that our units of observation, i.e., the size of municipalities, do not change over time. This rigorous process reduces

[11] We collect data from the census waves of 1877, 1887, 1900, 1910, 1920, 1930, 1940, 1950, 1960, and 1970.

[12] For his study on Galician emigration, Sanchez (2023) only considers absent men. In Galicia, absent women only present 23.7 % of total absent population, on average in our sample, 1877 to 1970 and only 18.2 % up to 1930, which is the point when his study stops. For all of Spain, absent women represent 32.3 % of total absent population on average. Therefore, we consider total absent population.

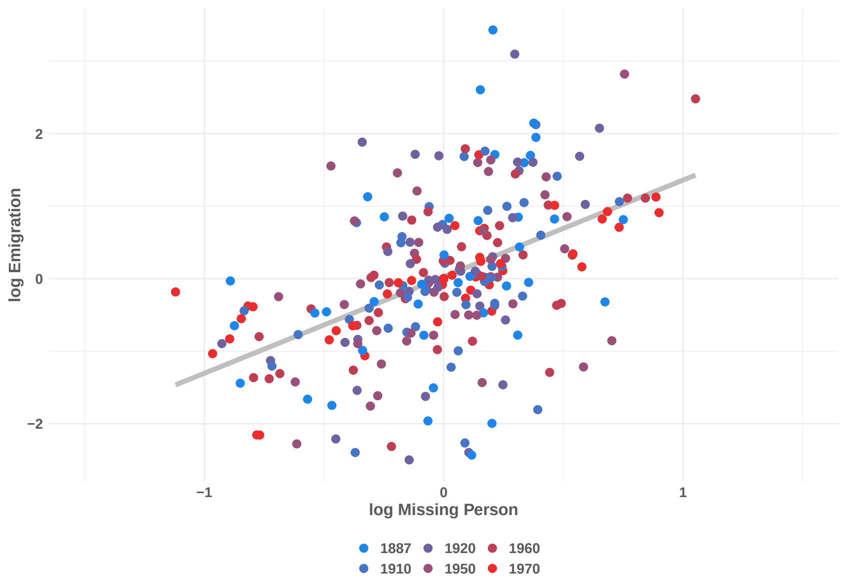


Figure 3 – Correlation of Spanish Migration vs. Absent Population

Notes: The figure displays the correlation between logged international emigration and logged absent population with regard to the province of origin. Both variables were adjusted for decade-autonomous regions specific effects. The emigration data prior to 1940 has been extracted from Sánchez-Alonso (1995) and matched with the nearest available census year. We take emigration data for the years after 1940 from the respective Statistical Year Books of Spain (INE, 2023a). Following residualization, we obtain a significant (at the 1% level) coefficient of 0.7407 for the elasticity between both variables, with a (within-) R^2 value of 0.065.

our number of observation from over 9,000 to 8,022 municipalities, that are now time-consistent for all decades between 1877 and 1970, except 1940. The average population size of a municipality in our sample is 3,058 while the median is only 1,017, indicating the usual heavy upper tails for population distribution among towns (Gabaix, 1999).

Based on the absent population from the municipal census, we define our dependent variable, emigration share, as total absent population over total population.

$$emigration\ share_{it} = \frac{absent\ population_{it}}{total\ population_{it}},$$

where $emigration\ share_{it}$ is the share of absent population in municipality i in decade t, respectively.

4.2 Local Random Income Shocks

To measure local income shocks, we rely on the annual draw of the Spanish Christmas lottery. We collect annual data on winnings from the official Spanish daily between 1870 and 1970.[13] Overall, 344 time-consistent municipalities have won a lottery prize at least once during our sample period. The map of Spain in Figure 4 visualizes how often each

[13] 1870 to 1959: Gaceta de Madrid: https://www.boe.es/buscar/ayudas/gazeta_ayuda.php (last accessed: 10 May 2023); 1960 to 1970: Boletín Oficial del Estado, https://www.boe.es/buscar/boe.php (last accessed: May 10, 2023).

of all 8,022 municipalities win a prize in the lottery in our sample. The average town size of a winning town is 69,080, however, the median population of a winning municipality is only 25,217. On average each municipality wins 2.53 times but 182 of all municipalities only win once. These results are not surprising since the likelihood for a town to win increases with relative population size. On the contrary, we regard these findings to be in line with anecdotal evidence (see Section 2) claiming that playing the lottery is evenly popular across the entire Spanish population.

Besides the location of winning winning towns, we also include prize money, which gives us a measure the evaluate the intensity of winning as well as the prize rank. We convert prizes to 2012 EUR, using the consumer price index by the Bank of Spain (Banco de España, 2021) and aggregate annual winnings to decadal winnings in order to match the data to the decennial census. Figure A.6 in Appendix A shows the average prize money for the first 20 prizes in the lottery, converted to constant 2012 EUR. Dividing the annual prize money by the population of winning towns yields an average annual prize per capita of 2,110 EUR. This is a bit more than twice the amount for an overseas passage from Vigo in Northern Spain to the Río de la Plata river mouth in South America.[14] According to Sánchez-Alonso (1990) this sea passage provides an upper bound of travel costs since it would have been a particularly long and, thus, expensive passage for Spanish emigrants. The cumulative decadal prize per capita is 17,119 EUR, while the average winning per capita for the top five prizes is only 9,569 EUR. This indicates that major prizes tend to be won in larger towns.

The Spanish dailies only report the main prizes. On average, we find the first 21,5 annual prizes. This implies that we do not observe the majority of smaller prizes that are handed out as well. Assuming that on average, 0.5% of annual GDP is distributed in prizes we observe about 15% of this winning sum, on average. However, we do not regard this as a threat to our identification for two reasons: Firstly, only major prizes will create a significant income shock within a winning municipality. Secondly, if at all, our results will be downward biased.

Table A.1 in Appendix A presents the summary statistics.

[14]According to Sánchez-Alonso (1990) the price for a Sea passage was 250 Pesetas which converts to 919 constant 2012 EUR.

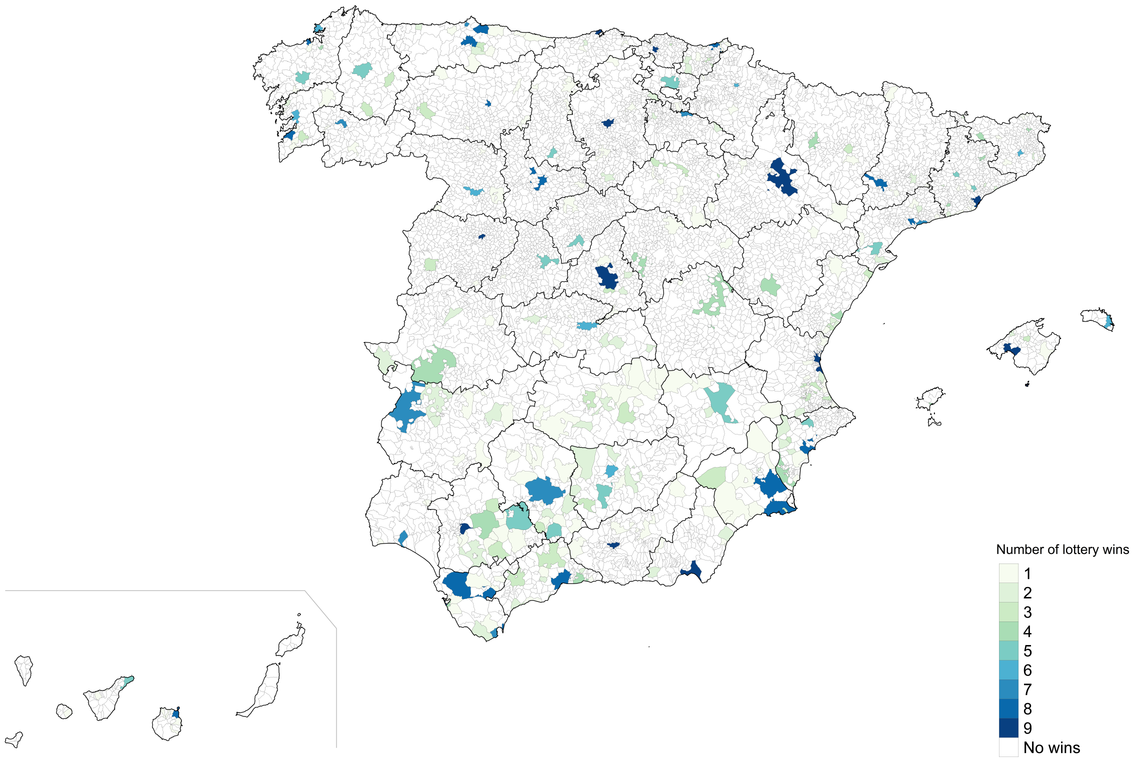


Figure 4 – Winning Towns in Spain, 1877 – 1970

Notes: The figure shows the number of times a municipality has won a prize at the Spanish Christmas lottery between 1877 and 1970. Province borders are shaded in black. The Provinces of Melilla and Ceuta are excluded. Data on administrative boundaries were taken from INE (2014). Note, that the Canary Islands were dislocated for a better visualization, using the *mapSpain* package in *R* (Hernangómez, 2023).

5 Empirical Strategy

We are interested in how randomized income shocks affect migration, conditional on economic development. As our main independent variable, we define an indicator variable, win_{ijt} that takes the value of one, if municipality i in province j has won a prize at the lottery in the past decade prior to the current census t.

Since no GDP data is available at the municipality level, we turn to population density, which is a commonly used proxy for economic prosperity in fine-grained historic studies, as it correlates well with GDP (Kremer, 1993). We calculate the natural logarithm of population density for all time-consistent municipalities in our sample using the de jure population from the census and official area data from Statistics Spain (INE, 2014). For an easier interpretation of the later results, we define population density as inhabitants per kilometer squared.

To capture the non-linear effect of the income shock conditional on economic development, we interact the winning indicator, win_{ijt}, with the natural logarithm of population density. While we expect an overall positive effect of winning the lottery on emigration, we expect that this effect is more pronounced for relatively poorer municipalities.

Measuring the influence of changes in income and wealth on people's decisions to migrate comes with several challenges, as reverse causality and potential omitted confounders may not allow the estimation of the 'true' relationship. To address potential causal identification concerns, we exploit the national Christmas lottery of Spain as a rarely observed and random income shock at a small local geographic scale (municipality level). In particular, we are interested in the causal effect of income on migration, conditional on economic development. Equation (11) describes our preferred baseline specification:

$$\begin{aligned} emigration\ share_{ijt} = {} & \alpha\ D_{ijt} + \gamma\ ln(population\ density_{ij,t-1}) \\ & + \beta\ D_{ijt} \times ln(population\ density_{ij,t-1}) \\ & + \mu_i + \lambda_{jt} + \varepsilon_{ijt} \end{aligned} \tag{11}$$

Our main dependent variable is the emigration share, $emigration\ share_{ijt}$, observed for municipality i in Province j and census wave t. The main goal of our analysis is to disentangle the moderating role of relative income level with respect to the unexpected income shock. We define our main treatment variable, D_{ijt} as an indicator, that takes the value one, if municipality i has won a prize at the Spanish Christmas lottery during the previous years of census wave t. To condition on local and relative economic performance of that winning town, we interact our treatment variable with the natural logarithm of population density, $ln(population\ density_{ij,t-1})$ which we lag by one period. This way, we avoid that we capture a direct migration effect of the actual lottery win on the population change in the affected town. We include a municipality fixed effect, μ_i, to control for any unobserved municipality specific characteristics and a province-specific (NUTS3) time trend, λ_{jt}, that controls for all unobserved province-specific and time-varying heterogeneity, such as faster growth rates of the more industrialized northern provinces in Catalonia and the Basque Country. ε_{ijt} denotes the error term.

Our identifying assumption is that a winning (treated) municipality shows a significantly different migration pattern than a town that wins nothing (control). Depending on the town's relative income compared to relative income abroad and within Spain, members of the winning syndicate decide to migrate, conditional on migration costs.

The identification rests upon the argument, that lottery winnings are truly random. A potential threat to the identifying assumption might be, if playing the lottery would not be evenly distributed across Spain. Then, winning would only be conditional on lottery sales. Besides the overwhelming anecdotal evidence on the exceptional popularity of the Christmas Lottery in Spain (see Section 2), we also find a correlation of 0.87 between the municipal population and the winning amount. This reassures us that winnings are spread evenly across the population. Therefore, lottery sales also have to be distributed proportionally across the population of Spain, since the first is a necessary condition for the latter.

6 Results

6.1 Main Results

Our main regression results are presented in Table 1. We display our preferred main specification in column 2, emphasizing the significance of distinguishing between population densities at different levels to untangle the effect of a sudden income shock on the decision to migrate abroad. Column 1 displays solely the average impact of the win, indicated by an estimated semi-elasticity of approximately 0.1 percentage points, though statistically insignificant. Once we interact our binary win indicator with the logarithm of the lagged population density variable, the coefficient becomes negative and statistically significant, indicating that higher levels of population densities result in a lower emigration rate. To understand the overall impact of a lottery win, Panel A in Figure 5 illustrates the marginal effects for different levels of population density. The average municipal emigration rate is approximately 0.0480. Winning the Christmas Lottery increases the emigration rate by approximately 25.7% at the lowest percentile of population density.[15] These municipalities have an average population of 122, which results in the emigration of 1.5 additional people ($122 \times 0.0123 \approx 1.5$) due to winning the lottery. For municipalities at the median, the estimate corresponds to a 13.1% increase in the emigration rate, which translates to an additional 6.4 people emigrating.[16] However, for the most densely populated municipalities, the effect reverts. Here, the lottery decreases the emigration rate by 10.1% or 131.6 people on average.[17] Therefore, based on our main analysis, lottery winnings are indeed effective in promoting emigration from less developed, i.e., rural, economic areas, but not in the case of the most economically developed municipalities. The results align with our theoretical prediction in Section 3, where the impact of a windfall income decreasing emigration depends on its ability to consistently increase the opportunity costs of leaving. In our case, it appears that winning the lottery is incapable of raising opportunity costs over the long run.

Columns 3 through 5 present several tests that cross-validate our results. A major threat to our identification would be if winning the lottery would be conditional on the location of ticket sales. Column 3 controls for this claim. Since it is not possible to observe ticket sales for all time periods, we reduce our sample to only those municipalities for which we know that they had a licensed ticket vendor ("lottery shop") in 1941. This is the only year for which detailed information on licensed lottery ticket selling stores exists in

[15] The coefficient for the lowest percentile is 0.0123: $0.0123/0.0480 \approx 0.2568$.

[16] To calculate the emigration rate, we take the average value of municipalities that have a population density below the median. The average emigration rate is 0.0480. This group of municipalities has an average population size of 1017. Therefore, the emigration rate increases by approximately 0.63 percentage points, calculated by $(0.0480 \times 0.131) \times 100$. As a result, for an average town size of 1017 persons, the number of people emigrating increases by approximately 6.4 individuals, calculated by multiplying the emigration rate by the population size: $0.0063 \times 1017 \approx 6.4$.

[17] $-0.0051 \times 25482 \approx 131.6$.

Table 1 – Main Regression Results

Emigration Share	Baseline		Lottery Shops	Major Win	ln(emigration)	Spatial Lag
	(1)	(2)	(3)	(4)	(5)	(6)
Win	0.001	0.018***	0.013***	0.014***	0.310*	0.018***
	(0.001)	(0.004)	(0.005)	(0.005)	(0.159)	(0.005)
ln(Pop. Den. (lag.))	0.020***	0.020***	0.008***	0.020***	0.377***	0.020***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.026)	(0.001)
Win × ln(Pop. Den. (lag.))		-0.004***	-0.002***	-0.002**	-0.055*	-0.004***
		(0.001)	(0.001)	(0.001)	(0.031)	(0.001)
Win (spatial lag)						0.005
						(0.003)
Win × Win (spatial lag)						0.001
						(0.007)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Decade-Province FE	Yes	Yes		Yes	Yes	Yes
Decade-Aut. Comm. FE			Yes			
Observations	63,556	63,556	3,627	63,556	61,429	63,556
Within R^2	0.01174	0.01187	0.00683	0.01182	0.00719	0.01193
Dependent variable mean	0.04804	0.04804	0.02893	0.04804	-3.4551	0.04804

Notes: The dependent variable is emigration share for columns 1 to 4 and 6, and the natural logarithm of emigration share for column 5. Column 3 restricts the sample to those municipalities that had a lottery ticket shop in 1941. Column 4 only considers major wins that are at least 20 % of annual GDP per capita. Column 5 takes the natural logarithm of the dependent varialbe, emigration share. Column 6 includes a spatial lag. Standard errors are clustered at the municipality level and reported in parentheses. Decade corresponds to the census waves of 1877, 1887, 1900, 1910, 1920, 1930, 1950, 1960 and 1970. Province considers all 50 Provinces of Spain, excluding Ceuta and Melilla. Autonomous Communities corresponds to the 16 Autonomous Communities of Spain. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

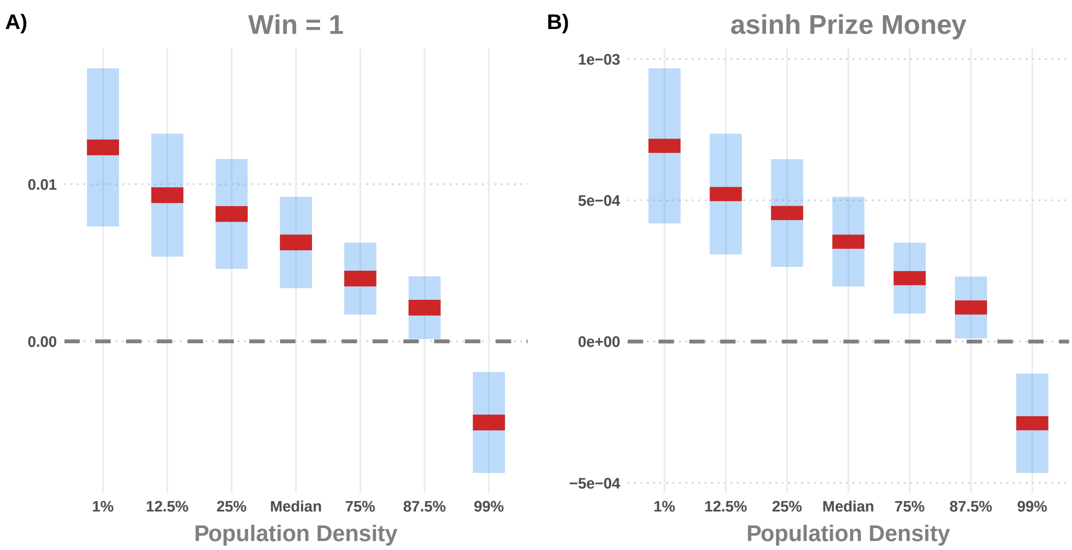


Figure 5 – Marginal Effects on International Emigration conditionally on Population Density

Notes: The figure shows the marginal effects of our binary treatment variable 'win' and our continuous measure 'asinh Prize Money' for different levels of population density on international emigration. Seven different population densities are used in the analysis. In addition to the median, different percentiles are included. The estimates presented are based on Model 2 in Table 1 and Table A.2 respectively, which are our preferred specifications. The red bares represent the point estimates, while the blue bars correspond to the 90% confidence intervals.

our sample period (Kent and Martínez-Marquina, 2022). The test is particularly rigid as our sample shrinks by 94% from 8,022 municipalities to 455 municipalities. We find that the magnitude of the direct effect reduces by around 25% and the interaction effect reduces by 50%. However, direction and significance of the overall effect remain unchanged.[18] This test reassures us that our main findings are not different when controlling for the location of ticket sales. We explain this reduction in magnitude with a possible downward bias of our results by excluding municipalities that will have a lottery selling location after 1941. At the same time, it is unlikely that a town did have a vendor before 1941 which closed down. Anecdotal evidence suggests that popularity of playing the lottery is constantly increasing throughout our sample period (see 2).

In column 4, we restrict our treatment to lottery prizes that are at least 20% of the provincial per capita GDP to verify whether the impact of winning large-scale lottery prizes is distinct. The average winning amount per capita increases from 17,119 EUR for the baseline to 21,989 EUR for a winning town in this specification. Again, the magnitude reduces but the results remain similar to our baseline results from column 2. Column 5 repeats the baseline estimation, but takes the natural logarithm of emigration rate, in order to interpret our results in terms of elasticities. While we loose some precision, the results remain intact. Finally, column 6 controls for spatial spillovers by including a spatial lag. Spillovers may occur if a member of a winning syndicate does not live in the same municipality but close by in a neighboring town. The lag considers all first order neighbors of treated municipalities using queen weights. While the main variables of interest do not change, the lag itself as well as the interaction of the lag with the treatment indicator remain insignificant. We, thus, conclude that our main results are not affected by potential spatial spillovers.

Next, we are also interested in the intensive margin of winning the lottery. To capture a potential intensity of winning, we consider the amount of money that was won in a municipality. We define $asinh(prize\ money_{ijt})$ as the sum of all prizes won by municipality i in province j and decade t during the years between the prior and the current census wave. We take the inverse hyperbolic sine transformation in order to be able to include our control group that wins nothing.[19] Table A.2 in Appendix A replicates our main specifications from Table 1 and replaces the winning indicator from equation (11) with $asinh(prize\ money_{ijt})$. Again, column 2 shows our main specification of interest. Overall, our results remain similar to column 2 of Table 1 in terms of direction and significance for the main as well as the interaction effect. Likewise, the same relationship observed earlier can be seen in the marginal effect for various population densities depicted

[18]Note that we have to reduce panel clusters for this specification, from province-decade to autonomous community-decade fixed effects for the estimation to remain conclusive. Otherwise, we would consider clusters of 50 provinces times 9 Decades (= 450) by 455 observations overall.

[19]Note that it is not reasonable to interact prize money per capita with population density, since the economic interpretation would then be prize money per kilometer squared.

in panel B of Figure 5. For a median sized town with a population of 1017 the emigration rate increases by 0.03 percentage points (or 0.4 people) if the prize money increases by 1%. This positive emigration effect decreases in population density, i.e. for larger towns, and eventually turns negative.

6.2 Gender Specific Results

Having approved our main hypotheses, we further explore the underlying mechanisms that we observe in our results. We calculate the female (male) emigration share dividing the missing female (male) population by the present female (male) population for all towns and decades in our sample. This way, we obtain two new dependent variables, which we replace in equation (11). Table 2 shows separate results for the share of male and female emigration in columns 1 and 2, respectively. The main effect for male migration is highly significant and 61% larger than the average effect of Table 1. The interaction effect is even 50% larger. For female migration the main effect remains significant but it is just a quarter than that of men. The interaction effect remains negative but insignificant. The results of columns 1 and 2 show that male migration is the main driver of the overall effect. Column 3 shows that the difference between male and female emigration share is sizable and highly significant.[20] This pattern is in line with anecdotal evidence (see Section 2) and other findings in the literature for migration from Spain (Sanchez, 2023), or elsewhere (Abramitzky et al., 2012).

Table 2 – Gender Regression Results

Emigration Share	Male (♂)	Female (♀)	Difference	Lottery Shops ♂	Lottery Shops ♀	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
Win	0.029***	0.007*	0.023	0.023***	0.002	0.021
	(0.006)	(0.004)	(0.002)	(0.007)	(0.003)	(0.005)
ln(Pop. Den. (lag.))	0.029***	0.013***	0.016	0.014***	0.003*	0.011
	(0.001)	(0.001)	(0.000)	(0.003)	(0.002)	(0.004)
Win × ln(Pop. Den. (lag.))	-0.006***	-0.001	-0.005	-0.004***	0.000	-0.004
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)
Municipality FE	Yes	Yes		Yes	Yes	
Decade-Province FE	Yes	Yes				
Decade-Aut. Comm. FE				Yes	Yes	
Observations	63,556	63,556		3,627	3,627	
Within R^2	0.01501	0.00507		0.00902	0.00202	
Dependent variable mean	0.05704	0.03921		0.04125	0.01726	

Notes: The dependent variable is the male emigration share in columns 1 and 4, and the female emigration share in columns 2, and 5. Columns 4 and 5 restrict the sample to those municipalities that had a lottery ticket shop in 1941. Standard errors are clustered at the municipality level and reported in parentheses in columns 1, 2, 4, and 5. Columns 3 and 6 report the difference between the respectrive mmale and female regrssion. Here, the p-values are reported in parentheses. Decade corresponds to the census waves of 1877, 1887, 1900, 1910, 1920, 1930, 1950, 1960 and 1970. Province considers all 50 Provinces of Spain, excluding Ceuta and Melilla. Autonomous Communities corresponds to the 16 Autonomous Communities of Spain. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

[20] The values in parentheses report the p-values.

Columns 4 and 5 show gender specific results for our most important robustness check, i.e. column 3 of Table 1. When only considering municipalities that had a lottery ticket vendor in 1941, the pattern across gender persist. Results for male emigration is highly significant and much larger, while results for female emigration remain insignificant. Column 6 reports, again, a significant difference between both. The overall pattern persists that male migrants are the driver of the overall emigration effect.

6.3 Internal Migration

In addition to absent population as a proxy for emigration, we also consider traveling population (*transuentes*) as a proxy for internal migration. The proxy collects all people that were found in a different municipality within Spain other than their hometown. This definition implies that the variable tracks incoming migrants rather than out-migration.

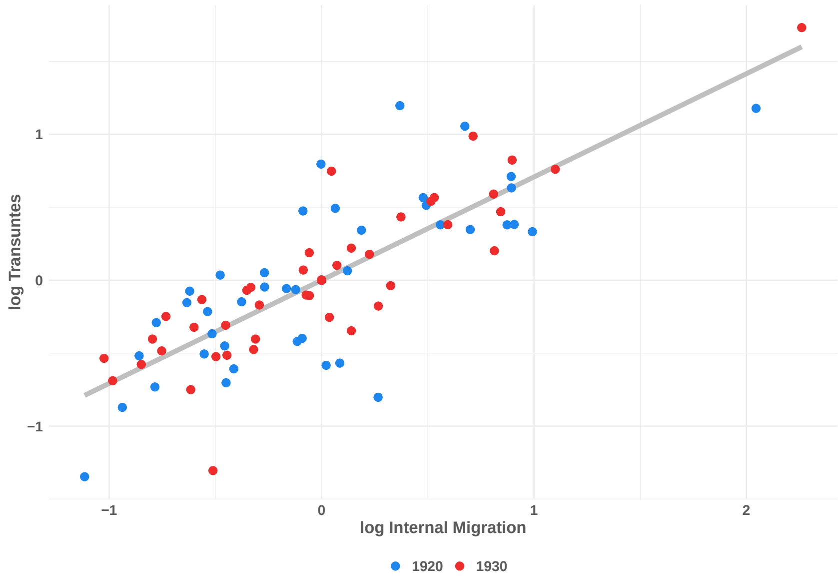


Figure 6 – Correlation of Spanish Internal Migration vs. Traveling Population

Notes: The figure displays the correlation between the logged internal migration and logged traveling population with regard to the province of origin. Internal migrants are defined as persons who did not live in the province of their birth. We take the internal migration data from the respective Spanish population census INE (2023b). Both variables were adjusted for decade-autonomous regions specific effects. Following residualization, we obtain a significant (at the 1% level) coefficient of 0.7076 for the elasticity between both variables, and a (within-) R^2 value of 0.66.

Figure 6 plots the correlation between official internal migration data for the years 1920 and 1930 and census data of traveling population aggregates at the province level. Similar to Figure 3, the correlation is high with 0.71 and highly significant.

Table 3 shows the results for internal migration, repeating all specifications from table 1. As expected, the direction of the coefficients reverse. The main and the interaction effect of our win indicator are positive and highly statistically significant. Panel A in Figure 7 plots the marginal effects for different levels of population density and shows a

Table 3 – Internal Migration Regression Results

Migration Share	Baseline		Lottery Shops	Major Win	ln(migration)	Spatial Lag
	(1)	(2)	(3)	(4)	(5)	(6)
asinh(Prize Money)	0.0001	-0.0012**	-0.0011**	-0.0011***	0.0172*	-0.0012**
	(0.0001)	(0.0005)	(0.0005)	(0.0004)	(0.0088)	(0.0005)
ln(Pop. Den. (lag.))	-0.0090***	-0.0094***	-0.0061	-0.0091***	0.3775***	-0.0094***
	(0.0011)	(0.0012)	(0.0045)	(0.0011)	(0.0260)	(0.0012)
asinh(Prize Money) × ln(Pop. Den. (lag.))		0.0003**	0.0002**	0.0002***	-0.0030*	0.0003**
		(0.0001)	(0.0001)	(0.0001)	(0.0017)	(0.0001)
Win (spatial lag)						-0.0017
						(0.0021)
asinh(Prize Money) × Win (spatial lag)						-0.0003
						(0.0004)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Decade-Province FE	Yes	Yes		Yes	Yes	Yes
Decade-Aut. Comm. FE			Yes			
Observations	63,471	63,471	3,626	63,471	61,429	63,471
Within R^2	0.00338	0.00375	0.00367	0.00357	0.00719	0.00377
Dependent variable mean	0.02137	0.02137	0.02497	0.02137	-3.4551	0.02137

Notes: The dependent variable is the internal migration share. Column 3 restricts the sample to those municipalities that had a lottery ticket shop in 1941. Column 4 only considers major wins that are at least 20 % of annual GDP per capita. Column 5 takes the natural logarithm of the dependent varialbe, emigration share. Column 6 includes a spatial lag. Decade corresponds to the census waves of 1877, 1887, 1900, 1910, 1920, 1930, 1950, 1960 and 1970. Province considers all 50 Provinces of Spain, excluding Ceuta and Melilla. Autonomous Communities corresponds to the 16 Autonomous Communities of Spain. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

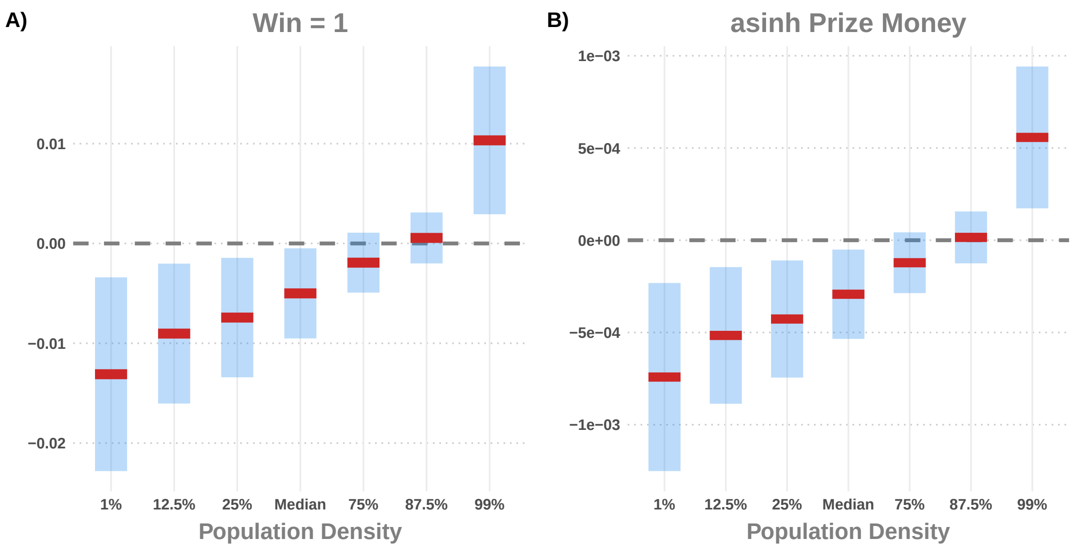


Figure 7 – Marginal Effects conditionally on Population Density on Internal Migration

Notes: The figure shows the marginal effects of our binary treatment variable 'win' for different levels of population density on internal migration. Seven different population densities are used in the analysis. In addition to the median, different percentiles are included. The estimates presented are based on Model 2 in Table 3. The red bares represent the point estimates, while the blue bars correspond to the 90% confidence intervals.

clear pattern. For less densely populated areas, winning the lottery attracts fewer people from other municipalities, while urban centers attract relatively more people. A possible explanation could be that internal migrants take the opportunity to leave a municipality with the prize money, either to move abroad or to return to their home municipalities. Hence, internal migrants might also react to a windfall income shock.

Again, we are also interested in the intensive margin of the effect of lottery wins on immigration. Table A.3 repeats all specifications from Table 3 but replaces the winning indicator with the inverse hyperbolic sine transformation of the prize money. Overall, the results remain similar to the main specification, also when observing the marginal effects for different levels of population density, presented in panel B of Figure 7.

6.4 Robustness Tests

To further validate our results, we run a number of robustness tests, which we present in Table A.4. Column 1 excludes the towns of *Sort* and *Vic*, which means luck and victory in Spanish, respectively. Both towns might attract players from further away to buy tickets in these "lucky" towns out of superstition. Indeed, both towns have won the lottery overproportionally often given their population size. Excluding both towns form the sample, yields similar results to our main specification.

Column 2 tests whether winners might invest their win into a vacation instead of migrating permanently. If the census is conducted shortly after the lottery draw, our proxy might accidentally capture missing population that are only on vacation. Column 2 excludes wins from the year the census was conducted as well as the following year. This means, for example, that we exclude the winnings from 1910 and 1911 for the census wave of 1910.While we believe that going on vacation abroad is rather a phenomenon of more recent decades, we exclude those years in order to prevent a possible holiday effect of lottery winners spending their win on a vacation rather than emigrating permanently. However, we do not find a possible holiday effect since our results remain largely unchanged despite excluding these years.

In column 3 we shift the treatment period by one year since migrating abroad requires a certain preparation. Winning the lottery on December 22 might have little effect on the census taken on December 31 which is only 9 days later. Thus, people that win the lottery in the year a census is taken need a little more time to migrate and a possible migration effect might only be captured by the next census wave. Therefore, we move winnings of a year the census is taken to the following census wave. For example, if a town wins the lottery in 1910, we do not consider this town treated in 1910 but in 1920 instead. However, delaying results by one year seems to have little effect on the results.

Column 4 controls for spatial correlation once more. This time, we include Conley standard errors with a 20 km cutoff to control for spatial correlation even further away

(Conley, 1999). Again, our results are not affected when controlling for spatial spillovers.

As a final robustness test, we only consider smaller towns. Column 6 excludes the 1% largest municipalities in our sample. The average town size reduces to 2690 inhabitants and the number of treated municipalities reduces to 343. The magnitude of both, the main and the interaction effect reduce and we lose precision. However, the overall results remain robust.

Last but not least, we can only claim causality in our findings only under the condition that lottery winnings are truly random. To test the causal direction of windfall incomes through lottery winnings on emigration, we perform a placebo test similar to Merlino et al. (2019). We rerun our baseline regression from Equation (11) 10,000 times but randomly assign lottery winnings to municipalities. Figure 8 shows the coefficient distribution in relation to the coefficients from our main results in column 2 of Table 1. For both, the main effect in Panel A and the interaction effect in Panel B, less than 1% of the placebo coefficients are larger (smaller) than the coefficients from our baseline. Figure A.1 in Appendix A reports the same test for our measure of internal migration. Based on this empirical exercise, we conclude that our causal identification mechanism remains intact throughout all specifications. Our results are not spurious and not subject to reverse causality. Thus, we interpret our empirical findings as causal.

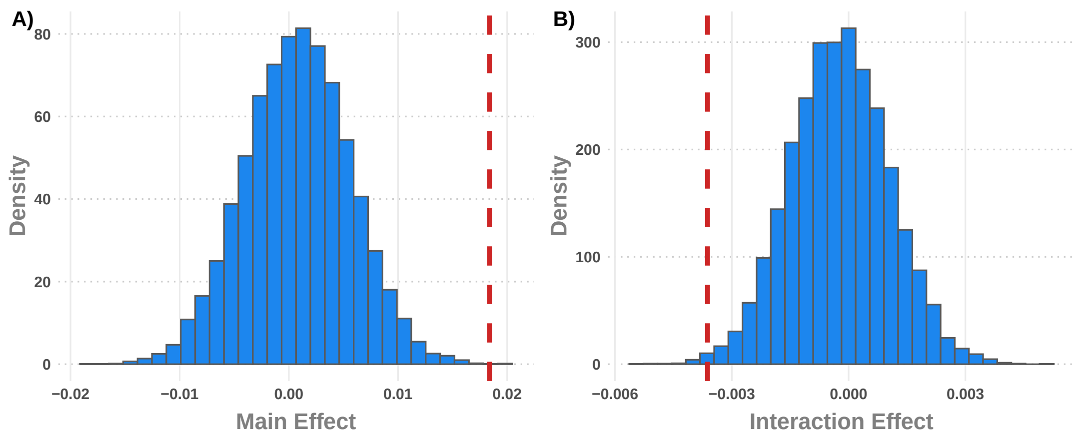


Figure 8 – Placebo Test

Notes: Figure 8 plots the distribution of 10,000 coefficients based on equation (11), where we randomize the treatment of winning the lottery. The vertical dashed red line in Panel A plots the coefficient distribution of the main effect, α. The vertical dashed red line Panel B plots the coefficient distribution of the interaction effect, β. The vertical red and dashed line plots both coefficients based on Model 2 in Table 1, respectively.

7 Conclusion

We study a century of Spanish emigration in order to provide novel and causal empirical evidence on the effect of windfall income on emigration, conditional on economic development. We collect fine-grained information on Spanish emigration from the municipal censuses between 1877 and 1970 as well as data on lottery wins from the annual Spanish Christmas lottery. Our theoretical framework models how unexpected windfall income gains affect the decision to relocate abroad in the context of economic development. Overall, we find that a positive income shock increases international emigration for relatively poor regions within Spain, but not for the most economically developed regions. Our results are particularly pronounced for male migrants. In addition, we also disentangle internal migration from out-migration. We find that internal migrants take the opportunity to leave a municipality with the prize money, either to move abroad or to return to their home municipalities. The results suggest that a windfall income shock may be a way to alleviate the financial constraints associated with pre-funding migration costs. Our study contributes to the vast literature on the causes of migration by combining microfounded and quasi-experimental evidence with a long-run perspective.

Managing and coping with migration remains one of the key challenges of our time, and policymakers need solid evidence on how to tailor effective solutions. However, many decisions that aim at reducing south-north migratory pressure are long-term investments. Therefore, it is important to better understand the effect of emigration in the context of economic development. Our results provide novel and long-run evidence that economic development in fact fosters migration for low- and middle-income regions and only reduces migration in later stages of economic development.

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A APPENDIX: Supporting Tables and Figures

Table A.1 – Summary Statistics

	N	Mean	SD	Min	Median	Max
Total emigration share	63556	0.05	0.05	0.00	0.03	0.59
Male emigration share	63556	0.06	0.06	0.00	0.04	0.62
Female emigration share	63556	0.04	0.04	0.00	0.03	0.57
Internal migration share	63471	0.02	0.04	0.00	0.01	0.79
Population	63556	3058.30	23533.87	10.00	1017.00	3120941.00
ln(Population Density)	63556	3.46	1.01	-0.62	3.33	9.87
asinh(Prize Money)	63556	0.25	2.18	0.00	0.00	25.86
Win	63556	0.01	0.11	0.00	0.00	1.00
Major Win	63556	0.01	0.10	0.00	0.00	1.00

Notes: Descriptive statistics based on sample used in Table 1, column 2.

Table A.2 – Prize Money Regression Results

Emigration Share	Baseline		Lottery Shops	Major Win	ln(emigration)	Spatial Lag
	(1)	(2)	(3)	(4)	(5)	(6)
asinh(Prize Money)	0.0001	0.0010***	0.0007**	0.0008***	0.0172*	0.0010***
	(0.0001)	(0.0002)	(0.0003)	(0.0003)	(0.0088)	(0.0002)
ln(Pop. Den. (lag.))	0.0202***	0.0205***	0.0081***	0.0204***	0.3775***	0.0204***
	(0.0011)	(0.0011)	(0.0023)	(0.0011)	(0.0260)	(0.0011)
asinh(Prize Money) × ln(Pop. Den. (lag.))		-0.0002***	-0.0001**	-0.0001**	-0.0030*	-0.0002***
		(0.0000)	(0.0000)	(0.0001)	(0.0017)	(0.0001)
Win (spatial lag)						0.0047
						(0.0029)
asinh(Prize Money) × Win (spatial lag)						0.0001
						(0.0004)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Decade-Province FE	Yes	Yes		Yes	Yes	Yes
Decade-Aut. Comm. FE			Yes			
Observations	63,556	63,556	3,627	63,556	61,429	63,556
Within R^2	0.01174	0.01189	0.00673	0.01183	0.00719	0.01194
Dependent variable mean	0.04804	0.04804	0.02893	0.04804	-3.4551	0.04804

Notes: The dependent variable is emigration share. Column 3 restricts the sample to those municipalities that had a lottery ticket shop in 1941. Column 4 only considers major wins that are at least 20 % of annual GDP per capita. Column 5 takes the natural logarithm of the dependent varialbe, emigration share. Column 6 includes a spatial lag. Standard errors are clustered at the municipality level and reported in parentheses. Decade corresponds to the census waves of 1877, 1887, 1900, 1910, 1920, 1930, 1950, 1960 and 1970. Province considers all 50 Provinces of Spain, excluding Ceuta and Melilla. Autonomous Communities corresponds to the 16 Autonomous Communities of Spain. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3 – Internal Migration Prize Money Regression Results

Migration Share	Baseline		Lottery Shops	Major Win	ln(migration)	Spatial Lag
	(1)	(2)	(3)	(4)	(5)	(6)
Win	0.002	-0.021**	-0.017*	-0.020**	0.310*	-0.021**
	(0.002)	(0.009)	(0.009)	(0.008)	(0.159)	(0.009)
ln(Pop. Den. (lag.))	-0.009***	-0.009***	-0.006	-0.009***	0.377***	-0.009***
	(0.001)	(0.001)	(0.004)	(0.001)	(0.026)	(0.001)
Win × ln(Pop. Den. (lag.))		0.005**	0.004**	0.004**	-0.055*	0.005**
		(0.002)	(0.002)	(0.001)	(0.031)	(0.002)
Win (spatial lag)						-0.002
						(0.002)
Win × Win (spatial lag)						-0.006
						(0.008)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Decade-Province FE	Yes	Yes		Yes	Yes	Yes
Decade-Aut. Comm. FE			Yes			
Observations	63,471	63,471	3,626	63,471	61,429	63,471
Within R^2	0.00339	0.00373	0.00313	0.00355	0.00719	0.00375
Dependent variable mean	0.02137	0.02137	0.02497	0.02137	-3.4551	0.02137

Notes: The dependent variable is the internal migration share. Column 3 restricts the sample to those municipalities that had a lottery ticket shop in 1941. Column 4 only considers major wins that are at least 20 % of annual GDP per capita. Column 5 takes the natural logarithm of the dependent varialbe, emigration share. Column 6 includes a spatial lag. Decade corresponds to the census waves of 1877, 1887, 1900, 1910, 1920, 1930, 1950, 1960 and 1970. Province considers all 50 Provinces of Spain, excluding Ceuta and Melilla. Autonomous Communities corresponds to the 16 Autonomous Communities of Spain. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4 – Robustness Check Results

Emigration Share	Lucky Towns	Holidaymakers	Delayed Win	Spatial Correlation	Small Towns
	(1)	(2)	(3)	(4)	(5)
Win	0.018***	0.019***	0.017***	0.018***	0.009**
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
ln(Pop. Den. (lag.))	0.020***	0.020***	0.021***	0.020***	0.021***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Win × ln(Pop. Den. (lag.))	-0.004***	-0.004***	-0.004***	-0.004***	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Municipality FE	Yes	Yes	Yes	Yes	Yes
Decade-Province FE	Yes	Yes	Yes	Yes	Yes
Observations	63,540	63,556	63,556	63,556	62,535
Within R^2	0.01187	0.01186	0.01186	0.01187	0.01231
Dependent variable mean	0.04805	0.04804	0.04804	0.04804	0.04833

Notes: The dependent variable is emigration share. Regression results in column 1 excludes the towns Sort and Vic. Column 2 excludes lottery wins in the year of the census as well the year afterwards, to avoid a possible holiday effect. Column 3 moves lottery wins in the year of the census to the next census wave. Standard errors clustered at the municipality level in parentheses for coluns 1 to 3. Column 4 reports Conley standard errors with a 20 km cutoff in parentheses. Column 5 excludes the one percent largest municipalities. Decade corresponds to the census waves of 1877, 1887, 1900, 1910, 1920, 1930, 1950, 1960 and 1970. Province considers all 50 Provinces of Spain, excluding Ceuta and Melilla. Autonomous Communities corresponds to the 16 Autonomous Communities of Spain. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5 – War casualties

Dependent Variable:	log $\Delta absentMen$	
	(1)	(2)
Constant	-2.403***	
	(0.3759)	
log Casualties	0.0633**	0.0220
	(0.0310)	(0.0359)
log Male Population (1930)	0.7222***	0.7673***
	(0.0549)	(0.0508)
Province FE	No	Yes
Observations	395	395
R^2	0.52720	0.63200
Within R^2		0.48424

Notes: Civil war casualties are calculated as the number of buried people in mass graves from the Spanish Civil War. Data on georefferecend graves stems from MPR (2015) as provided by Kurtz (2023). The Canarian Provinces of Santa Cruz de Tenerife and Gran Canaria are combined to a single Province. Province fixed effects included in all specifications. Standard errors clustered at the Province level are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6 – Average Lottery Winnings (in 2012 EUR)

Rank	Prize money
1	6,690,279.32
2	2,883,346.05
3	1,489,449.06
4	646,476.84
5	464,670.85
6	180,903.62
7	152,314.04
8	138,354.49
9	135,824.34
10	143,773.66
11	128,073.89
12	115,092.72
13	109,321.14
14	104,319.39
15	103,318.96
16	96,205.30
17	94,880.20
18	88,327.04
19	81,823.87
20	78,458.17

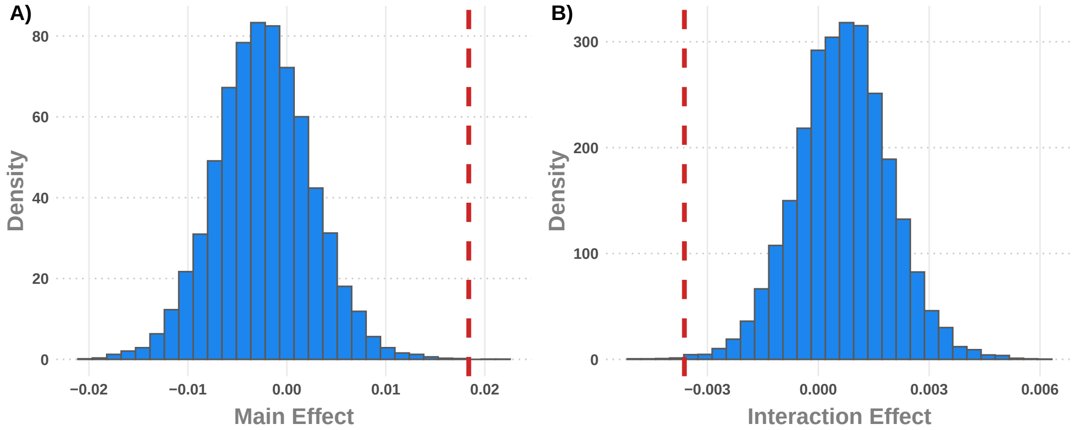

Figure A.1 – Placebo Test Internal Migration

Notes: This Figure plots the distribution of 10,000 coefficients, where we randomize the treatment of winning the lottery. The vertical dashed red line in Panel A plots the coefficient distribution of the main effect, α. The vertical dashed red line Panel B plots the coefficient distribution of the interaction effect, β. The vertical red and dashed line plots both coefficients based on Model 2 in Table 3, respectively.

B APPENDIX: Anecdotal Evidence from Winning Syndicates

Garvía (2007) describes several anecdotes of a typical winning syndicate during our period of observation:

"In 1889, Miguel Leiva, a post commander of the Guardia Civil (a rural police corps), bought a lottery ticket and distributed it among his closest subordinates according to their ranking. One of them, Francisco Morante, the father of a large family, did not want to buy his whole share and instead bought a smaller one, though not quite appropriate for his rank. The syndicate was lucky, and when it was time to share the prize, the commander decided to hand over to Morante the sum corresponding to his position, but not to his purchase. Apparently, he did so in order to preserve the status hierarchy of the post and the esprit de corps. This was at least the interpretation of the minister of war, who generously rewarded him (Royal Order of November 30, 1889)" (Garvía, 2007, p. 628).

"[In 1924], Manuel Lamana, head of the public register office of Salamanca, bought two fractions of the same Christmas lottery ticket. He kept one for himself and distributed the second among his subordinates. They were not permitted to decide the size of their shares, which were apportioned by Lamana according to their [social] status. Thus, each senior employee was offered a 20 peseta share, middle rank employees could each buy a 15 peseta share, and the youngest employees were each offered a 10 peseta share. One of the latter could barely afford it, but he paid anyway to avoid embarrassment. He then had to find somebody willing to split his share with him. This was his mother-in-law, who took a share of five pesetas, kept one peseta for herself, and offered four pesetas to her friend, Unamuno's wife [Concha Lizárraga]. She took it, winning enough to buy a ticket to Paris (Salcedo, 1964, pp. 277–78)" (Garvía, 2007, p. 629).

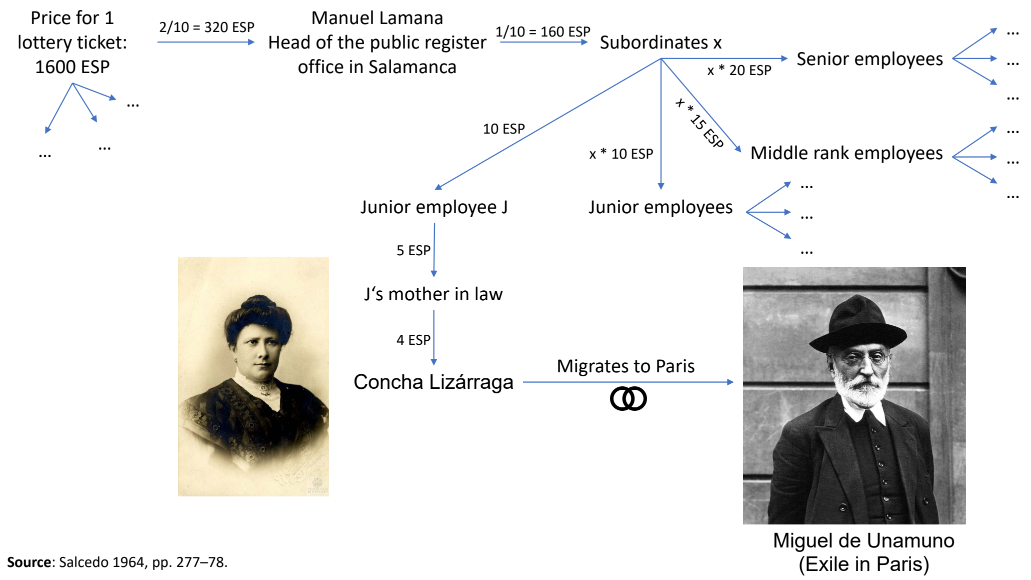

Figure C.1 – A Winning Syndicate from the 1924 Draw of the Spanish Christmas Lottery

Notes: The figure visualizes a winning syndicate from the 1924 draw of the Spanish Christmas lottery. A famous winner was Concha Lizárraga, the wife of Miguel de Unamuno. Source: Salcedo (1964), own visualization, prizes were adjusted to 1964 prices.