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Abstract

This study investigates the causal link between inequality and gambling on a distinct dataset that encompasses administrative records of gambling turnover by game type in Italian municipalities. Employing shift–share instruments, we find a substantial impact of inequality on gambling turnover. Moreover, we show that such impact is additional and larger than the impact of poverty and is biggest in less well-off Southern municipalities, especially concerning turnover generated from games closely associated with gambling-related issues. Given the documented regressive nature of gambling taxation, our results substantiate the concept of a hysteresis loop between inequality and gambling.

Keywords: Income; Gambling; Inequality; Italy.

JEL codes: I12; I14

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1 Introduction

The propensity to gamble and the characteristics of the individuals who are attracted to different games is a topic that is being investigated in economics. Different works have attempted to study the socio-economic characteristics of gamblers (Resce et al., 2019; Worthington et al., 2007). In this regard, experimental studies found that lotteries are more attractive to poor people because they provide an opportunity to correct for low-income status and that part of their appeal is that lotteries provide one of the few opportunities available to the poor for a sudden increase in wealth (Haisley et al., 2008). Other studies have proved that a strong status orientation (i.e. importance attached to one's position in relation to others) among households with positional concerns is highly correlated with both higher participation in and expenditure on gambling (Friehe and Mechtel, 2017).

A strand of literature has highlighted how the propensity to gamble can affect the extent of inequality in the social context where people live (Freund and Morris, 2006). Instead, Bol et al. (2014) pointed out that income inequality is likely to increase gambling expenditure in US states. Indeed, low social mobility and high inequality could lure the poorest to try new ways to improve their living conditions as a strategy to get ahead in society. Moreover, inequality leads to more anxiety and stress amongst the poor, which increases gambling behavior as a relief in the lower part of the income distribution (Pickett and Wilkinson, 2010).

Economists have often wondered about the popularity of lotto games despite their typically poor return expectations (see Baker et al. (2020)). Yet, studies regarding sports betting odds have frequently concentrated on the tendency known as the favorite-longshot bias, where bets placed on longshot contenders typically result in greater losses compared to bets made on favorites (Whelan, n.d.). On this issue, Forrest et al. (2002) highlight that despite the high probability of loss, buying a ticket can mean buying a dream. However, as

Stetzka and Winter (2021) point out, if that explanation is correct, lottery players would be expected not to spend additional money on other gambling activities that do not offer life-changing wins. With regard to this, Brunk (1981) found out from a national US survey that respondents' dissatisfaction with their current income predicted participation in lotteries but not in other gambling activities that do not offer extreme wins. In the literature, there is clear evidence of a relationship between poverty and gambling. These studies highlight how the impoverished are more prone to risk-taking and invest their limited resources in gambling in an attempt to alter the course of their lives. Blalock et al. (2007) underline that escaping from poverty may indeed be a major motive for participating in lotteries since sales of lotto tickets and poverty rates are significantly positively associated. Yet, a strand of economic literature has investigated how inequality worsens other social indicators such as crime (Kelly, 2000)or suicide (Andres, 2005), which suggests the intuition that inequality might have as well an autonomous impact on gambling besides that of poverty.

Indeed, some recent studies (Brown-Iannuzzi and McKee, 2019; Payne et al., 2017) have suggested that not only poverty but also a heightened perception of inequality can foster a greater propensity for risk-taking. Also, some suggestions can be drawn from existing works to explain the mentioned difference between the poverty-"lotteries only" pair vs the inequality-"gambling in general" pair. A starting point is observing that a high poverty rate not accompanied by high inequality normally associates with a relatively homogeneous social set up, while a high inequality rate – irrespective of the concurrent poverty – postulates a divided and likely segregated social setting. This is, for instance, the intuition proposed by Tuttle (2022) to explain the association between economic inequality and homicide rates through a three-fold mechanism operating at the neighborhood level: i) greater economic inequality within society corresponds with more spatial segregation by income across neighborhoods; ii) spatial segregation contributes to concentrated disadvantage and less social integration of the lowest economic stratum; iii) less social integration contributes to higher rates of crime due to weakened social control and cultural/social adaptations to social isolation. In turn, studying how misinformation spreads online, Del Vicario et al. (2016) find that the existence of segregated communities provides an echo chamber effect which may trigger collective framing of narratives that are often biased toward self-confirmation, a phenomenon to which also epistemic bubbles may contribute (Castioni et al., 2022; Nguyen, 2020). On his part, Henry (2011) showed through a simulation how segregated communities may increase cognitive biases. Hence, the sequence of scholarly findings we just surveyed suggests that we should not be surprised by the difference between situations of poverty – where participating in lotteries may be rational – and situations of inequality – in which segregation may amplify cognitive biases paving the way to gambling on other activities that do not offer extreme wins as well.

To our knowledge, no economics work has specifically studied whether inequality nurtures gambling, the only exception being Bol et al. (2014) which, however, fails to control for the role of poverty. Yet, this possibility is not just a theoretical curiosum but could imply enduring social implications. In reality, since gambling acts as a regressive tax, any evidence that inequality - besides poverty - promotes gambling could envisage a hysteresis loop between inequality and gambling. We test the hypothesis that inequality and gambling are related empirically on a uniquely granular database of the above 8,000 Italian Municipalities for three years 2017, 2018, and 2019, taking into consideration the years immediately preceding the COVID-19 time, in order to avoid tainting the analysis with data that were inevitably affected by the pandemic. In more detail, with an IV approach, we first attempt to assess the determinants of inequality using the shift-share of income sources as an instrument. In particular, we see how the sources of income at the municipal level have changed over time, and in the second stage, we test how inequality may affect gambling. Taking into account different types of gaming and controlling for a range of covariates - including poverty - our results show that there is a positive and statistically significant relationship at municipal level between inequality and gambling.

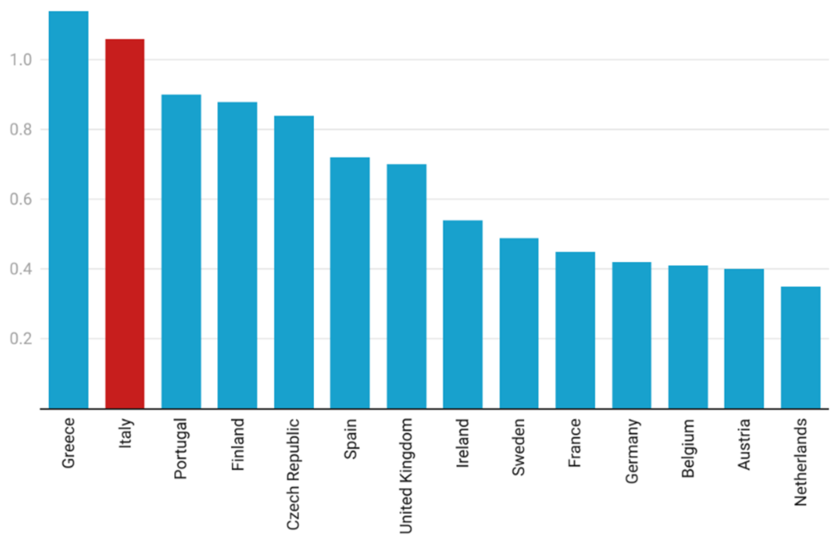
Italy is an interesting case study since over the last two decades the size of gambling has risen exponentially and currently constitutes the largest in Europe and one of the most important in the world. Guiso (2016) emphasized the fact that although Italy's GDP represents only 3 per cent of the world economy, the country accounts for 22 per cent of global expenditure on gambling. At the same time, inequality and poverty have also risen in Italy, especially after the Global Financial Crisis (GFC) of 2007-2009 and the Euro Sovereign Crisis (ESC) of 2010-2012. As measured by the Gini index, inequality in Italy rose from the local trough of 32.9 in 2007 to the peak of 35.4 in 2015. Concurrently, the share of population living in poverty almost tripled from 0.7% in 2008 to 2.0% in 2015. Accordingly, it may be meaningful to explore for Italy whether the two phenomena, inequality and gambling, were somehow related.

The rest of the paper runs as follows. The next section presents descriptive evidence on the relation between gambling and inequality in Italy and formulates our testable hypotheses. Section 3 describes the data, Section 4 presents the empirical strategy, Section 5 shows the main results. In turn, Section 6 disentangles the germane boosting effect of inequality after controlling for poverty, while Section 7 reports a battery of additional robustness checks. Finally, Section 8 concludes by depicting as well the chief policy implications of our findings and suggesting possible directions for future research.

2 Gambling and Inequality in Italy

According to H2 Gambling Capital [1], in the pre-COVID period, the Italian gambling losses were the fourth largest internationally among the 12 heaviest gambling countries ($23.9 billion dollars), behind the United States ($142.6 billions), China ($95.4 billions), and Japan ($29.8 billions) taken in absolute terms, and if considered in its ratio to GDP, Italy ranked third (1.11%) surpassed only by Singapore (2.83%) and Australia (1.38%). In the European context [2], in 2018 the Italian gambling losses were the largest (€18.7 bln), followed by the United Kingdom (€17.2 bln), and Germany (€14.2 bln). In terms of the share of GDP devoted to gambling, Italy is the second country in Europe (1.06%), the first being Greece (1.14%) and the third Portugal (0.9%; Figure 1).

Figure 1: *Gross Gaming Revenue percent of GDP in selected European countries in 2019*



Source: Authors' elaborations on H2 Gambling Capital (2020); and Statista (2020).

[1] Gambling Capital (2020) The most trusted data and intelligence on the global gambling industry. Link: https://h2gc.com/

[2] Statista, Global No.1 Business Data Platform (accessed 8 January 2020) link: https://www.statista.com/

Data from the Customs and Monopolies Agency (Agenzia delle Dogane e dei Monopoli)[3] show that in 2019 Italians gambled €110.5 bln (gross turnover before subtracting winnings), an amount comparable to the National Health Fund for 2019 (worth around €114 bln). What is most surprising is the dramatic growth in Italy's gambling market which enjoyed a 481% boom in gross turnover in less than twenty years, surging from €19 bln in 2000. Over the last decade, most of the European countries started to liberalize their gambling markets in order to fight illegal gambling and collect an increasing amount of tax revenues (Paton et al., 2009). This process of boosting gambling revenues has been particularly intense in Italy where since 2003 the government has increased the availability of games characterized by high payouts and high rates of re-investment of winnings (e.g., entertainment machines) and has simultaneously cut the tax rates on these types of games (Gandullia and Leporatti, 2018; Resce et al., 2019). A great innovation in the gambling market was the introduction of slot machines since these brought gambling closer to people. Since 2003, slot machines can be placed in cafes, tobacco shops, stations, and supermarkets without being confined to casinos as in other countries. Furthermore, in 2006, the government removed the barriers to access of foreign operators to the gambling market, in 2011 video-lotteries (which compared to slot machines are characterized by higher possible stakes and winnings) were introduced and online gaming was liberalized. This swift market liberalization deeply changed the lure of gaming supply and the attitudes of Italian citizens to gambling both in terms of amounts of euro gambled and of the composition of consumption across different gambling forms.

This huge development and high volume of the gambling market inflamed the debate on the morality of gambling promotion by the government. The number of people spending significant amounts of money on gambling rose with the ubiquity of available public games and the spread of gambling addiction, rapidly raising a public health issue. The prevalence

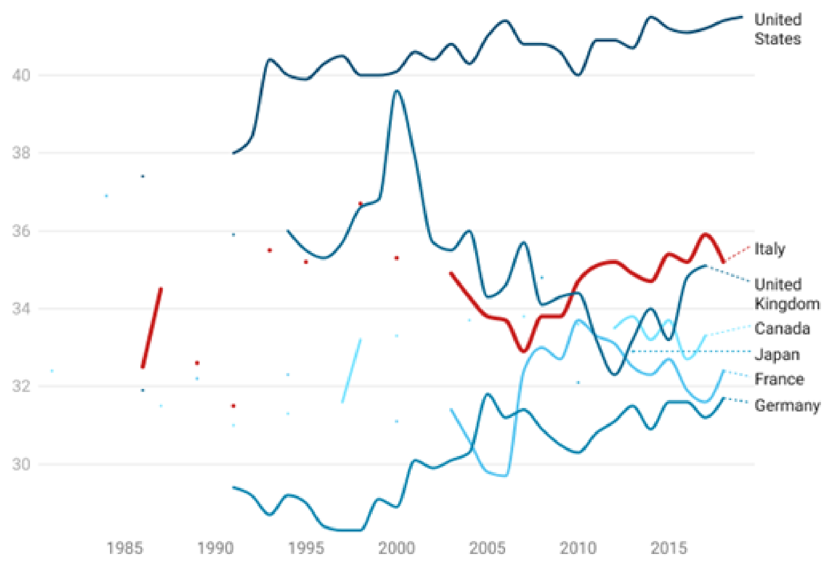
[3] ADM (2020). Agenzia delle Dogane e dei Monopoli - Libro Blu 2019, Rome. https://www.adm.gov.it/portale/documents/20182/6061302/Libro+blu+2019+-+Relazione.pdf

of gamblers in the general population aged 15-64 who are at severe risk of developing addiction rose from 0.33% in 2007 to 1.04% in 2017 (Colasante et al., 2013; Molinaro et al., 2018). In 2012, public health concern over gambling prompted new legislation. On the one hand, this aimed to admit gambling addiction as a pathology (like drug addiction) and consequently plan adequate levels of public healthcare services. On the other hand, it was meant to curb the spread of gambling by limiting access to it by the most at-risk people. Indeed, Law 189/2012 included the treatment of gambling addiction among the Essential Levels of Health Service (Livelli Essenziali di Assistenza – LEA) and planned specific measures on slot machines. It is, in fact, widely known that offline gambling such as electronic gambling machines is the most harmful for communities due to their high addictive power and ubiquity, deemed to induce problematic behavior and related social costs more than other products (Resce et al., 2019). Based on Law 189/2012, Italian regions and municipalities can autonomously issue their own laws, creating a high variability in the different provisions applied. Furthermore, recent studies on the Italian case show that less well-off people are the main contributors to the growth of gambling turnover and to the increase in gambling disorders (betting and new generation games), with an observed income-related inequality (Resce et al., 2019). From a spatial perspective, Gandullia and Leporatti (2019) show that in Italy gambling products are generally regressive at a regional level.

The reported evidence suggests that a significant part of the increasing social costs associated with gambling are probably paid by the less-well-off and potentially most vulnerable members of society. At the same time, the observation that the propensity to gamble is higher for lower-income classes suggests that increasing inequality (and poverty) may contribute to boosting gambling and addiction to it. In turn, if gambling acts as a regressive tax, a hysteresis loop could ensue between inequality and gambling. This is the keystone of our research question which tests the hypothesis that more inequality leads to more gambling.

Looking at inequality, as quantified by the Gini index, Italy stands out as having a relatively unequal income distribution among G7 countries (Figure 2). In the recent decade, Italy is the most unequal if we exclude the US – where, for various reasons, inequality tends to be higher than in other major developed countries (Piketty, 2014). Although there was a downward trend for a decade, when the Gini index for Italy dropped from 0.307 in 1980 to 0.278 in 1991, it rose abruptly thereafter to 0.310 in 1993 and was relatively stable around that level until it peaked at 0.316 in 2010. More recent data seems to confirm that income inequality has further increased in Italy. The Gini averaged 0.339 over 2003-2009 and rose to 0.350 in the 2010-2018 average.

Figure 2: *Gini Index in G7 Countries: 1980-2019*



Source: Authors' elaborations on data from World Bank (2023).

Further aspects worth noting relate to intergenerational issues and to some geographical characteristics in inequality and poverty. Various authors pointed out that, due to demographic and labor market trends as well as to the pro-elderly features of Italy's welfare system, there was a widening gap between the young and the elderly (Brandolini et al., 2018). Simonazzi et al. (2018) also indicate that the evolution of the labor market – especially because of its dualistic nature between permanent and temporary/flexible workers – contributed to expanding inequality and poverty in Italy. Studying the risk of poverty for older and younger generations of Italians from 1948 to the recent years, Baldini et al. (2018) show that poverty rates have decreased steadily for all age groups, but that youth has been left behind. The risk of poverty for children aged 0-17, relative to adults over 65, increased steadily over time: in 1977, the children faced a risk of poverty that was 30% lower than the elderly, but by 2016 they were 5 times likelier to be poor than the elderly. They also find that the Great Recession following the GFC and ESC hit the young hardest, particularly in Southern regions. They argue that the main culprit of that is the welfare state which offers better protection for the elderly than for the young. In turn, Ciani and Torrini (2019) remind us that the North-South development gap greatly contributes to rising income inequality in Italy, particularly because of the worse distribution of employment in the South. Gallo and Pagliacci (2020) report that 'Inner Areas' show a higher Gini index and lower mean and median income. Moving towards our analysis,Canale et al. (2017) find that students in high-income inequality regions were significantly more likely than those in low-income inequality regions to be at-risk or problem gamblers.

Finally, rising inequality and poverty in Italy may relate to the macroeconomic policies adopted after the GFC and ESC. Perez and Matsaganis (2018) highlight that the austerity policies introduced after the ESC in Southern European countries contributed to raising their inequality and poverty. Besides, Mussida and Parisi (2020) find that the risk of poverty rose on average between 2007 and 2014 in Greece, Italy, and Spain while it inched down in France. They also find a heterogeneous impact of the economic recession, worsening the status of temporary workers, the self-employed, and single and female-headed households, while the risk of poverty decreased for larger households with dependent children and elderly members.

In light of the discussion of the relevant literature in the Introduction and of the just described peculiarities of the Italian situation, we can formulate the following testable hypotheses:

- H1: Greater inequality leads to a higher propensity for gambling.
- H2: Gambling shows territorial heterogeneity, and is more prevalent in regions with higher socioeconomic disadvantage and in areas with lower social mobility.
- H3: Greater inequality increases the propensity to engage in gambling activities disproportionately for younger and poorer individuals.
- H4: Inequality exerts an autonomous boosting effect on gambling even after controlling for the level of poverty.

3 Data

A key feature of the novel dataset we envisaged and crafted to estimate the link between inequality and gambling is that it was obtained by merging differentiated official sources. We merged administrative data at the municipal level on the gambling turnover by type of game for the years 2017, 2018 and 2019, made available by the Italian Monopoly Agency (ADM), which regulates the Italian gambling market.

The dataset reports figures on total gross gambling turnover for exclusively land-based games and its decomposition by the following games (Table 1, third column): VLT and AWP machines and machines with non-monetary prizes; Big Match, Virtual betting, Sport betting lotteries and betting with fixed payout; Bingo; instant lotteries, traditional lotteries, remote lotteries; Lotto; V7 - multiple bet on horse racing, agency horse racing, national horse betting; Superenalotto, Win for life, Eurojackpot; Betting exchange, Playsix, and skill games.

Table 1: Description of public games available in the dataset and categorization adopted

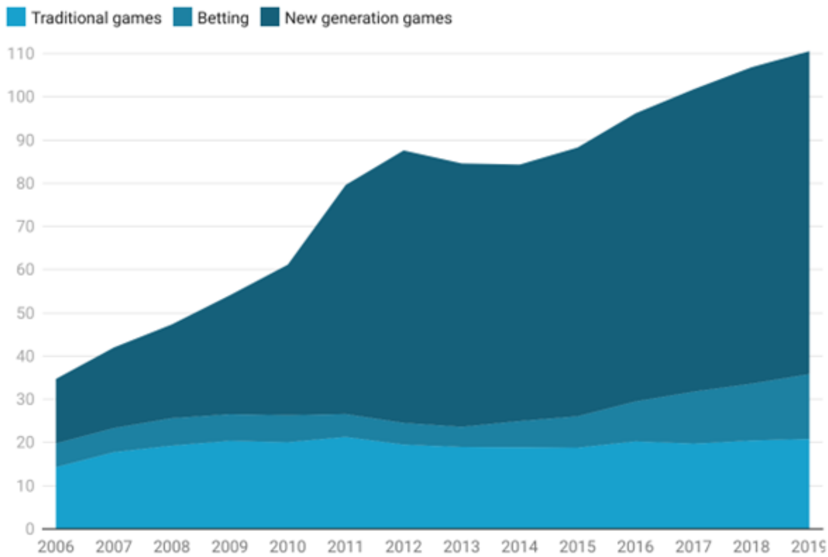
Broad categories	Category	Type of game
Traditional games	Bingo	Bingo
	Lotteries	Instant lotteries
		Traditional lotteries
		Remote lotteries
	Lotto	Lotto
	Numerical games	Superenalotto
		Winforlife
		Eurojackpot
New generation games	Entertainment machines	Entertainment machines with non-monetary prizes
		Slot machines – AWP
		Videolotteries – VLT
	Remote gambling	Betting exchange
		Playsix
	Skill games	Skill games
Sport betting	Sport betting	Big Match
		Virtual betting
		Sport betting – fixed payout rate 75%
		Sport betting – lotteries
	Horse racing	V7 – multiple horse racing
		Agency horse racing
		National horse betting

The municipal disaggregation of the gambling turnover concerns only games distributed through a physical network. The online part of gambling turnover is not disaggregated at the territorial level and is therefore excluded from the following analysis. The turnover from games distributed over a physical network accounts for €74.735 out of the €101.753 billion total gambling in 2017 (73.5%), for €75.421 out of the €106.863 billion total gambling in 2018 (70.6%), and for €74.137 out of the €110.542 billion total gambling in 2019 (67.1%).

Following the recent literature (Resce et al., 2019), we group gambling products with similar characteristics into three broad categories: traditional games (Lotto, numerical games such as Superenalotto and Win for Life, lotteries, and Bingo), sport betting (sport betting and horse racing), and new generation games (remote gambling such as online Poker and Texas hold'em, New Slots/AWP, Video-Lotteries/VLT, entertainment machines with non-monetary prizes; Table 1).

Traditional games grew to a certain degree until 2011 since when their slower growth led their share on total gambling turnover to drop to 19 percent in 2019. Sport betting products, forming a relatively small share of the market until 2013, thanks to the expansion of the betting offer, recorded on the other hand a substantial increase from 2014 mainly driven by online betting. In 2019, sport betting represented about 14 percent of the total turnover. New generation games were the main contributors to the impressive boom of the gambling turnover in the last 15 years of our observation window and by 2019 represented 68 percent of the total gross turnover (Figure 3).

Figure 3: *The evolution of gambling turnover in three broad categories (2006-2019)*



Source: Authors' elaborations on data from UPB (2018), ADM (2020).

With regard to the socio-demographic characteristics of municipalities, we use data from the Italian National Institute of Statistics (ISTAT) on resident population, territorial size, and population density. We retrieved the income information used to estimate municipal inequality (by the Gini index) from the Ministry of Economy and Finance (MEF). Descriptive statistics are in Table 2. Per capita gambling turnover at the municipal level is €850.45 on average in 2017 and increased to €873.50 in 2019. When looking at the components of gambling turnover, a certain heterogeneity can be observed both in the levels and the trends. As for traditional games, there has been a slight increase in mean for the gross turnover (from €221.11 to €245.99). New generation games, on the contrary, registered a slight decrease in the three years considered (from €591.77 to €584.83). An increase, on the other hand, can be observed in the sports betting gross turnover from 2017 to 2019 (from €37.57 to €42.68). The mean Gini coefficient in Italian municipalities is 0.38 in 2017 and increases to 0.40 in 2019. In the same time interval, there has been an increase in average income (from e17,823 to €18,348) (Table 2). As for the other independent variables, the mean Altitude decreases by 1 percent circa following internal migratory trends; there is a

2.5 percent increase in Population Density; the shares of the population under 18 and that over 65 as well as the measure of Education, measured as the percentage of the population with at least a high school diploma, do not show significant changes in the average; instead, the average Unemployment rate drops by 1.2% points and the Loan risk variable falls by 1.5% points.[4] Table 2 also reports descriptive statistics for a dummy for municipalities that have had earthquakes in the time interval considered, since it has been shown that there is a robust connection between earthquakes and gambling opportunity in the Italian case, as law decree 39/2009 "Decreto Abruzzo" liberalized Video Lottery Terminals to pay for part of the reconstruction after the L'Aquila earthquake,[5] and after that, there has been a significant increase in the supply of gambling in the area affected by the earthquake.[6] In addition, Table 2 includes a dummy for Inner Areas, which according to (Gallo and Pagliacci, 2020), have a positive effect on the Gini index. Table 2 also presents data on the proportion of individuals with an income below 10 thousand euros (employed as a poverty indicator) and the proportion of individuals with an income exceeding 75 thousand euros (employed as an indicator of affluence). These metrics exhibit a notable degree of consistency over time, with an average poverty rate of approximately 33 percent and an average rate of affluent individuals at approximately 1.25 percent.

The spatial distribution of inequality, as measured by municipal Gini coefficients, highlights wide heterogeneity with a slight North-South divide in which the South has more inequality. As shown in the left panel in Figure 4, some regions such as Puglia, Sicilia, Campania, and Lazio are characterized by a significant number of red municipalities (with higher inequality), while the municipalities with lower inequality are more concentrated in the Center-North part of the country (Marche, Toscana, Emilia Romagna, Friuli Venezia

[4]Provided on a provincial basis by ISTAT (Italian National Institute of Statistics) and measured as the Cash Financing Decay Rate (percentage)

[5]https://www.camera.it/parlam/leggi/decreti/09039d.htm

[6]For more news, see:
https://www.agi.it/cronaca/abruzzo$_ludopatia - 5235853/news/$2019 − 03 − 31/
https://www.ansa.it/abruzzo/notizie/2016/03/21/sisma-73-spesa-per-gioco-dazzardo$_2fd780f5$ − $53ea - 41a8 - be41 - ac7fdc0e137b.html$

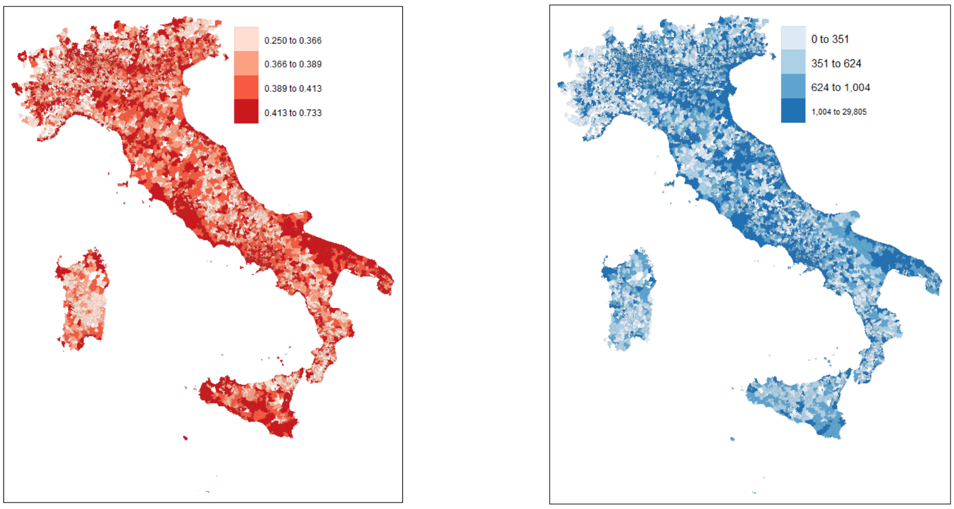
Table 2: Desctiptive statistics

	2017	2018	2019
Per capita gross turnover in total	850.45	862.09	873.50
	(1069.787)	*(1140.334)*	*(1119.923)*
Per capita gross turnover in Traditional games	221.11	235.03	245.99
	(188.674)	*(196.044)*	*(210.582)*
Per capita gross turnover in New Generation games	591.77	588.24	584.83
	(968.99)	*(1038.052)*	*(1010.955)*
Per capita gross turnover in Sport games	37.57	38.82	42.68
	(86.837)	*(87.387)*	*(99.294)*
Gini	0.38	0.39	0.40
	(0.038)	*(0.038)*	*(0.062)*
Average Income	17823.87	17757.91	18348.74
	(4054.863)	*(4124.69)*	*(4212.498)*
Altitude	400.49	399.35	396.22
	(388.067)	*(384.031)*	*(381.707)*
Population Density	339.60	343.59	348.22
	(689.769)	*(696.251)*	*(702.192)*
Share pop. Under 18	0.15	0.15	0.15
	(0.028)	*(0.028)*	*(0.027)*
Share pop. Over 65	0.24	0.24	0.23
	(0.05)	*(0.049)*	*(0.047)*
Education (% pop. degree or more)	0.14	0.14	0.15
	(0.02)	*(0.022)*	*(0.022)*
Unemployment	11.47	10.77	10.22
	(5.914)	*(5.882)*	*(5.742)*
Loan risk	3.87	2.54	2.32
	(1.614)	*(1.009)*	*(1.267)*
Earthquakes	0.02	0.02	0.02
	(0.125)	*(0.126)*	*(0.128)*
Inner Areas	0.49	0.49	0.49
	(0.5)	*(0.5)*	*(0.5)*
Poverty	33.04	33.76	32.20
	(10.837)	*(10.803)*	*(10.517)*
Richness	1.21	1.23	1.33
	(1.12)	*(1.123)*	*(1.182)*

Notes: Mean and (Standard Deviation). Source: Authors' elaborations on data from ISTAT (2022), ADM (2022), MEF (2022).

Giulia). The municipal gross gambling turnover also shows a spatial heterogeneity, with higher values in many municipalities in the North (in Piemonte, Lombardia, Veneto, the Eastern part of Emilia Romagna), the Center (Umbria, Lazio), and the South (Campania and Puglia). Lower levels of gambling turnover can be observed in many municipalities in Sardegna and Toscana.

Figure 4: *Geography of the Gini coefficient (left panel), and per capita gambling turnover (right panel) by Municipalities (average 2017 - 2019)*



Source: Authors' elaborations on data from UPB (2018), ADM (2020).

4 Empirical Strategy

The increase in inequality, as observed in the trend of the Gini Index, may indeed have favored a higher propensity for gambling. However, there does not appear to be a clear causal link. Furthermore, an increase in gambling could potentially lead to greater inequality if significant winnings occur, creating a reverse causality. To test our hypothesis on the link between inequality and gambling we adopt two empirical strategies. First, we estimate an OLS with all relevant covariates lagged one year to avoid simultaneity issues. As a second strategy, we implement an Instrumental-variables (IV) regression with a two-stage least squares (IV-2SLS).

The key regression in our model is the following:

$$y_{it} = \alpha + \beta_1 G_{it-1} + \beta_2 X_{it} + u_{it} \tag{1}$$

where y_{it} is the logarithm of per capita turnover in gambling in municipality i in year t. Turnover in gambling is further differentiated into 4 different models: total turnover, turnover from traditional games, turnover from new generation games, and turnover from sports betting. The first regressor, G_{it-1}, is the Gini index which measures the degree of inequality taken in municipality i at time $t-1$. X_{it} is a vector of relevant control variables at the municipal level. In this vector, we include average income, altitude, population, population density, and population structure (the share of people below 18 and above 65). Furthermore, we include a dummy for municipalities that have had earthquakes in the time interval considered since it has been shown that there is a robust connection between earthquakes and gambling opportunity in the Italian case, as law decree 39/2009 "Decreto Abruzzo" liberalized Video Lottery Terminals to pay for part of the reconstruction after the L'Aquila earthquake, and after that, there has been a significant increase in the supply of gambling in the area affected by the earthquake. In addition, we include a dummy for Inner Areas (which according to Gallo and Pagliacci (2020), have a positive effect on the Gini index). In addition, we include time fixed effects accounting for unobservable yearly factors, and provincial fixed effects to account for the spatial heterogeneity and for the fact that Italy is a dual country economy in many dimensions including inequality and gambling attitudes (see Ciani and Torrini (2019); Gandullia and Leporatti (2019). Furthermore, we also include control for provincial and regional controls to account for differentiations in education (percentage of the population with the degree or more which is available at the regional level), unemployment (unemployment rate at the regional level), and the index of loan risk. Moreover, we take into account time fixed effects to control for unobservable yearly factors, and provincial fixed effects to account for spatial heterogeneity.

The parameter of interest is β_1, which captures the effect of inequality on gambling turnover at the municipal level. We must consider the possibility that inequality and gambling turnover are jointly determined and that there are unobserved factors that are correlated with both variables of interest. We address these endogeneity issues using a shift-share instrument for sources of income: the sum of the yearly nationwide income variations by source, weighted by the source of income share in the municipality source at the start of the period. That is:

$$\text{INST}_{it} = \sum_k \left(\frac{\ln \text{Inc}_{nkt}/\text{Inc}_{nkt-1}}{\text{Share}_{ikt-1}} \right) \tag{2}$$

where i refers to the municipality, t to the year, n to the nationwide value, and k to the income sources. Using MEF (2020) data, we can partition the municipal income into 7 sources: 1) income from buildings, 2) employee income, 3) self-employed income, 4) retirement income, 5) income of entrepreneur in ordinary accounts, 6) simplified accountancy entrepreneur's income, and 7) income from financial participation. As in the recent paper by (Albanese and de Blasio, 2021), the instrumental variable used here is a derivation of the shift-share approach introduced by Bartik (1991) and Blanchard and Katz (1992). The validity of the instrument relies on the fact that national shocks to individual income sources affect the local economies proportionally to the lagged income shares of those sources in total income and thus inequality. As shown by Lerman and Yitzhaki (1985), the change in various income sources impacts the overall income inequality. On the other hand, both the national shocks and the lagged sources shares can be exogenous to city changes in gambling turnover over time. This is accomplished in an IV model where the first-stage equation is the following:

$$G_{it} = \alpha + \beta_1 \text{INST}_{it} + u_{it} \tag{3}$$

The fitted values of G_{it} (inequality) in equation (3) are then plugged into the original regression equation (1) in a standard two-stage least square regression. In order to test endogeneity and the validity of the instrument variable employed, we implement the robust

Durbin-Wu-Hausman test (DWH), the F-Test for the first stage, and the Wald test[7].

5 Results

Considering all games together, Table 3 shows that the positive effect of inequality on turnover is confirmed in both the OLS and IV-2SL estimates.[8] Positive and significant coefficients at 1% are estimated by each specification of the model: short version (columns 1 and 2), with additional covariates (column 3), and instrumental-variables regression with a two-stage least squares (column 5). The reduced form in column (6) provides an estimate of the log of income at municipal level on the turnover. We observe that turnover increased by 0.243 percentage points; the estimate is statistically significant at 1% level, with a standard error of 0.014. In the case of the reduced form, the coefficient of the instrument is negative and statistically significant. This allows us to clearly infer that the instrument used has no positive effect on our dependent variable, thereby corroborating the validity of the instrument in the analysis.

Regarding the remaining covariates, negative and significant associations with the gambling turnover are observed for Altitude, Inner Areas, the Share of population under 18, and Education. Population density shows a positive association with gambling turnover, while Income shows opposite coefficients when comparing OLS and IV-2SLS. This effect is

[7] Jaeger et al. (2018) have highlighted that for the use of the shift-share analysis, it would be preferable to gather data from a period well before the analysis period. As a robustness check, we have therefore considered data from 10 years prior, and the results remain consistent. For the sake of brevity, we do not include them in the paper, but they are available upon request.

[8] We also control for weak instruments using LIML estimates. The results are very similar to IV. To save space we report only the IV results. LIML results are available upon request. Since the IV estimate is unaffected by the measurement error in the treatment variable, its coefficients tend to be larger than the OLS estimates. However, the main reason why the IV estimate might be larger than the OLS estimate, even in cases where the omitted variable bias is expected to be the other way round, is as follows. While the OLS estimate describes the average difference in inequality for those whose gambling differs by one year, the IV estimate is the effect of increasing gambling only for the population whose choice of treatment was affected by the instrument. This is known as the "local average treatment effect" (LATE).

Table 3: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results (logarithm of per capita gross turnover in total as dependent)

VARIABLES	OLS	OLS	OLS	First Stage	IV-2SLS	OLS RED.FORM
	turnover	*turnover*	*turnover*	*Gini*	*turnover*	*turnover*
lag(Gini)	0.189 ***	0.167 ***	0.066 ***		0.657 ***	
	(0.008)	*(0.008)*	*(0.008)*		*(0.181)*	
log(Income)			0.194 ***	0.035 ***	-0.978 *	0.243***
			(0.015)	*(0.001)*	*(0.556)*	*(0.014)*
Altitude			-0.129 ***	-0.003 ***	-0.000 ***	-0.135***
			(0.010)	*(0.000)*	*(0.000)*	*(0.01)*
Pop Density			0.139 ***	0.002 ***	0.000 ***	0.141***
			(0.009)	*(0.000)*	*(0.000)*	*(0.009)*
Earthquakes			0.064	-0.011 ***	0.201 **	0.052
			(0.072)	*(0.003)*	*(0.091)*	*(0.072)*
Inner Areas			-0.068 ***	0.005 ***	-0.128 ***	-0.065***
			(0.019)	*(0.001)*	*(0.028)*	*(0.019)*
Share of population under 18			-0.159 ***	-0.002 ***	-2.278 ***	-0.168***
			(0.018)	*(0.001)*	*(0.339)*	*(0.018)*
Share of population over 65			-0.118 ***	-0.014 ***	0.896	-0.144***
			(0.017)	*(0.001)*	*(1.045)*	*(0.017)*
Education (% pop. degree or more)			-0.116 **	0.008 ***	-10.450 ***	-0.123***
			(0.053)	*(0.002)*	*(3.456)*	*(0.059)*
Unemployment			0.059	0.007 ***	-0.008	0.054
			(0.043)	*(0.002)*	*(0.010)*	*(0.048)*
Loan risk			0.006	-0.002 ***	0.023 **	0.007
			(0.011)	*(0.001)*	*(0.011)*	*(0.013)*
(Intercept)	6.305 ***	6.339 ***	6.376 ***	0.426 ***	17.243 ***	6.297***
	(0.008)	*(0.090)*	*(0.194)*	*(0.008)*	*(5.350)*	*(0.197)*
Instrument				-0.010 ***		-0.132***
				(0.001)		*(0.033)*
Time fixed effects	NO	YES	YES	YES	YES	YES
Provincial fixed effects	NO	YES	YES	YES	YES	YES
Observations	20087	20087	19715	19715	19715	19715
F- Test for the first stage					33.156***	
Wu-Hausman					8.857**	

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

due to the difference in the empirical strategy (the use of IV-2SLS), which does not affect the association and the significance between municipal inequality and gambling turnover. Overall, these results provide support for our H1 that greater inequality leads to a higher propensity for gambling.

Next, Table 4 shows OLS and IV-2SLS results on gambling turnover by disentangling the sample of municipalities in three macro areas – North, Centre, and South – in order to verify whether there is territorial heterogeneity and if the propensity for gambling is higher in areas with greater socio-economic strain. Coefficients associated with inequality are all positive and they are all significant except for the IV-2SLS specification in the case of municipalities in the Centre. In particular, the magnitude and significance of the effect of inequality on gambling turnover is higher in Southern municipalities. This result may reflect the fact that higher inequality in areas with low social mobility (Canale et al., 2017) could incentivize more people to try new ways to improve their living conditions.

Several factors could contribute to this phenomenon. One key factor is the presence of structural economic and development disparities between the southern and northern regions of Italy (Lagravinese, 2015). The South has historically experienced lower levels of industrialization, limited job opportunities, and weaker infrastructure compared to the more prosperous North. These economic disparities make it challenging for individuals to access quality education, secure and stable employment, and accumulate wealth. Another contributing factor is the prevalence of organised crime (Daniele and Geys, 2015) in some areas of the South. These factors can undermine fair competition, hinder economic growth, and create an environment where meritocracy and equal opportunities are compromised. By and large, the results of Table 4 concur with our H2 that gambling shows territorial heterogeneity, and is more prevalent in regions with higher socio-economic disadvantage.

Table 4: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results with turnover by macro-area (North, Centre, South)

	North		Centre		South	
VARIABLES	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
lag(Gini)	0.035 **	0.118 **	0.040 **	0.279	0.155 ***	0.658 ***
	(0.014)	*(0.050)*	*(0.020)*	*(0.346)*	*(0.013)*	*(0.185)*
log(Income)	0.079 ***	0.252	0.158 ***	0.235	0.136 ***	-0.366
	(0.015)	*(0.192)*	*(0.026)*	*(1.310)*	*(0.014)*	*(0.463)*
Altitude	-0.132 ***	-0.000 ***	-0.113 ***	-0.000 *	-0.124 ***	-0.000 **
	(0.017)	*(0.000)*	*(0.022)*	*(0.000)*	*(0.014)*	*(0.000)*
Pop Density	0.225 ***	0.000 ***	0.176 ***	0.000 ***	0.047 ***	0.000 ***
	(0.014)	*(0.000)*	*(0.019)*	*(0.000)*	*(0.013)*	*(0.000)*
Inner Areas	-0.073 **	-0.082 ***	-0.193 ***	-0.226 ***	0.011	-0.027
	(0.030)	*(0.030)*	*(0.040)*	*(0.063)*	*(0.027)*	*(0.033)*
Share of population under 18	-0.036	-0.724	-0.125 **	-2.241 **	-0.290 ***	-2.946 ***
	(0.028)	*(0.481)*	*(0.050)*	*(0.903)*	*(0.024)*	*(0.714)*
Share of population over 65	-0.040	-0.548	-0.053	-0.241	-0.193 ***	0.240
	(0.026)	*(0.568)*	*(0.050)*	*(1.408)*	*(0.024)*	*(1.490)*
Education (% pop. degree or more)	-0.019	-3.701	0.024	9.876	-0.045	-12.310 **
	(0.092)	*(8.253)*	*(0.109)*	*(13.800)*	*(0.044)*	*(4.959)*
Unemployment	0.090 **	0.045 **	-0.001	-0.016	0.001	0.006
	(0.036)	*(0.019)*	*(0.055)*	*(0.029)*	*(0.041)*	*(0.010)*
Loan risk	0.010	0.013	0.004	0.017	0.022	0.005
	(0.018)	*(0.016)*	*(0.027)*	*(0.028)*	*(0.017)*	*(0.012)*
(Intercept)	5.491 ***	3.466	6.315 ***	3.325	6.228 ***	11.386 ***
	(0.178)	*(2.368)*	*(0.153)*	*(11.211)*	*(0.130)*	*(4.296)*
Time fixed effects	YES	YES	YES	YES	YES	YES
Provincial fixed effects	YES	YES	YES	YES	YES	YES
Observations	10083	10083	2565	2565	7067	7067
F- Test for the first stage		328.312***		9.573**		43.965***
Wu-Hausman		2.053		0.474		5.257*

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** p < 0.001; ** p < 0.01; * p < 0.05.

Finally, Table 5 shows the effect of the inequality on gambling differentiating the turnover according to the three main categories discussed in Section 3: traditional games (columns 1-2), new generation games (columns 3-4) and sport betting (columns 5-6). The impact of the municipal Gini coefficient on the municipal turnover is positive and significant for all the categories in OLS and in two out of the three categories in the IV-2SLS contexts too (traditional games and sport betting).

Indeed, although all positive, the impact of inequality on the turnover for the differentiated category of games shows a certain heterogeneity in significance and magnitude. It can be observed that both the magnitude and significance of the impact of inequality on turnover for traditional games is lower than the impact on turnover for sport betting and is higher than the impact of inequality on new generation games. These results reflect the heterogeneity observed in previous studies which show that some categories of games are concentrated among the poorest individuals. In this regard, Resce et al. (2019) show how

Table 5: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results with differentiated games

	Traditional Games		New Gen. Games		Sport Betting	
VARIABLES	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
lag(Gini)	0.118 ***	0.945 ***	0.069 ***	0.382	0.210 ***	1.212 ***
	(0.011)	*(0.246)*	*(0.014)*	*(0.279)*	*(0.015)*	*(0.322)*
log(Income)	0.395 ***	-0.843	0.228 ***	0.010	0.638 ***	-0.348
	(0.021)	*(0.754)*	*(0.026)*	*(0.856)*	*(0.027)*	*(0.987)*
Altitude	-0.112 ***	-0.000 ***	-0.226 ***	-0.001 ***	-0.174 ***	-0.000 ***
	(0.014)	*(0.000)*	*(0.018)*	*(0.000)*	*(0.019)*	*(0.000)*
Pop Density	0.112 ***	0.000 ***	0.170 ***	0.000 ***	0.498 ***	0.001 ***
	(0.013)	*(0.000)*	*(0.016)*	*(0.000)*	*(0.017)*	*(0.000)*
Earthquakes	0.004	0.197	-0.034	0.039	-0.264 **	-0.031
	(0.097)	*(0.124)*	*(0.123)*	*(0.141)*	*(0.130)*	*(0.162)*
Inner Areas	-0.080 ***	-0.164 ***	-0.171 ***	-0.203 ***	-0.271 ***	-0.372 ***
	(0.025)	*(0.038)*	*(0.032)*	*(0.043)*	*(0.034)*	*(0.050)*
Share of population under 18	-0.234 ***	-3.392 ***	-0.239 ***	-3.746 ***	-0.272 ***	-3.907 ***
	(0.024)	*(0.460)*	*(0.030)*	*(0.522)*	*(0.032)*	*(0.602)*
Share of population over 65	-0.133 ***	1.878	-0.228 ***	-2.731 *	-0.160 ***	2.284
	(0.023)	*(1.416)*	*(0.029)*	*(1.608)*	*(0.031)*	*(1.854)*
Education (% pop. degree or more)	-0.083	-11.693 **	-0.216 **	-12.885 **	0.021	-8.589
	(0.078)	*(4.684)*	*(0.099)*	*(5.320)*	*(0.105)*	*(6.132)*
Unemployment	-0.133 **	-0.042 ***	0.159 **	0.020	-0.037	-0.029 *
	(0.064)	*(0.013)*	*(0.081)*	*(0.015)*	*(0.085)*	*(0.018)*
Loan risk	0.037 **	0.047 ***	-0.038 *	-0.017	0.031	0.048 **
	(0.017)	*(0.014)*	*(0.021)*	*(0.016)*	*(0.022)*	*(0.019)*
(Intercept)	5.771 ***	15.606 **	5.612 ***	8.319	3.170 ***	7.316
	(0.261)	*(7.250)*	*(0.330)*	*(8.235)*	*(0.348)*	*(9.491)*
Time fixed effect	YES	YES	YES	YES	YES	YES
Provincial fixed effect	YES	YES	YES	YES	YES	YES
Observations	19715	19715	19715	19715	19715	19715
F- Test for the first stage		33.156***		33.156***		33.156***
Wu-Hausman		8.611**		0.741		13.10***

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

sports betting is predominantly played by young people and individuals with lower incomes. Therefore, it is not surprising that the coefficient for sports betting is more than three times larger than that of traditional games and new generation games. Additionally, the coefficient for the latter is not significant. This can be explained by the fact that these types of games often require extensive knowledge and training (e.g., Poker) and are frequently played online by individuals with a higher level of education. The second argument is that sport betting games have higher payouts and low-income people willing to leapfrog the societal hierarchy may be more attracted by those games (Friehe and Mechtel, 2017). As for the covariates, Table 5 shows some differentiations in the association with the turnover for the different categories of games. Regarding income, a positive association can be observed with all the categories of games in the OLS context while no significant association with turnover can be observed in the IV-2SLS framework. Heterogeneous associations with gambling turnover can also be observed between gambling turnover and the dummy for earthquakes, the population, and the share of population over 65 years old, education, unemployment, and loan risk. A negative and significant association can be observed between turnover and altitude, the dummy for inner areas, and the share of population under 18 years old. A significant positive association can be observed for population density. Summing up, the results of Table 5 provide support for our H3 that greater inequality increases the propensity to engage in gambling activities disproportionately for younger and poorer individuals.

6 Is it all about poverty?

The empirical analysis presented in Section 5 shows a clear linkage between inequality and gambling. In this Section, we investigate what are the mechanisms behind this linkage and, in particular, check whether the boosting effect on gambling we assign to inequality is germane or simply derived from the fact that inequality will worsen any time poverty increases. Indeed, as recalled in the Introduction, there is a large literature in economics exploring the possibility that poor agents love risk and such literature is precise on the mechanism, i.e., on what explains individuals' decisions (Baker et al., 2020; Haisley et al., 2008; Resce et al., 2019). Of course, inequality could increase because the bottom incomes decrease: this might give rise to more gambling through the risk-loving poor (already known in the literature). But what if inequality increases because the rich getting richer? To explore this research question we perform two additional regressions, including the share of the population with an income lower than 10,000 euros as a proxy of poverty, and the share of the population with an income higher than 75,000 euros as a proxy of richness in the municipalities. Furthermore, we also include an interaction term between the Gini index and, in turn, poverty and richness.

As can be noted in Table 6, the direct impact of inequality on gambling remains positive and significant including the share of poverty and the interaction term in the regressions. This result is confirmed for the total gambling turnover, in any territory, and in all the categories of games. On the contrary, the direct impact of poverty on the gambling turnover is not significant considering the total gambling turnover, it is negative and significant in Northern and Centre regions, and it is positive and significant in Southern regions. Considering the categories of games, the direct impact of poverty on gambling turnover is not significant for traditional games, it is negative for new-generation games and it is positive for sports betting. This last result reflects the fact that the new-generation games are frequently played by individuals with a higher level of education, while sports betting is predominantly played by young people and individuals with lower incomes (Resce et al., 2019). In this regard, an increase in the share of poverty is reflected in a decrease in players for new-generation games and an increase in the number of sports betting players.

Table 6: OLS regression with poverty and interaction term

VARIABLES	Total	North	Centre	South	Traditional Games	New Gen. Games	Sport Betting
lag(Gini)	0.059 ***	0.063 ***	0.093 ***	0.109 ***	0.123 ***	0.091 ***	0.127 ***
	(0.01)	(0.02)	(0.025)	(0.016)	(0.014)	(0.018)	(0.018)
lag(Poverty)	0.034	-0.082 ***	-0.163 ***	0.184 ***	-0.028	-0.123 **	0.429 ***
	(0.032)	(0.026)	(0.042)	(0.033)	(0.043)	(0.055)	(0.058)
lag(Gini)*lag(Poverty)	0.065 ***	0.030 ***	0.049 ***	0.009	0.083 ***	0.074 ***	0.162 ***
	(0.008)	(0.01)	(0.016)	(0.01)	(0.01)	(0.013)	(0.014)
log(Income)	0.232 ***	0.019	0.024	0.314 ***	0.387 ***	0.143 ***	1.003 ***
	(0.03)	(0.029)	(0.043)	(0.035)	(0.04)	(0.051)	(0.053)
Altitude	-0.128 ***	-0.123 ***	-0.079 ***	-0.118 ***	-0.110 ***	-0.223 ***	-0.175 ***
	(0.01)	(0.018)	(0.021)	(0.014)	(0.014)	(0.018)	(0.019)
Pop Density	0.140 ***	0.228 ***	0.194 ***	0.046 ***	0.114 ***	0.173 ***	0.495 ***
	(0.009)	(0.014)	(0.02)	(0.013)	(0.012)	(0.016)	(0.017)
Earthquakes	0.067				0.008	-0.03	-0.258 **
	(0.072)				(0.097)	(0.123)	(0.129)
Inner Areas	-0.072 ***	-0.064 **	-0.181 ***	0.011	-0.083 ***	-0.171 ***	-0.287 ***
	(0.019)	(0.03)	(0.04)	(0.027)	(0.025)	(0.032)	(0.034)
Share of population under 18	-0.135 ***	-0.023	-0.115 **	-0.293 ***	-0.202 ***	-0.207 ***	-0.224 ***
	(0.018)	(0.028)	(0.05)	(0.024)	(0.024)	(0.031)	(0.032)
Share of population over 65	-0.100 ***	-0.027	-0.046	-0.204 ***	-0.105 ***	-0.197 ***	-0.139 ***
	(0.018)	(0.027)	(0.049)	(0.025)	(0.024)	(0.03)	(0.031)
Education (% pop. degree or more)	-0.121 **	-0.037	0.016	-0.039	-0.105	-0.237 **	-0.013
	(0.058)	(0.092)	(0.11)	(0.044)	(0.078)	(0.099)	(0.104)
Unemployment	0.054	0.092 **	-0.009	-0.001	-0.109 *	0.179 **	0.021
	(0.048)	(0.036)	(0.056)	(0.041)	(0.064)	(0.081)	(0.085)
Loan risk	0.009	0.014	0.005	0.024	0.036 **	-0.038 *	0.025
	(0.012)	(0.018)	(0.027)	(0.017)	(0.017)	(0.021)	(0.022)
(Intercept)	6.254 ***	5.464 ***	6.245 ***	6.212 ***	5.647 ***	5.547 ***	2.713 ***
	(0.195)	(0.179)	(0.154)	(0.13)	(0.262)	(0.332)	(0.348)
Time fixed effects	YES	YES	YES	YES	YES	YES	YES
Provincial fixed effects	YES	YES	YES	YES	YES	YES	YES
Observations	19715	10083	2565	7067	19715	19715	19715

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

The interaction term in Table 6 is always positive and significantly associated with gambling turnover with the exception of the South where the association is not significant. Overall, the Average Marginal Effect of the share of poverty on the logarithm of the total gambling turnover is 0.003163, while the Average Marginal Effect of the Gini on the logarithm of the total gambling turnover is 1.232.[9]

A quite different result can be observed when the share of the rich population is included in the regression (Table 7). In this case, the direct impact of inequality on gambling turnover is confirmed in the total sample, and for any category of games, but it is not confirmed in the northern and center regions. The share of the rich population has a positive and significant direct impact on gambling turnover in any specification with the exception of the Center regions. Finally, the interaction between the Gini coefficient and the share of the rich population is always negative and significant.

The Average Marginal Effect of the share of the rich population on the logarithm of gambling turnover is 0.09418 while the Average Marginal Effect of the share of the Gini coefficient on the logarithm of gambling turnover is 0.8567. Overall, the Average Marginal Effect of the share of the rich population is higher than the Average Marginal Effect of the share of the poor population. This result means that the mechanism behind the inequality and gambling linkage is not just a matter of poor agents loving risk. The surge in inequality, regardless of whether it stems from reduced income among the lower strata or increased income among the upper echelons, exerts a favorable influence on gambling.

[9]The Average Marginal Effect is estimated by the `margins` package in R (Leeper, 2021).

Table 7: OLS regression with richness and interaction term

VARIABLES	Total	North	Centre	South	Traditional Games	New Gen. Games	Sport Betting
lag(Gini)	0.041 ***	0.007	0.024	0.096 ***	0.071 ***	0.037 **	0.161 ***
	(0.009)	(0.017)	(0.022)	(0.015)	(0.012)	(0.016)	(0.017)
lag(Richness)	0.108 ***	0.059 **	0.021	0.170 ***	0.200 ***	0.137 ***	0.206 ***
	(0.017)	(0.026)	(0.035)	(0.022)	(0.023)	(0.029)	(0.031)
lag(Gini)*lag(Richness)	-0.118 ***	-0.122 ***	-0.092 ***	-0.073 ***	-0.180 ***	-0.167 ***	-0.177 ***
	(0.006)	(0.009)	(0.013)	(0.011)	(0.009)	(0.011)	(0.011)
log(Income)	0.189 ***	0.121 ***	0.206 ***	0.059 ***	0.354 ***	0.235 ***	0.588 ***
	(0.021)	(0.023)	(0.035)	(0.019)	(0.028)	(0.035)	(0.037)
Altitude	-0.111 ***	-0.108 ***	-0.084 ***	-0.115 ***	-0.085 ***	-0.201 ***	-0.147 ***
	(0.01)	(0.017)	(0.021)	(0.014)	(0.014)	(0.018)	(0.019)
Pop Density	0.139 ***	0.221 ***	0.190 ***	0.047 ***	0.111 ***	0.170 ***	0.497 ***
	(0.009)	(0.014)	(0.02)	(0.013)	(0.012)	(0.016)	(0.017)
Earthquakes	0.077				0.024	-0.016	-0.244 *
	(0.072)				(0.096)	(0.123)	(0.129)
Inner Areas	-0.048 **	-0.038	-0.160 ***	0.004	-0.050 **	-0.141 ***	-0.242 ***
	(0.019)	(0.03)	(0.039)	(0.027)	(0.025)	(0.032)	(0.034)
Share of population under 18	-0.115 ***	0.01	-0.069	-0.286 ***	-0.174 ***	-0.175 ***	-0.214 ***
	(0.018)	(0.028)	(0.051)	(0.025)	(0.024)	(0.03)	(0.032)
Share of population over 65	-0.086 ***	-0.016	-0.013	-0.191 ***	-0.091 ***	-0.180 ***	-0.121 ***
	(0.017)	(0.026)	(0.049)	(0.025)	(0.023)	(0.03)	(0.031)
Education (% pop. degree or more)	-0.117 **	-0.025	-0.031	-0.025	-0.099	-0.234 **	0.006
	(0.058)	(0.091)	(0.108)	(0.044)	(0.078)	(0.099)	(0.104)
Unemployment	0.052	0.089 **	0.011	0.003	-0.104 *	0.185 **	-0.008
	(0.047)	(0.036)	(0.055)	(0.041)	(0.063)	(0.08)	(0.085)
Loan risk	0.01	0.015	0.005	0.025	0.037 **	-0.038 *	0.031
	(0.012)	(0.018)	(0.027)	(0.017)	(0.017)	(0.021)	(0.022)
(Intercept)	6.338 ***	5.518 ***	6.242 ***	6.276 ***	5.699 ***	5.563 ***	3.097 ***
	(0.192)	(0.177)	(0.152)	(0.13)	(0.258)	(0.328)	(0.346)
Time fixed effects	YES	YES	YES	YES	YES	YES	YES
Provincial fixed effects	YES	YES	YES	YES	YES	YES	YES
Observations	19715	10083	2565	7067	19715	19715	19715

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

7 Robustness

This section presents additional robustness checks performed to validate our results. The first part (Table 8,Table 9, Table 10, and Table 12) verifies the robustness of the results to changes in the index used to measure inequality. In this regard, we repeat the whole analysis using two different indicators instead of the Gini index: the Theil (1967) index; and the ratio of the average income of those with incomes higher than 75,000 euros (top income class) to the average income of those with incomes lower than 10,000 euros (bottom income class). The second part (Table 14, Table 15, and Table 16) presents the robustness of the results to changing the dependent variable: using gambling losses instead of gross gambling turnover. At the municipal level, the losses represent the municipal gross gambling turnover (used in the estimates in Tables 3, 4, and 5) minus the municipal winnings. The more the winnings compared with how much people invested in gambling, the fewer the losses. Gambling losses at the municipal level can be even zero or negative (gains), in the case the community of gamblers in the municipality wins more than it invests in gambling. In the main analysis we use gross gambling turnover as the dependent variable because it reflects the money invested in gambling. Indeed, the gross gambling turnover is more appropriate for estimating the phenomenon of gambling since the losses also depend on the local pay-out (i.e., the probability of winning), which is likely to be uncorrelated with how much people invest in gambling. However, for data availability reasons, gambling losses are frequently used for international comparisons on gambling (H2 Gambling Capital, 2020), thus it is worth showing the validity of our main results on this indicator as well.

Table 8 shows that switching from the Gini to the Theil index does not affect the main results. As we found in Table 3, Table 8 shows that positive and significant coefficients for inequality are estimated by each model specification: short version (columns 1 and 2), additional covariates (column 3), and instrumental-variables regression with a two-stage least squares (column 5).

Table 8: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results (logarithm of per capita gross turnover in total as dependent, Theil index to measure inequality)

VARIABLES	OLS	OLS	OLS	First Stage	IV-2SLS
lag(Theil)	0.272 ***	0.305 ***	0.195 ***		0.683 ***
	(0.007)	*(0.008)*	*(0.010)*		*(0.177)*
log(Income)			0.103 ***	0.711 ***	-1.028 *
			(0.016)	*(0.010)*	*(0.536)*
Altitude			-0.112 ***	-0.111 ***	-0.000 ***
			(0.010)	*(0.008)*	*(0.000)*
Pop Density			0.134 ***	0.038 ***	0.000 ***
			(0.009)	*(0.007)*	*(0.000)*
Earthquakes			0.077	-0.140 ***	0.148 *
			(0.072)	*(0.053)*	*(0.080)*
Inner Areas			-0.067 ***	0.024 *	-0.081 ***
			(0.019)	*(0.014)*	*(0.021)*
Share of population under 18			-0.120 ***	-0.221 ***	-0.279
			(0.018)	*(0.013)*	*(0.683)*
Share of population over 65			-0.119 ***	-0.100 ***	-1.455 ***
			(0.017)	*(0.013)*	*(0.466)*
Education (% pop. degree or more)			-0.082	-0.096 **	-2.640
			(0.058)	*(0.043)*	*(2.843)*
Unemployment			0.043	0.012	0.008
			(0.047)	*(0.035)*	*(0.009)*
Loan risk			0.009	-0.011	0.009
			(0.012)	*(0.009)*	*(0.009)*
(Intercept)	6.305 ***	6.381 ***	6.289 ***	0.579 ***	16.536 ***
	(0.007)	*(0.088)*	*(0.192)*	*(0.143)*	*(4.852)*
Instrument				-0.193 ***	
				(0.024)	
Time fixed effects	NO	YES	YES	YES	YES
Provincial fixed effects	NO	YES	YES	YES	YES
Observations	20115	20115	19715	19715	19715
F- Test for the first stage					41.847***
Wu-Hausman					5.653*

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Table 9: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results (logarithm of per capita gross turnover in total as dependent, the ratio of the average of top income class on the average of bottom income class to measure inequality)

VARIABLES	OLS	OLS	OLS	First Stage	IV-2SLS
lag(Ratio)	0.193 ***	0.194 ***	0.106 ***		0.282 ***
	(0.008)	*(0.008)*	*(0.008)*		*(0.075)*
log(Income)			0.201 ***	0.788 ***	0.089
			(0.014)	*(0.025)*	*(0.256)*
Altitude			-0.129 ***	-0.081 ***	-0.000 ***
			(0.01)	*(0.018)*	*(0)*
Pop Density			0.140 ***	0.017	0.000 ***
			(0.009)	*(0.016)*	*(0)*
Earthquakes			0.064	-0.279 **	0.131
			(0.072)	*(0.127)*	*(0.081)*
Inner Areas			-0.062 ***	-0.006	-0.063 ***
			(0.019)	*(0.033)*	*(0.02)*
Share of population under 18			-0.100 *	0.052	-6.311 **
			(0.058)	*(0.103)*	*(2.931)*
Share of population over 65			-0.114 ***	-0.928 ***	1.539
			(0.018)	*(0.031)*	*(1.15)*
Education (% pop. degree or more)			-0.102 ***	-0.691 ***	0.986
			(0.017)	*(0.03)*	*(1.026)*
Unemployment			0.044	0.015	0.008
			(0.047)	*(0.083)*	*(0.009)*
Loan risk			0.008	-0.008	0.006
			(0.012)	*(0.022)*	*(0.009)*
(Intercept)	6.305 ***	6.351 ***	6.362 ***	19.714 ***	0.227
	(0.008)	*(0.09)*	*(0.193)*	*(0.345)*	*(0.934)*
Instrument				-0.468 ***	
				(0.057)	
Time fixed effects	NO	YES	YES	YES	YES
Provincial fixed effects	NO	YES	YES	YES	YES
Observations	20115	20115	19715	19715	19715
F- Test for the first stage					34.290***
Wu-Hausman					7.469**

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

A quite similar result is obtained if the ratio of the average of the top income class on the average of the bottom income class is used to measure inequality (Table 9). Switching from the Theil index to this indicator of inequality does not affect the main results. As we found in Table 3 and Table 8, Table 9 shows that positive and significant coefficients for inequality are estimated by each model specification.

In addition, the results presented in Table 10 demonstrate that the outcomes achieved using the Theil index align with those obtained using the Gini index in terms of geographical areas. Similar to the findings in Table 4, Table 10 illustrates that the coefficients related to inequality are uniformly positive and significant, with the exception of the IV-2SLS specification for municipalities located in the Centre. Additionally, consistent with Table 4,

Table 10: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results with Theil by macro-area (North, Centre, South)

	North		Centre		South	
VARIABLES	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
lag(Theil)	0.035 **	0.118 **	0.040 **	0.279	0.155 ***	0.658 ***
	(0.014)	*(0.050)*	*(0.020)*	*(0.346)*	*(0.013)*	*(0.185)*
log(Income)	0.079 ***	0.252	0.158 ***	0.235	0.136 ***	-0.366
	(0.015)	*(0.192)*	*(0.026)*	*(1.310)*	*(0.014)*	*(0.463)*
Altitude	-0.132 ***	-0.000 ***	-0.113 ***	-0.000 *	-0.124 ***	-0.000 **
	(0.017)	*(0.000)*	*(0.022)*	*(0.000)*	*(0.014)*	*(0.000)*
Pop Density	0.225 ***	0.000 ***	0.176 ***	0.000 ***	0.047 ***	0.000 ***
	(0.014)	*(0.000)*	*(0.019)*	*(0.000)*	*(0.013)*	*(0.000)*
Inner Areas	-0.073 **	-0.082 ***	-0.193 ***	-0.226 ***	0.011	-0.027
	(0.030)	*(0.030)*	*(0.040)*	*(0.063)*	*(0.027)*	*(0.033)*
Share of population under 18	-0.036	-0.724	-0.125 **	-2.241 **	-0.290 ***	-2.946 ***
	(0.028)	*(0.481)*	*(0.050)*	*(0.903)*	*(0.024)*	*(0.714)*
Share of population over 65	-0.040	-0.548	-0.053	-0.241	-0.193 ***	0.240
	(0.026)	*(0.568)*	*(0.050)*	*(1.408)*	*(0.024)*	*(1.490)*
Education (% pop. degree or more)	-0.019	-3.701	0.024	9.876	-0.045	-12.310 **
	(0.092)	*(8.253)*	*(0.109)*	*(13.800)*	*(0.044)*	*(4.959)*
Unemployment	0.090 **	0.045 **	-0.001	-0.016	0.001	0.006
	(0.036)	*(0.019)*	*(0.055)*	*(0.029)*	*(0.041)*	*(0.010)*
Loan risk	0.010	0.013	0.004	0.017	0.022	0.005
	(0.018)	*(0.016)*	*(0.027)*	*(0.028)*	*(0.017)*	*(0.012)*
(Intercept)	5.491 ***	3.466	6.315 ***	3.325	6.228 ***	11.386 ***
	(0.178)	*(2.368)*	*(0.153)*	*(11.211)*	*(0.130)*	*(4.296)*
Time fixed effects	YES	YES	YES	YES	YES	YES
Provincial fixed effects	YES	YES	YES	YES	YES	YES
Observations	10083	10083	2565	2565	7067	7067
F- Test for the first stage		328.312***		9.573**		43.965***
Wu-Hausman		2.053		0.474		5.257*

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** p < 0.001; ** p < 0.01; * p < 0.05.

the impact of inequality on gambling turnover is both more substantial and statistically significant in Southern municipalities.

A substantially similar result is obtained by area if the ratio of the average of top income class on the average of bottom income class is used to measure inequality (Table 11). In line with the findings in Table 4 and Table 10, Table 11 shows that the coefficients related to inequality are positive and significant, with the exception of the IV-2SLS specification for municipalities located in the Centre.

Furthermore, Table 12 shows that results obtained with the Theil index are consistent with those obtained with the Gini index also by type of games. As in Table 5, Table 12 shows that the effect of the inequality on gambling differentiating the turnover by the three main typologies is positive and significant for all the categories in OLS and is positive and significant for two out of the three categories of games in IV-2SLS contexts (traditional

Table 11: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results with the ratio of the average of top income class on the average of bottom income class by macro-area (North, Centre, South)

	North		Centre		South	
VARIABLES	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
lag(Ratio)	0.069 ***	0.214 **	0.092 ***	0.22	0.137 ***	0.413 ***
	(0.012)	(0.094)	(0.019)	(0.291)	(0.013)	(0.139)
log(Income)	0.088 ***	0.379 **	0.142 ***	0.135	0.153 ***	-0.864
	(0.014)	(0.152)	(0.025)	(1.54)	(0.013)	(0.719)
Altitude	-0.132 ***	-0.000 ***	-0.091 ***	-0.000 **	-0.127 ***	0
	(0.017)	(0)	(0.021)	(0)	(0.014)	(0)
Pop Density	0.226 ***	0.000 ***	0.180 ***	0.001 ***	0.049 ***	0.000 ***
	(0.014)	(0)	(0.019)	(0)	(0.013)	(0)
Inner Areas	-0.064 **	-0.041	-0.180 ***	-0.173 ***	0.014	-0.04
	(0.03)	(0.033)	(0.039)	(0.043)	(0.028)	(0.04)
Share of population under 18	-0.01	1.705	-0.094 *	0.573	-0.258 ***	2.094
	(0.028)	(1.113)	(0.051)	(3.705)	(0.025)	(2.439)
Share of population over 65	-0.029	0.928	-0.04	1.158	-0.215 ***	1.3
	(0.026)	(0.988)	(0.05)	(3.428)	(0.024)	(2.119)
Education (% pop. degree or more)	-0.015	-3.435	-0.018	-1.398	-0.007	-0.996
	(0.091)	(8.518)	(0.107)	(5.051)	(0.044)	(4.249)
Unemployment	0.096 ***	0.059 ***	0.012	0.007	-0.01	-0.004
	(0.036)	(0.02)	(0.055)	(0.019)	(0.041)	(0.011)
Loan risk	0.008	0.01	0.002	0.004	0.027	0.017
	(0.018)	(0.016)	(0.027)	(0.021)	(0.017)	(0.014)
(Intercept)	5.490 ***	-2.789	6.292 ***	0.799	6.307 ***	6.152 *
	(0.178)	(1.757)	(0.148)	(8.66)	(0.13)	(3.44)
Time fixed effects	YES	YES	YES	YES	YES	YES
Provincial fixed effects	YES	YES	YES	YES	YES	YES
Observations	10083	10083	2565	2565	7067	7067
F- Test for the first stage		20.055***		3.373*		12.327***
Wu-Hausman		2.634		0.346		7.068*

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** p < 0.001; ** p < 0.01; * p < 0.05.

Table 12: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results with Theil on differentiated games

	Traditional Games		New Gen. Games		Sport Betting	
VARIABLES	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
lag(Theil)	0.338 ***	0.983 ***	0.301 ***	0.397	0.359 ***	1.260 ***
	(0.013)	*(0.237)*	*(0.017)*	*(0.285)*	*(0.017)*	*(0.320)*
log(Income)	0.241 ***	-0.914	0.063 **	-0.018	0.535 ***	-0.439
	(0.021)	*(0.716)*	*(0.026)*	*(0.861)*	*(0.028)*	*(0.967)*
Altitude	-0.083 ***	-0.000	-0.198 ***	-0.000 ***	-0.148 ***	-0.000
	(0.014)	*(0.000)*	*(0.018)*	*(0.000)*	*(0.019)*	*(0.000)*
Pop Density	0.103 ***	0.000 ***	0.161 ***	0.000 ***	0.491 ***	0.001 ***
	(0.012)	*(0.000)*	*(0.016)*	*(0.000)*	*(0.017)*	*(0.000)*
Earthquakes	0.026	0.120	-0.006	0.008	-0.261 **	-0.130
	(0.096)	*(0.107)*	*(0.122)*	*(0.129)*	*(0.129)*	*(0.145)*
Inner Areas	-0.077 ***	-0.096 ***	-0.172 ***	-0.175 ***	-0.259 ***	-0.285 ***
	(0.025)	*(0.027)*	*(0.032)*	*(0.033)*	*(0.034)*	*(0.037)*
Share of population under 18	-0.167 ***	-0.518	-0.178 ***	-2.584 **	-0.203 ***	-0.221
	(0.024)	*(0.912)*	*(0.030)*	*(1.097)*	*(0.032)*	*(1.233)*
Share of population over 65	-0.135 ***	-1.503 **	-0.220 ***	-4.099 ***	-0.187 ***	-2.052 **
	(0.023)	*(0.622)*	*(0.029)*	*(0.748)*	*(0.031)*	*(0.841)*
Education (% pop. degree or more)	-0.042	-0.462	-0.187 *	-8.343 *	0.083	5.812
	(0.077)	*(3.795)*	*(0.099)*	*(4.564)*	*(0.104)*	*(5.131)*
Unemployment	-0.116 *	-0.019 *	0.170 **	0.029 **	-0.007	-0.000
	(0.063)	*(0.011)*	*(0.080)*	*(0.014)*	*(0.085)*	*(0.015)*
Loan risk	0.036 **	0.028 **	-0.038 *	-0.025 *	0.026	0.023
	(0.017)	*(0.012)*	*(0.021)*	*(0.014)*	*(0.022)*	*(0.016)*
(Intercept)	5.623 ***	14.590 **	5.444 ***	7.908	3.097 ***	6.014
	(0.257)	*(6.476)*	*(0.327)*	*(7.788)*	*(0.346)*	*(8.755)*
Time fixed effects	YES	YES	YES	YES	YES	YES
Provincial fixed effects	YES	YES	YES	YES	YES	YES
Observations	19715	19715	19715	19715	19715	19715
F- Test for the first stage		41.847***		41.847***		41.847***
Wu-Hausman		5.01*		0.064		9.896**

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** p < 0.001; ** p < 0.01; * p < 0.05.

games and sport betting). The heterogeneity among categories shown in Table 12 is also in line with the differentiation highlighted in Table 5: i.e., the impact of inequality on turnover for traditional games is lower than the impact on turnover for sport betting and is higher than the impact of inequality on new generation games.

Table 13: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results with the ratio of the average of top income class on the average of bottom income class on differentiated games

	Traditional Games		New Gen. Games		Sport Betting	
VARIABLES	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
lag(Ratio)	0.198 ***	0.405 ***	0.132 ***	0.164	0.230 ***	0.520 ***
	(0.011)	*(0.1)*	*(0.014)*	*(0.119)*	*(0.015)*	*(0.134)*
log(Income)	0.404 ***	0.691 **	0.227 ***	0.631	0.701 ***	1.619 ***
	(0.019)	*(0.343)*	*(0.024)*	*(0.406)*	*(0.026)*	*(0.459)*
Altitude	-0.112 ***	-0.000 ***	-0.225 ***	-0.001 ***	-0.179 ***	-0.000 ***
	(0.014)	*(0)*	*(0.018)*	*(0)*	*(0.019)*	*(0)*
Pop Density	0.114 ***	0.000 ***	0.171 ***	0.000 ***	0.503 ***	0.001 ***
	(0.012)	*(0)*	*(0.016)*	*(0)*	*(0.017)*	*(0)*
Earthquakes	0.005	0.095	-0.031	-0.002	-0.280 **	-0.162
	(0.097)	*(0.108)*	*(0.123)*	*(0.128)*	*(0.13)*	*(0.145)*
Inner Areas	-0.068 ***	-0.070 **	-0.164 ***	-0.164 ***	-0.249 ***	-0.251 ***
	(0.025)	*(0.027)*	*(0.032)*	*(0.032)*	*(0.034)*	*(0.036)*
Share of population under 18	-0.150 ***	2.096	-0.183 ***	-1.527	-0.176 ***	3.131
	(0.024)	*(1.541)*	*(0.031)*	*(1.826)*	*(0.032)*	*(2.061)*
Share of population over 65	-0.101 ***	2.007	-0.204 ***	-2.679	-0.144 ***	2.449
	(0.023)	*(1.376)*	*(0.029)*	*(1.63)*	*(0.031)*	*(1.84)*
Education (% pop. degree or more)	-0.074	-5.741	-0.212 **	-10.478 **	0.046	-0.957
	(0.078)	*(3.927)*	*(0.099)*	*(4.654)*	*(0.105)*	*(5.253)*
Unemployment	-0.115 *	-0.018	0.170 **	0.029 **	-0.006	0.001
	(0.064)	*(0.012)*	*(0.081)*	*(0.014)*	*(0.085)*	*(0.016)*
Loan risk	0.033 **	0.023 *	-0.041 *	-0.027 *	0.023	0.017
	(0.017)	*(0.012)*	*(0.021)*	*(0.014)*	*(0.022)*	*(0.016)*
(Intercept)	5.738 ***	-8.864 ***	5.581 ***	-1.577	3.205 ***	-24.062 ***
	(0.259)	*(1.252)*	*(0.329)*	*(1.484)*	*(0.347)*	*(1.675)*
Time fixed effects	YES	YES	YES	YES	YES	YES
Provincial fixed effects	YES	YES	YES	YES	YES	YES
Observations	19464	19464	19464	19464	19464	19464
F- Test for the first stage		34.290**		34.290***		34.29***
Wu-Hausman		6.702***		0.48		11.93***

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** p < 0.001; ** p < 0.01; * p < 0.05.

Finally, Table 13 confirms that the same results can be obtained using the ratio of the average of the top income class to the average of the bottom income class as a measure of inequality. In particular, the effect of the inequality on gambling differentiating the turnover by the three main typologies is positive and significant for all the categories in OLS and it is positive and significant for two out of the three categories of games in IV-2SLS contexts (traditional games and sport betting). As in Tables 5 and 12, Table 13 shows that the impact of inequality on turnover for traditional games is lower than the impact on turnover for sports betting and is higher than the impact of inequality on new generation games.

Table 14: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results (logarithm of gambling losses per capita in total as dependent)

	OLS	OLS	OLS	IV-2SLS
lag(Gini)	0.155 ***	0.137 ***	0.054 ***	0.403 **
	(0.007)	*(0.007)*	*(0.008)*	*(0.160)*
log(Income)			0.156 ***	-0.399
			(0.014)	*(0.491)*
Altitude			-0.110 ***	-0.000 ***
			(0.010)	*(0.000)*
Pop Density			0.111 ***	0.000 ***
			(0.009)	*(0.000)*
Earthquakes			0.085	0.166 **
			(0.066)	*(0.079)*
Inner Areas			-0.051 ***	-0.087 ***
			(0.017)	*(0.025)*
Share of population under 18			-0.132 ***	-1.975 ***
			(0.016)	*(0.292)*
Share of population over 65			-0.099 ***	-0.044
			(0.016)	*(0.918)*
Education (% pop. degree or more)			-0.116 **	-8.696 ***
			(0.053)	*(3.002)*
Unemployment			0.059	0.002
			(0.043)	*(0.009)*
Loan risk			0.006	0.013
			(0.011)	*(0.009)*
(Intercept)	5.073 ***	5.114 ***	5.012 ***	10.235 **
	(0.007)	*(0.082)*	*(0.177)*	*(4.728)*
Time fixed effects	NO	YES	YES	YES
Provincial fixed effects	NO	YES	YES	YES
Observations	19977	19977	19587	19587
F- Test for the first stage				31.063***
Wu-Hausman				2.771*

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** p < 0.001; ** p < 0.01; * p < 0.05.

Moving on to the robustness checks hinged on replacing the dependent variable, Table 14 shows that the main results are consistent switching from turnover to losses to measure gambling. As in Table 3 and in Table 8, in Table 14 positive and significant coefficients for inequality are estimated by each model specification: short version (columns 1 and 2), additional covariates (column 3), and instrumental-variables regression with a two-stage least squares (column 4).

Additionally, Table 15 provides the findings from the OLS and IV-2SLS analyses, examining the relationship between gambling losses and inequality across different geographical areas. Consistent with previous tables (Tables 4 and 10), the coefficients linked to inequality are consistently positive and statistically significant, indicating a meaningful association. However, it is worth noting that in the IV-2SLS specification for the Centre region, the co-

Table 15: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results (logarithm of gambling losses per capita in total as dependent) by macro-area (North, Centre, South)

	North		Centre		South	
VARIABLES	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
lag(Gini)	0.024 *	0.053	0.02	0.136	0.136 ***	0.561 ***
	(0.013)	*(0.046)*	*(0.019)*	*(0.31)*	*(0.012)*	*(0.175)*
log(Income)	0.059 ***	0.304 *	0.130 ***	0.494	0.112 ***	-0.316
	(0.014)	*(0.175)*	*(0.024)*	*(1.178)*	*(0.013)*	*(0.437)*
Altitude	-0.111 ***	-0.000 ***	-0.074 ***	0	-0.111 ***	-0.000 **
	(0.016)	*(0)*	*(0.02)*	*(0)*	*(0.013)*	*(0)*
Pop Density	0.182 ***	0.000 ***	0.141 ***	0.000 ***	0.033 ***	0.000 **
	(0.013)	*(0)*	*(0.018)*	*(0)*	*(0.013)*	*(0)*
Inner Areas	-0.067 **	-0.070 **	-0.152 ***	-0.168 ***	0.03	-0.001
	(0.027)	*(0.028)*	*(0.037)*	*(0.057)*	*(0.026)*	*(0.03)*
Share of population under 18	-0.013	-0.261	-0.111 **	-1.904 **	-0.257 ***	-2.675 ***
	(0.025)	*(0.435)*	*(0.046)*	*(0.83)*	*(0.023)*	*(0.674)*
Share of population over 65	-0.02	-0.315	-0.054	-0.66	-0.172 ***	0.028
	(0.024)	*(0.513)*	*(0.045)*	*(1.237)*	*(0.023)*	*(1.409)*
Education (% pop. degree or more)	-0.07	-6.986	-0.027	3.011	-0.015	-8.476 *
	(0.083)	*(7.465)*	*(0.1)*	*(12.299)*	*(0.042)*	*(4.602)*
Unemployment	0.106 ***	0.056 ***	0.023	0	0.008	0.007
	(0.033)	*(0.018)*	*(0.051)*	*(0.026)*	*(0.038)*	*(0.009)*
Loan risk	0.006	0.007	-0.006	0.003	0.02	0.005
	(0.016)	*(0.014)*	*(0.025)*	*(0.026)*	*(0.016)*	*(0.012)*
(Intercept)	4.161 ***	1.918	5.043 ***	0.387	5.004 ***	9.246 **
	(0.162)	*(2.155)*	*(0.141)*	*(10.113)*	*(0.122)*	*(4.049)*
Time fixed effects	YES	YES	YES	YES	YES	YES
Provincial fixed effects	YES	YES	YES	YES	YES	YES
Observations	10002	10002	2550	2550	7035	7035
F- Test for the first stage		322.192***		9.773**		42.375***
Wu-Hausman		0.224		0.127		4.119*

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** p < 0.001; ** p < 0.01; * p < 0.05.

efficient associated with inequality is not statistically significant, deviating from the overall pattern observed in the other analyses.

Finally, Table 16 shows OLS and IV-2SLS results on gambling losses for each category of games separately. Coefficients associated with inequality are all positive and significant except for the IV-2SLS specification for new generation games. In this case, the coefficient associated with new generation games in the IV-2SLS specification is negative although not significant. This last result may be partially due to the differentiation in the pay-out which impacts the losses. Indeed, Resce et al. (2019) show that on average the pay-out for new generation games is the highest (94 per cent), while lower pay-outs can be observed for Sport Betting (73 %) and Traditional Games (63%).

Table 16: OLS and Instrumental-variables (IV) regression with a two-stage least squares – (2SLS) Results (logarithm of gambling losses per capita in total as dependent) on differentiated games

	Traditional Games		New Gen. Games		Sport Betting	
VARIABLES	OLS	IV-2SLS	OLS	IV-2SLS	OLS	IV-2SLS
lag(Gini)	0.095 ***	0.919 ***	0.057 ***	-0.103	0.137 ***	0.870 ***
	(0.010)	*(0.226)*	*(0.012)*	*(0.232)*	*(0.010)*	*(0.218)*
log(Income)	0.345 ***	-1.040	0.142 ***	1.090	0.412 ***	-0.487
	(0.018)	*(0.691)*	*(0.022)*	*(0.711)*	*(0.018)*	*(0.669)*
Altitude	-0.096 ***	-0.000 **	-0.183 ***	-0.001 ***	-0.106 ***	-0.000 ***
	(0.012)	*(0.000)*	*(0.015)*	*(0.000)*	*(0.013)*	*(0.000)*
Pop Density	0.101 ***	0.000 ***	0.124 ***	0.000 ***	0.337 ***	0.000 ***
	(0.011)	*(0.000)*	*(0.013)*	*(0.000)*	*(0.011)*	*(0.000)*
Earthquakes	-0.010	0.181	0.001	-0.036	-0.159 *	0.011
	(0.083)	*(0.110)*	*(0.103)*	*(0.117)*	*(0.087)*	*(0.110)*
Inner Areas	-0.071 ***	-0.155 ***	-0.122 ***	-0.105 ***	-0.174 ***	-0.249 ***
	(0.022)	*(0.034)*	*(0.027)*	*(0.036)*	*(0.023)*	*(0.034)*
Share of population under 18	-0.177 ***	-2.476 ***	-0.196 ***	-3.294 ***	-0.181 ***	-2.558 ***
	(0.020)	*(0.410)*	*(0.025)*	*(0.433)*	*(0.021)*	*(0.409)*
Share of population over 65	-0.099 ***	2.483 *	-0.181 ***	-4.365 ***	-0.108 ***	1.852
	(0.020)	*(1.288)*	*(0.025)*	*(1.337)*	*(0.021)*	*(1.257)*
Education (% pop. degree or more)	-0.058	-10.195 **	-0.321 ***	-13.164 ***	0.019	-6.081
	(0.067)	*(4.162)*	*(0.083)*	*(4.420)*	*(0.070)*	*(4.158)*
Unemployment	-0.113 **	-0.039 ***	0.207 ***	0.039 ***	-0.020	-0.020 *
	(0.055)	*(0.012)*	*(0.068)*	*(0.013)*	*(0.057)*	*(0.012)*
Loan risk	0.022	0.036 ***	-0.028	-0.023 *	0.015	0.030 **
	(0.014)	*(0.013)*	*(0.018)*	*(0.014)*	*(0.015)*	*(0.013)*
(Intercept)	4.587 ***	15.846 **	3.922 ***	-3.406	2.008 ***	7.186
	(0.223)	*(6.640)*	*(0.276)*	*(6.842)*	*(0.232)*	*(6.429)*
Time fixed effects	YES	YES	YES	YES	YES	YES
Provincial fixed effects	YES	YES	YES	YES	YES	YES
Observations	19464	19464	19464	19464	19464	19464
F- Test for the first stage		31.063***		31.063***		31.063***
Wu-Hausman		11.54***		0.278		15.39***

All continuous predictors are mean-centered and scaled by 1 standard deviation. *** p < 0.001; ** p < 0.01; * p < 0.05.

8 Concluding remarks

Recent studies have shown that a significant part of increasing social costs associated with gambling are more likely to be paid by the less-well off and potentially most vulnerable members of society. Furthermore, it has been demonstrated that the propensity to gamble is higher for lower income classes and this suggests that increasing inequality may contribute to boosting gambling and the addiction to it. These factors could generate a hysteresis loop between inequality and gambling.

This paper tested the hypothesis that more inequality leads to more gambling on a uniquely granular database of almost 7,000 Italian municipalities for three years: 2017, 2018, and 2019. As an empirical strategy, we estimated an Instrumental-variables (IV) regression with a two-stage least squares (IV-2SLS) with relevant covariates lagged to avoid simultaneity issues. The dependent variable is yearly gambling turnover and inequality is measured by the Gini coefficient on income in the previous year. To account for the possibility that inequality and gambling turnover are jointly determined we instrumented municipal inequality employing the shift-share approach. Specifically, we tested and found empirical support to three hypotheses: H1) that greater inequality leads to a higher propensity for gambling; H2) that gambling shows territorial heterogeneity, and is more prevalent in regions with higher socioeconomic strain; H3) that greater inequality increases the propensity to engage in gambling activities disproportionately for younger and poorer individuals. Moreover, and perhaps most importantly, we provided supporting evidence to our fourth hypothesis, namely that the boosting effect of inequality on gambling is not simply a reflection of increasing poverty but it is germane. Indeed, we showed that gambling increased more when inequality was heightened by the expansion of the share of the rich than when it resulted from the expansion of the share of the poor.

Considering all games together, results show that the positive effect of inequality on turnover is confirmed with various empirical strategies and it persists when several relevant covariates are added. By splitting the sample by geographical area, results show that the impact of inequality on gambling turnover is more pronounced in Southern municipalities. This outcome suggests that areas with low social mobility and higher inequality may motivate individuals to seek alternative means of improving their living conditions. Differentiating the turnover by the three main categories of games (traditional games, new generation games, and sport betting) the impact of the municipal Gini coefficient to the municipal turnover remains positive and significant but shows a certain heterogeneity. Both the magnitude and significance of the impact of inequality on turnover for traditional games is lower than the impact on turnover for sport betting and is higher than the impact of the turnover for new generation games. This may be partially due to the fact that sport betting is more associated with the development of addiction and low socio-economic status interferes with mechanisms that favor the adoption of risk behaviors. The empirical association between inequality and gambling is confirmed by several robustness checks performed to validate our results. Many studies use individual data. This is the first work using municipal data in this context. Although there may be some critical issues with municipal data, we think that given the sample size of the dataset and the purpose of the work, the results are germane. In fact, the main point to be made is that our inequality index – as captured by the average municipal data – is more accurately measured than any index of perceived inequality which may be available in individual survey data.[10]

Our results have important policy implications. Given the notable increase of gambling in Italy and the related social costs that pathological gambling can entail, public policies become essential to counter excessive gambling especially in the less affluent situations. To this end, investing in education programs that make people understand the high probability

[10] For the pros and cons of using objective measures – e.g., the Gini index in our case – vs subjective measures – i.e., perceived inequality in our case –, please see Galvin (2019) and Jetten Peters (2019).

of loss by increasing gamblers' awareness seems desirable. Many pathological gamblers only take into account eventual winnings, disregarding the cost of loss (Kovic and Kristiansen, 2019). For example, gaming venues could be mandated to advertise the probability of winning for each game and the number of daily plays could be limited. The state could also diversify taxation systems across types of games so to tax more games used by poorer individuals.

Besides the usefulness of controlling market developments, the additional tax revenue raised can be used for worthy social purposes, e.g., funding social services (Clotfelter and Cook, 1991). On this point there is consensus among economists that although earmarking gambling revenues can generate support from the public, it is often used as a political means to neutralize opposition by socially concerned groups but usually covers a small proportion of total funding for such services (Smith, 2000). This concern could be addressed by devolving the increased tax revenues to a targeted purpose, i.e., to mitigate the health and social issues created by the spread of gambling.

Finally, our findings suggest that future research could address two additional issues. First, checking whether the gambling-to-inequality link persists if – as it is possibly happening – the gambling turnover shifts towards the new generation games, where the link has shown weaker. Second, verifying the existence and economic significance of the envisaged hysteresis loop between inequality and gambling.

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