# Gambling outlets as agents of local area disorganization: Crime and local institutions, the case of the UK

**Neli Demireva** [iD]
University of Essex, Colchester Campus, UK

**Sergio Lo Iacono**
University of Essex, Colchester Campus, UK

## Abstract

Amid growing public and policy concerns there is a great need for a systematic analysis of the relationship between commodity industries and social disorganization. Using data from the ONS, the UK Census, the UK Police Street-level Crime Dataset, and the POI Ordnance Survey, we analyse the association between gambling outlets as an example of a commodity industry and crime events across England and Wales and explore the possibility of a heterogeneous effect dependent upon the level of deprivation and residential stability of an area. Our findings show that gambling outlets are significantly and positively associated with different types of crime even when controlling for other businesses, the areas' demographic and socio-economic characteristics. Small businesses provide distinctive shielding effects – in areas of high density of small business owners, there is no significant correlation between crime types and gambling density. Our results have significant policy implications.

## Keywords

Gambling outlets, crime, deprivation, residential stability, routine activities theory, social disorganization

## Introduction

Do gambling outlets have crime-producing impact? Theoretically, gambling outlets are often suspected to be active contributors to the toxicity of the high street (Elbers et al., 2020) and classified as unhealthy commodity industries (Knai et al., 2021); either directly by attracting potential targets and perpetrators

**Corresponding Author:**
Neli Demireva, Department of Sociology & Criminology, University of Essex, Colchester Campus, UK.
Email: nvdem@essex.ac.uk

or indirectly by signalling reduced social guardianship which can further solidify their negative impact upon community well-being. Thus, gambling premises as criminogenic localities have been of concern to criminologists (Papineau et al., 2020; Wardle et al., 2020; Wardle et al., 2014; Pearce et al., 2008) and policy makers alike (BenCaveAssociates, 2014; Elbers et al., 2020).

Using several datasets focusing on the presence of gambling outlets and on crime at postcode level and street units across England and Wales,[1] this article draws on the previous literature and expands on it in several ways. Gambling premises and their impact on local communities merit further attention. Although land-based gambling is becoming overshadowed by online betting, in the case of Great Britain, land-based premises (such as casinos, betting shops and arcades) which are the focus of the paper produced a Gross Gambling Yield of £4.5 billion in 2022/23 and there were 8,301 registered premises in this year (the latest available data on the sector (Gambling Commission, 2024a). In fact, the Gross Gambling Yield of online betting surpassed that of remote betting only in 2019 which attests to its importance for the UK economy (Department for Culture, 2023).[2] To capture the levels of social disorganization in the local community, in this paper, we consider a wide range of crime events and distinguish between anti-social behaviour, interpersonal crimes (such as violent crimes and theft), burglaries, property damage and vehicle theft. Second, we take into account a variety of criminogenic localities. Previous research has shown that several types of outlets and local area amenities might be related to heightened levels of crime (Hipp, 2016), and as these may be in proximity to gambling outlets we need to control for such establishments and local social structures in order to be able to see whether gambling outlets resemble or differ from other established criminogenic spaces such as evening economy industries. Third, we control for a range of social-ecological factors that are known to be associated with crime rates such as the deprivation levels of the local area or its levels of ethnic diversity. Thus, the impact of gambling outlets may be more pronounced in deprived and residentially unstable areas than in less deprived or more residentially stable ones as socio-economic disadvantage is associated with a neighbourhood's capacity to provide social control or guardianship (Krivo and Peterson, 1996; Sampson, 2012).

## Gambling outlets as criminogenic places

### Routine activities theory

Crime pattern theory focuses on the environmental cues emitted through the routine activities of individuals that may lead to the commission or avoidance of criminal events; and the dependence of these cues on the local environment (Andresen, 2019). This paper investigates gambling outlets as an example of a node that draws routine activities from patrons but also attracts potential perpetrators and thus becomes a criminogenic place. Previous research on criminogenic places has focused on alcohol outlets (Slutske et al., 2016; Slutske et al., 2019), neighbourhood parks (Groff and McCord, 2012), big box retailers such as Walmart (Courtemanche and Carden, 2011), gun shops (Steidley et al., 2017), pawnshops and pay day lenders (Wilcox and Eck, 2011), high schools, subway stops and ramp ways (McCord et al., 2007; Wo and Park, 2020). Gambling outlets have been investigated primarily in relation to problem gambling (Papineau et al., 2020; Wardle et al., 2020). This paper argues that land-based gambling premises may have a broader negative impact on community well-being beyond problem gambling which merits further investigation and their impact as a criminogenic place should be considered in its own right.

One way that gambling outlets can be related to crime is through yielding a high volume of potential targets, a way in which businesses are directly linked to crime according to routine activities theory (Kubrin et al., 2011). Any site in which there is a financial transaction or exchange of money becomes a space where opportunistic attacks can happen – and through a combination of motivated offenders, suitable targets and lack of suitable guardians, businesses will become unsavoury for the community. Such a direct effect can be observed even if there is guardianship on the premises of the gambling outlet – through security guards or CCTV as this guardianship may not extend to the street on which the gambling premises are located.[3] If gambling outlets are likely to attract problem gamblers – individuals

who are unable to control their gambling habits and who are more likely to engage in deviant behaviour and criminal offending or are vulnerable and more likely to be victimized (King et al., 2020; Wardle et al., 2020) – a higher rate of crime will occur in the neighbourhoods in which gambling outlets are present. Offenders who know that the gambling outlet will appeal to problem gamblers can be prepared to travel some distance in order to exploit such criminal opportunity (Brantingham and Brantingham, 1995).

## Social disorganization

The variation in neighbourhood crime levels can be attributed to differences in informal social control according to social disorganization theory (Kubrin et al., 2011; Hipp and Kubrin, 2017). Structural disadvantage such as deprivation or high residential turnover in practice mean that the residents of such neighbourhoods have less time for the formation of ties that will provide guardianship, encourage the formation of trust and support the cohesiveness of the community (Sampson et al., 1997).

Specifically, businesses seen as undesirable such as betting shops or money lending shops can also induce local residents or visitors to believe that a neighbourhood in which the proportion of such establishments is high is not a thriving one or at least that this is not a neighbourhood for which anybody cares sufficiently (Kubrin and Wo, 2016). Thus, they may act to weaken guardianship and potential civic investment in a neighbourhood even if there is tight security that operates at such venues in an effort to try and minimize victimization and control the number of potential offenders. Businesses will then become indirectly generators of crime, and as commodity industries will be worthy of further government scrutiny and tighter regulations (Wilcox and Eck, 2011).

## Potential confounders and heterogeneous effects of gambling outlets

This study considers potential confounders and examines the heterogeneous effect of gambling outlets dependent upon the levels of deprivation and residential stability in the local area. On one hand, deprivation is often hypothesized in the literature to be strongly and positively associated with inter-personal crime and increased levels of social disorganization (Kawachi et al., 1999). If gambling outlets are concentrated in areas with high levels of deprivation and a variety of social problems – the positive relationship between their presence and crime may be spurious. Wardle et al. (2014) find that 84% of seaside resorts with a high percentage of low-income areas also have zones with a high density of gambling premises. Rintoul et al. (2013) also find that deprivation is heavily associated with gambling losses and the risk of unhealthy behaviours. There is also the issue of reverse causality – crime-prone areas may attract betting shops or gambling premises in general. With data from London boroughs, Kumar and Yoshimoto (2016) find that a new betting shop opens in a borough for every 1.4% increase in crime in the local area. One of the limitations of our study is that we do not have data on when the gambling outlet has opened to rule out the possibility of reverse causality. Yet, we account for the confounding effect of deprivation, and we further examine if a moderating effect exists: whether the negative impact of gambling outlets is more pronounced at higher levels of deprivation as research suggests (Krivo and Peterson, 1996; Kawachi et al., 1999; Slutske et al., 2015). Collective efficacy, trust and social cooperation are stronger in less deprived areas (Sampson et al., 1997), therefore such neighbourhoods may be less susceptible to harmful effects associated with higher density of gambling outlets.

On the other hand, residential stability and the presence of long term residents who own their homes is reported to have a positive effect on the well-being of the local area and may shield it from criminogenic localities such as gambling outlets (Pridemore and Grubesic, 2012). Research has found a negative association between the percentage of homeowners in a neighbourhood and variety of different crimes such as rates of burglary (Ross, 1977) or violence (Hipp, 2007; Krivo and Peterson, 1996). Moreover, guardianship as a proxy for community organization can have a moderating effect and reduce the negative impact of criminogenic places (Steidley et al., 2017; Pridemore and Grubesic, 2012); especially small businesses and other local institutions (Crowley and Stainback, 2019).

## Previous research on gambling outlets

Many previous studies focus on the examination of self-reports of gambling-related crime among problem gamblers in population surveys, gambling-related repots and criminal offences recorded by gambling commissions (Astbury and Thurstain-Goodwin, 2015; Elbers et al., 2020). These studies suggest that populations vulnerable to gambling harm experience a range of poor health and well-being outcomes in neighbourhoods in which gambling outlets are present and are also more likely to engage in a criminal activity (Wardle et al., 2020; Pearce et al., 2008; Papineau et al., 2020). There is evidence to suggest, however, that gambling premises should be considered as criminogenic places on par with alcohol outlets (Breetzke and Pearson, 2015), and thus may be associated with an increase in various types of crime including inter-personal crimes but also opportunistic types of crime such as burglaries or vehicle theft. Even though betting shops have functioned as working men social clubs in the past, the rise of machine gambling facilitated by the British Gambling Act of 2005 may have made them little different from other big box retailers as suggested by ethnographic research (Cassidy, 2012) and may have limited their ability to act as a protective business in the place of otherwise unoccupied or broken shop front window, the latter being a strong signal of social disorganization. Therefore, considering the broader social impact of gambling premises (Abbott, 2020) seems very pertinent amidst calls for a gambling reform that will aim to establish the health outcomes of gambling activities (Guardian, 2020; Industry, 2020, Andrew, 2024) and worldwide concern that the harm of gambling should be minimized as it has been for the tobacco and alcohol industry (Livingstone and Rintoul, 2020).

Similarly to the present study, Adeniyi et al. (2023) use the Ordnance Survey and police crime data from 2015 and then 2019 and establish a link between betting shops and theft and burglaries in England. Our analyses build on this research and draw out several further sociological implications. We relate to the criminological literature on unhealthy commodity places and crime events by considering three consecutive years of crime data (2015–2017) which is an established practice to account for potential yearly variations in crime levels (Steidley et al., 2017; Krivo et al., 2009). Second, we establish the relationship between different types of land-based gambling premises (all gambling outlets available in the data) and crime while accounting for other important established criminogenic places such as evening economy industries. Finally, we examine the potential heterogeneous impact of gambling density – highly deprived areas may be more susceptible to social disorganization, and on the other hand small businesses and long-term residents can provide protection. Thus, we offer a detailed picture of which localities can be exposed to higher levels of crime and contribute to the existing criminological and sociological literature on collective efficacy, local institutions and social disorganization.

## Our research expectations

The gambling outlets data that we have registers several types of land-based gambling premises such as betting shops, casinos, bingos and arcades. These are jointly regulated by the Gambling Commission (responsible for licensing operators) and licensing authorities (local authorities in England and Wales (which specifically license the gambling premises). Thus, in the case of the UK, under the 2005 Gambling Act, licensing authorities have considerable range of powers to place conditions on applications for gambling premises and may try to withhold licenses where they believe there are causes for concern (Department for Culture, 2023). Our data exploration was informed by the reports produced by the Southwark Council (BenCaveAssociates, 2014) and the borough of Barking and Dagenham (Lamptey, 2019) which call for an examination of the heterogeneous effect of land-based gambling premises located in deprived areas. Based on the previous literature, we have three main research expectations. We expect that a higher number of gambling outlets will be associated with higher crime rates in the neighbourhood controlling for other type of outlets in the local area. Major urban areas differ in respect to the leisure activities in which their inhabitants engage, the localities they frequent which in turn might affect exposure to higher rates of criminal victimization (Messner and Blau, 1987).

Establishing a causal relationship between gambling outlets and crime is difficult because localities may have a variety of businesses and establishments that could each contribute to the level of social disorganization of an area. Therefore, it is very important to control for different types of businesses in a local area – we account for evening activities, commercial services, but also community organizations that can provide guardianship and attenuate negative effects. A similar approach has been adopted by other studies as well (Wheeler, 2019). We also control for a variety of demographic and socio-economic characteristics of the local area which may confound the relationship between land-based gambling premises and crime. Second, the negative impact of gambling outlets will be more pronounced in neighbourhoods characterized by high level of multiple deprivation. Third, low levels of residential stability should be associated with higher levels of social disorganization as measured by higher levels of crime.

## Data and methods

### Geocoding and studying the relevant spatial units

To investigate whether the density of gambling outlets is associated with different types of crime, we constructed a dataset linking information from the 2015/2016 Ordnance Survey Point of Interest data (POI), the 2016 UK Police street-level data, the 2011 UK Census, and the Office for National Statistics data (ONS 2011–2016). Data is aggregated at the MSOA level (Middle layer Super Output Areas) and it includes urban MSOAs (as classified by the ONS) in England and Wales ($n = 5,875$). Most prior research in the United States usually focus on the effect of outlets in counties or census tracts and it is arguable whether these are a reasonable approximation of communities. MSOAs have a minimum population of 5,000 and a maximum population of 15,000, and the number of households varies between 2,000 and 6,000; and MSOAs are often used as proxy of local areas in social cohesion research (Laurence and Heath, 2008). Table 1 gives further detail about how the variables in our analysis were constructed.

### Dependent variables

The dependent variable in our study is counts of crime in England and Wales in a three-year period 2015 to 2017 to account for yearly variation in crime which is common practice in the sociological literature on the topic (Krivo et al., 2009). We have constructed this data using the UK Police street-level data. We consider the number of geo-coded crime events reported in each MSOA. In our analysis, we focus on the following categories: anti-social behaviour, violent crimes (including homicide and sexual offences), and theft which involves theft directly from the victim (including handbag, wallet, cash, mobile phones but without the use or threat of physical force), and burglaries, criminal property damage (including arson) and vehicle theft. The most numerous types of incidents in our three years of crime data looking at the average are anti-social behaviours ($M = 806.64$, SD $= 748.78$), followed by violent crimes ($M = 550.80$, SD $= 451.51$), property damage ($M = 248.99$, SD $= 165.53$), vehicle theft ($M = 181.84$, SD $= 127.30$), burglaries ($M = 181.53$, SD $= 111.26$) and finally thefts ($M = 41.22$, SD $= 188.93$) – see Table 2. Thus, anti-social behaviour and serious inter-personal crime such as violent crime dominate the police-reported incidents which pattern is in line with prior studies (Tarling and Morris, 2010). Although theft may not necessarily happen less often, it is perhaps less likely to be reported to the police.

### Independent variables

*Gambling outlets.* We have gathered information about the location of gambling outlets using the Ordnance Survey POI data. The POI identifies all public and privately-owned businesses, education and leisure services across the UK according to a three-level classification system (including over 600 categories – e.g. commercial services, gambling outlets, pubs etc.), offering one of the most

**Table 1.** Measurement of main constructs and source.

| Construct | Measurement | Source |
|---|---|---|
| Gambling per 100 m$^2$ | (n betting shops casinos, bingos, amusement parks and arcades/area hectares) × 100 | Ordnance Survey (2015/2016) |
| Retailers per 100 m$^2$ | (n clothing retailers, food and drinks retailers, household and office retailers/area hectares) × 100 | Ordnance Survey (2015/16) |
| Evening activities per 100 m$^2$ | (n cinemas, nightclubs, theatres, concert halls, eating and drinking/area hectares) × 100 | Ordnance Survey (2015/16) |
| Organisations per 100 m$^2$ | (n animal org, charitable org, community networks, conservation org, fan club, religious org, sport association, youth organization/area hectares) × 100 | Ordnance Survey (2015/16) |
| Commercial services per 100 m$^2$ | (n commercial services, excluding gambling activities/area hectares) × 100 | Ordnance Survey (2015/16) |
| MSOA disadvantage score | (% low educational qualification + % lone parents with dependent child + % semi- and routine- occupations + % unemployment + % hh deprived in three dimensions)/5 | Census UK 2011 |
| % own properties | (n owned households/ total households) × 100 | Census UK 2011 |
| Small owners per 100 m$^2$ | (n small owners and own account workers NS-SEC/area hectares) × 100 | Census UK 2011 |
| Herfindahl index of ethnic homogeneity | %White$^2$ + %Black$^2$ + %Mixed$^2$ + %Asian$^2$ + %other$^2$ | Census UK 2011 |
| % young males (15–34) | (n young males 15–34/total residents) × 100 | Census UK 2011 |
| % Non-UK born | (n non-UK born/total residents) × 100 | Census UK 2011 |
| % Divorces or separated | (n divorced and separated/total residents) × 100 | Census UK 2011 |
| Area hectares | MSOA hectares | Census UK 2011 |
| Weekly income (AHC-net) 2014 | Weekly income net (after housing costs) | ONS 2014 |
| Mean price house 2015 | Mean MSOA price house in 2015 | ONS 2015 |
| Population(log) | Log(total residents) | ONS 2015 |
| Anti-social behaviour 2015, 2016, 2017 | n anti-social behaviours in 2015, 2016, 2017 | Police UK street-level data 2015, 2016, 2017 |
| Violent crime 2015, 2016, 2017 | n violent crimes 2015, 2016, 2017 | Police UK street-level data 2015, 2016, 2017 |
| Burglaries 2015, 2016, 2017 | n burglaries 2015, 2016, 2017 | Police UK street-level data 2015, 2016, 2017 |
| Damage 2015, 2016, 2017 | n property damages & arsons 2015, 2016, 2017 | Police UK street-level data 2015, 2016, 2017 |
| Vehicle theft 2015, 2016, 2017 | n vehicle thefts 2015, 2016, 2017 | Police UK street-level data 2015, 2016, 2017 |
| Theft 2015, 2016, 2017 | n thefts 2015, 2016, 2017 | Police UK street-level data 2015, 2016, 2017 |

comprehensive datasets on infrastructures and economic activities in the country. We consider the following activities as related to gambling: bookmakers (betting shops), casinos, bingos, amusement parks and arcades and pools promoters.[4] Thus, this analysis focuses on all land-based gambling premises as available under sub-category 22 (Gambling) under Section 4/Sport and Entertainment of the POI data. The majority of studies that look to quantify the problematic negative effect of gambling outlets usually do so in three ways: by considering the spatial accessibility to gambling premises, a dimension of density of gambling premises and the relative risk associated with different types of games (Papineau et al., 2020). Our approach focuses primarily on the spatial density of gambling activities – land-based gambling outlets per 100 m$^2$ within each MSOA which is also adopted in other studies of premises and

**Table 2.** Descriptive statistics.

| Variables | M | SD | Min | Max |
|---|---|---|---|---|
| Violent crimes 2015, 2016, 2017 | 550.8 | 451.51 | 45 | 7942 |
| Burglaries 2015, 2016, 2017 | 181.53 | 111.26 | 8 | 1777 |
| Antisocial behaviours 2015, 2016, 2017 | 806.64 | 747.78 | 46 | 17643 |
| Property damage 2015, 2016, 2017 | 248.99 | 165.53 | 26 | 2232 |
| Vehicle crimes 2015, 2016, 2017 | 181.84 | 127.30 | 5 | 1739 |
| Thefts 2015, 2016, 2017 | 41.22 | 188.93 | 0 | 7716 |
| Gambling premises per 100 m$^2$ | 0.97 | 1.91 | 0 | 23.56 |
| Retailers per 100 m$^2$ | 19.43 | 37.89 | 0.08 | 966.97 |
| Evening activities per 100 m$^2$ | 11.83 | 25.25 | 0 | 600.29 |
| Organisations per 100 m$^2$ | 1.64 | 3.21 | 0 | 62.17 |
| Commercial service per 100 m$^2$ | 52.69 | 81.91 | 0.52 | 2272.76 |
| MSOA disadvantage | 20.29 | 6.42 | 4 | 39.46 |
| % Own properties | 62.02 | 17.94 | 7.28 | 96.49 |
| Small owners per 100 m$^2$ | 236.56 | 224.15 | 3.75 | 1953.56 |
| Herfindahl index of ethnic homogeneity | 77.82 | 20.05 | 23.97 | 98.84 |
| % Young males (15–34) | 13.84 | 4.65 | 5.36 | 46.46 |
| Population log | 8.95 | 0.20 | 8.52 | 9.70 |
| % Non-UK born | 7.97 | 8.62 | 0.32 | 51.71 |
| % Divorces or separated | 11.84 | 2.59 | 1.97 | 23.09 |
| Weekly income (net) 2014 | 483.50 | 115.18 | 230 | 990 |
| MSOA hectares | 563.76 | 1148.39 | 29.42 | 20812.64 |
| Mean house price 2015 | 254728.1 | 220337 | 43673 | 4768732 |
| Urban city and town | 0.55 | 0.50 | 0 | 1 |
| Urban city and town in sparse setting | 0.00 | 0.06 | 0 | 1 |
| Urban major conurbation | 0.41 | 0.49 | 0 | 1 |
| Urban minor conurbation | 0.04 | 0.20 | 0 | 1 |

Note: n = 5,875.

their relationship to crime (Steidley et al., 2017). The mean number of gambling outlets per 100 m$^2$ is 0.97 (SD = 1.91). In our data, there are some MSOAs that have zero gambling outlets and the maximum number per 100 m$^2$ within an MSOA is 23.56 (see Table 2).[5]

## Other independent variables

*Criminogenic places.* We considered a number of other variables that can be related to populations of potential targets and perpetrators or can be considered generators of crime. These are evening activities outlets, retailers, commercial services and organizations per 100 m$^2$ (Wheeler, 2019).

*MSOA level variables.* MSOA data on deprivation, ethnic diversity (a decline in the Herfindahl index of ethnic homogeneity equals growing diversity), immigrant background (percent non-UK born – previous research based on US data has found no connection or even a protective effect of immigrant communities and it will be important to include this variable with the present data (Ousey and Kubrin, 2018), percentage of young males, percentage of divorced or separated couples, as well as other relevant controls have been derived by the ONS or the 2011 UK Census (in case more recent estimates were not available). We include the percent of small business owners. Small businesses can have important protective effect for neighbourhoods as they can provide natural surveillance and at the same time signal neighbourhood vitality (Kim and Hipp, 2022). Our measure is based on the National Statistics Socio-Economic classification

(NS-SEC) that identifies owners of small businesses and we consider the percent small owners (ONS, 2021). We would have liked to be able to distinguish specifically local businesses as in the work by Kim and Hipp (2022), even capture the presence of businesses belonging to the ethnic economy, and the self-employed but our data does not allow us to draw this distinction which is an important limitation. Nevertheless, the small business owners variable we have is a proxy for aspects of neighbourhood presence and patronage that are important to explore.

## Modelling strategy

This study uses a Poisson model with fixed effects at MSOAs as a proxy for local areas. Our data include urban MSOAs (as classified by the ONS) in England and Wales ($n = 5,875$). Most prior research in the US usually focus on the effect of outlets in counties or census tracts and it is arguable whether these are a reasonable approximation of communities. MSOAs have a minimum population of 5,000 and a maximum population of 15,000, and the number of households varies between 2,000 and 6,000. In our data, the crime variable is measured in counts. The model can be written as:

$$Log(E[\text{Crime type}]) = \beta_1(\text{Gambling density}) + X_k B_k$$

where the natural log of the expected value of crime types is a function of gambling density per 100 m$^2$, the density of other establishments and a series of control variables captured at the MSOA level, $X_k B_k$. We have rerun all analyses using multi-level negative binomial models to account for overdispersion without observing a change in the pattern examined.

All continuous independent variables are standardized in the analysis. The interpretation of the model's coefficients is in terms of incidence rate ratios. This allows us to consider the different 'weight' that controls and predictors have in the analysis. Even though gambling, evening activities and retailer outlets' density is measured per 100 m$^2$, these variables have very different scales – retailers range from 0.08 to 966.97 and evening activities from 0 to 600.29. The small owner variable ranges from 3.75 to 1953.56 per 100 m$^2$. Re-parametrization of the variables is necessary to make comparisons possible between the numeric inputs of different predictor variables.

## Results

Table 3 presents the mean and standard deviation for the variables in our analysis differentiating between areas with gambling density below and areas in which gambling density is equal to or higher than the 75th percentile. The descriptive results suggest that the number of crime incidents is higher in areas with high density of gambling outlets. On average, areas with a high density of gambling outlets have twice the number of anti-social behaviour incidents and violent crimes than those reported in areas with low and medium gambling outlets density. Whereas the levels of MSOA disadvantage captured by the index of multiple deprivation do not seem to be different between the two areas (the same applies for rates of marital dissolution), the percentage of homeowners is lower in areas of high gambling density. These are also areas in which there is less ethnic homogeneity and in which there is greater presence of immigrants (non-UK born). The descriptive statistics underlie the importance of controlling in our models for a range of neighbourhood characteristics as well as the density of other outlets such as evening activities, retailer outlets, commercial services and small business owners – a greater number of which can be found in areas with high level of gambling density compared to areas with low and medium levels of such density. It is likely that high gambling density areas are less residential areas than areas with low and medium gambling density.

Table 4 looks at fixed effects Poisson models predicting the counts of crime as a function of the gambling density per 100 m$^2$, the density of other criminogenic places, deprivation, residential stability while

**Table 3.** Descriptive statistics by gambling outlets density.

| Variables | Gambling premises per 100 m$^2$ < top 25% (low + medium) | Gambling premises per 100 m$^2$ ≥ top 25% |
|---|---|---|
| Violent crimes 2015, 2016, 2017 | 441.9 (260.2) | 877.4 (685.8) |
| Burglaries 2015, 2016, 2017 | 158.4 (85.84) | 250.9 (144.9) |
| Antisocial behaviours 2015, 2016, 2017 | 651.8 (428.3) | 1271.1 (1182.8) |
| Property damage 2015, 2016, 2017 | 218.1 (130.0) | 341.6 (217.8) |
| Vehicle crimes 2015, 2016, 2017 | 156.8 (104.9) | 256.9 (155.9) |
| Thefts 2015, 2016, 2017 | 14.25 (37.94) | 122.1 (360.2) |
| Retailers per 100 m$^2$ | 8.284 (10.030) | 52.88 (62.85) |
| Evening activities per 100 m$^2$ | 4.384 (6.432) | 34.17 (41.97) |
| Organisations per 100 m$^2$ | 0.856 (1.202) | 3.975 (5.444) |
| Commercial service per 100 m$^2$ | 30.39 (26.45) | 119.6 (137.0) |
| MSOA disadvantage | 20.03 (6.306) | 21.09 (6.686) |
| % Own properties | 66.78 (15.56) | 47.75 (17.01) |
| Small owners per 100 m$^2$ | 171.7 (139.3) | 431.1 (303.8) |
| Herfindahl index of ethnic homogeneity | 82.17 (17.08) | 64.75 (22.48) |
| % Young males (15–34) | 12.74 (3.709) | 17.14 (5.523) |
| Population log | 8.936 (0.197) | 8.991 (0.192) |
| % Non-UK born | 5.780 (6.382) | 14.55 (10.82) |
| % Divorces or separated | 11.72 (2.400) | 12.19 (3.081) |
| Mean price house 2015 | 239646.2 (178444.8) | 299993.9 (309806.5) |
| Weekly income (net) 2014 | 495.5 (113.2) | 447.4 (113.6) |
| N | 4,407 | 1,468 |

*Note:* SD in parentheses.

holding constant a number of other MSOA level variables. All continuous variables in the model are standardized. The model reports incidence rate ratios.

There are several patterns that stand out. There is significant positive association between gambling outlets per 100 m$^2$ and each of our dependent variables – an increase in gambling premises density is associated with an increase in all types of crime in our data. For example, one standard deviation increase in gambling premises density per 100 m$^2$ is associated with an increase in the anti-social behaviour incidence rate ratio of 9.7% ($\beta = 1.097$, SE $= 0.016$, $p < .001$), of violent crimes by 8.5% ($\beta = 1.085$, SE $= 0.013$, $p < .001$), burglaries by 5.5% ($\beta = 1.055$, SE $= 0.009$, $p < .001$), property damage by 6.6% ($\beta = 1.066$, SE $= 0.010$, $p < .001$), vehicle crimes by 3.7% ($\beta = 1.037$, SE $= 0.012$, $p < .05$), and theft by 12.7% ($\beta = 1.127$, SE $= 0.021$, $p < .001$). Moreover, among the variety of criminogenic places (which are predominantly positively associated with social disorganization in the local area although for retailers and organizations this association is not statistically significant), gambling outlets have an impact similar to that of evening activities per 100 m$^2$. Evening activities are well-established criminogenic places in the literature due to their ability to attract both perpetrators and provide potential targets (Wheeler, 2019). Thus, gambling and evening economy outlets contribute in a sizeable negative way to social disorganization in the local area; in contrast to retailers, other organizations, commercial services for which the evidence is mixed–with some positive associations with neighbourhood social disorganization primarily insignificant or weakly so; or as is the case of the density of small business owners, the association with crime types is negative.

Several of the other predictors merit further discussion. The percentage of homeowners and the density of small business owners is negatively associated with each type of crime, as we would have expected from the literature. A standard deviation increase in the density of small business owners per 100 m$^2$ decreases the incidence rate ratio of anti-social behaviour by 13.3% ($\beta = 0.867$, SE $= 0.012$, $p < .001$),

**Table 4.** Baseline models. Poisson regression with MSOA fixed effect.

| DVs | Anti-soc behaviour | | Violent crimes | | Burglaries | | Property damage | | Vehicle crimes | | Theft | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gambling premises per 100 m² | 1.097*** | (0.016) | 1.085*** | (0.013) | 1.055*** | (0.009) | 1.066*** | (0.012) | 1.037** | (0.012) | 1.127*** | (0.021) |
| MSOA disadvantage score | 1.087*** | (0.024) | 1.192*** | (0.028) | 0.961* | (0.015) | 1.207*** | (0.019) | 0.984 | (0.019) | 0.797*** | (0.051) |
| % Own properties | 0.873*** | (0.021) | 0.921*** | (0.020) | 0.937*** | (0.018) | 0.898*** | (0.013) | 0.999 | (0.022) | 0.618*** | (0.058) |
| Small owners per 100 m² | 0.867*** | (0.012) | 0.856*** | (0.010) | 0.901*** | (0.010) | 0.888*** | (0.007) | 0.900*** | (0.011) | 0.773*** | (0.032) |
| Herfindahl Index of Ethnic Homogeneity | 0.995 | (0.018) | 0.924*** | (0.014) | 0.915*** | (0.017) | 0.985 | (0.013) | 0.918*** | (0.017) | 0.826** | (0.057) |
| % Young males (15–34) | 1.149*** | (0.024) | 1.201*** | (0.022) | 1.086*** | (0.016) | 1.150*** | (0.016) | 1.145*** | (0.024) | 1.278*** | (0.081) |
| Population(log) | 1.226*** | (0.010) | 1.224*** | (0.007) | 1.197*** | (0.007) | 1.216*** | (0.006) | 1.194*** | (0.012) | 1.259*** | (0.053) |
| % Non-UK born | 1.106*** | (0.027) | 1.090*** | (0.021) | 0.983 | (0.025) | 1.005 | (0.019) | 1.024 | (0.026) | 1.217** | (0.089) |
| % Divorces or separated | 1.225*** | (0.016) | 1.225*** | (0.014) | 1.133*** | (0.015) | 1.189*** | (0.013) | 1.165*** | (0.016) | 1.380*** | (0.073) |
| Weekly income (AHC-net) 2014 | 1.005 | (0.028) | 1.038 | (0.026) | 1.004 | (0.022) | 1.011 | (0.015) | 1.030 | (0.028) | 1.219*** | (0.059) |
| Area hectares | 0.964*** | (0.007) | 0.973*** | (0.006) | 1.014* | (0.007) | 0.972*** | (0.005) | 1.006 | (0.008) | 0.907*** | (0.030) |
| Retailers per 100 m² | 1.029 | (0.017) | 1.032* | (0.013) | 1.002 | (0.012) | 1.028* | (0.012) | 1.010 | (0.012) | 1.076* | (0.033) |
| Evening activities per 100 m² | 1.096*** | (0.022) | 1.115*** | (0.017) | 1.059*** | (0.018) | 1.059*** | (0.014) | 0.990 | (0.018) | 1.097** | (0.034) |
| Organisations per 100 m² | 1.028 | (0.020) | 1.016 | (0.015) | 1.003 | (0.009) | 1.011 | (0.012) | 0.984 | (0.009) | 1.058* | (0.026) |
| Commercial services per 100 m² | 0.961 | (0.022) | 0.950** | (0.018) | 1.014 | (0.013) | 0.993 | (0.017) | 1.060*** | (0.016) | 0.936 | (0.038) |
| Mean price house 2015 | 1.023 | (0.016) | 1.018 | (0.022) | 1.075*** | (0.026) | 1.026 | (0.015) | 1.074*** | (0.018) | 1.101*** | (0.028) |
| N | 5867 | | 5867 | | 5867 | | 5867 | | 5867 | | 5867 | |

Note: Standard errors in parentheses. All independent variables have been standardized. Coefficients are IRR (incidence rate ratios). *$p < .05$, **$p < .01$, ***$p < .001$

of violent crimes by 14.4% ($\beta = 0.856$, SE $= 0.010$, $p < .001$), burglaries by 9.9% ($\beta = 0.901$, SE $= 0.010$, $p < .001$), property damage by 11.2% ($\beta = 0.888$, SE $= 0.007$, $p < .001$), vehicle crimes by 10% ($\beta = 0.900$, SE $= 0.011$, $p < .001$), and theft by 22.7% ($\beta = 0.773$, SE $= 0.032$, $p < .001$). A standard deviation increase in the percentage of homeowners decreases the rate of anti-social behaviour by 12.7% ($\beta = 0.873$, SE $= 0.021$, $p < .001$), of violent crime by 7.9% ($\beta = 0.921$ SE $= 0.020$, $p < .001$), of burglaries by 6.3% ($\beta = 0.937$, SE $= 0.018$, $p < .001$), of property damage by 10.2% ($\beta = 0.898$, SE $= 0.013$, $p < .001$), and of theft quite considerably by 38.2% ($\beta = 0.618$, SE $= 0.058$, $p < .001$). Clearly, both percent homeowners and percent small business owners operate along our research expectations. The literature suggests (Kawachi et al., 1999) that the disadvantage at MSOA-level measured by the index of multiple deprivation should be positively associated with crime levels – one standard deviation increase in the MSOA disadvantage score in our data indeed increases the rate of anti-social behaviour by 8.6% ($\beta = 1.086$, SE $= 0.024$, $p < .001$), of violent crime by 19.2% ($\beta = 1.192$, SE $= 0.028$, $p < .001$), and of property damage by 20.7% ($\beta = 1.207$, SE $= 0.019$, $p < .001$). For burglaries, vehicle crimes and theft, the association is negative. It is significant for burglaries (a decrease of 3.9%, $\beta = 0.961$, SE $= 0.015$, $p < .05$) and theft (a decrease of 20.3%, $\beta = 0.797$, SE $= 0.051$, $p < .001$). This may reflect lower presence of targeted valuable goods in deprived areas. Positively associated with neighbourhood social disorganization is the proportion of young males, as well as the level of marriage dissolution in the MSOA. Ethnic homogeneity is significantly negatively associated with all crime types but anti-social behaviour (for which the association is positive but non-significant).

We next examine a series of interaction effects (Figures 1 to 3). In the Figures, we plot the predicted number of crime events, as estimated via fixed effect Poisson models for areas with very high (25th percentile), and very low (25th percentile) levels of deprivation, percent of homeowners and small business owners per 100 m$^2$, while varying the level of gambling density (from low–bottom 5%, to high–top 5%). We find mixed evidence that deprivation and residential stability measured by the proportion of homeowners and the proportion of small businesses per 100 m$^2$ moderate the effect of gambling density. The positive association between the density of gambling outlets and crime is more pronounced in deprived
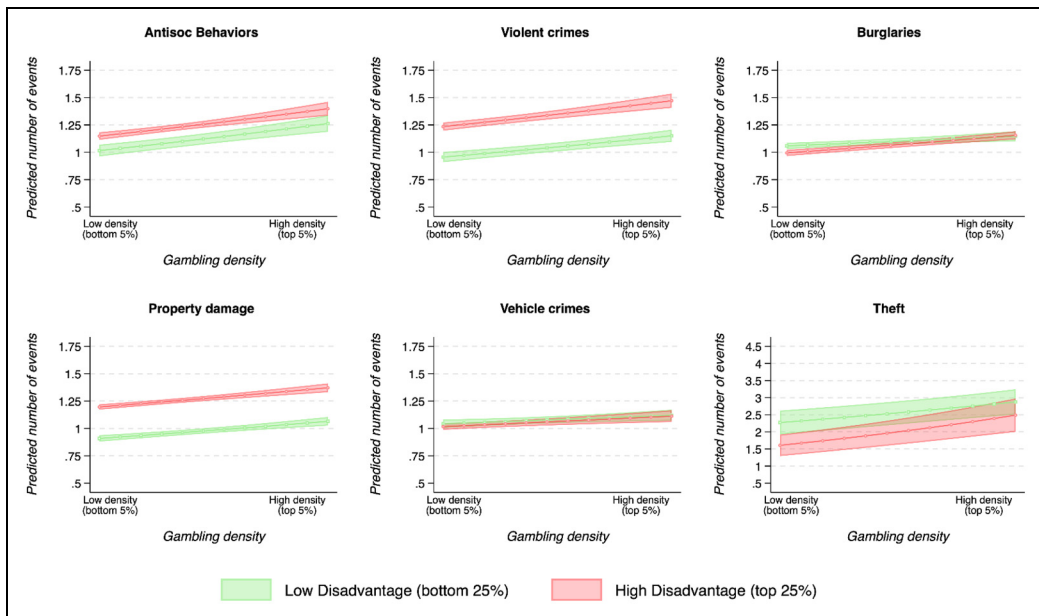


**Figure 1.** Predicted crime events by gambling density and MSOA disadvantage score.
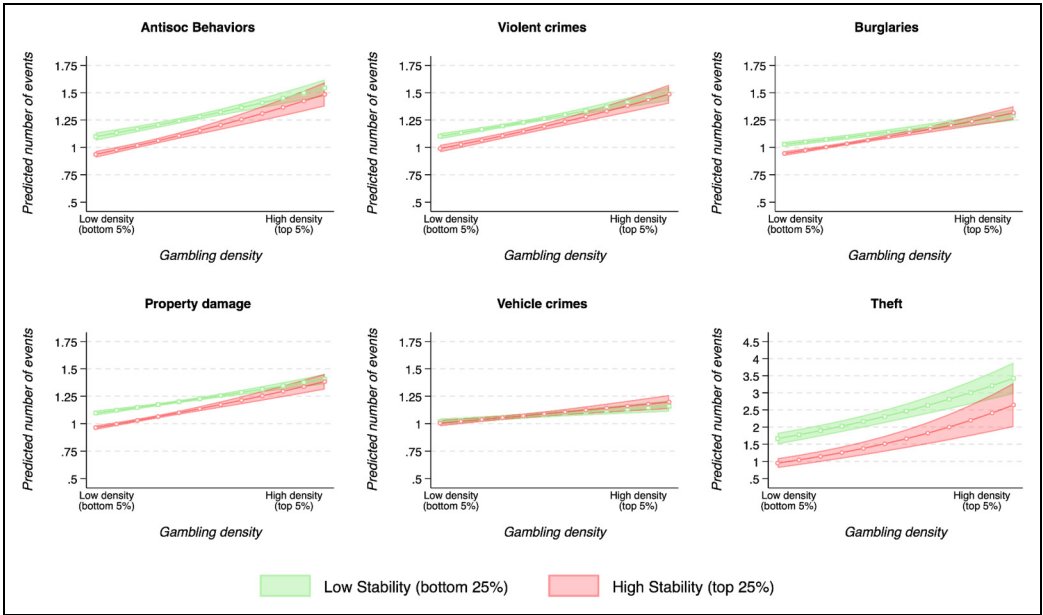*Note:* 95% CIs, theft on a different scale.

**Figure 2.** Predicted crime events by gambling density and residential stability proxied by percent own properties (home owners).
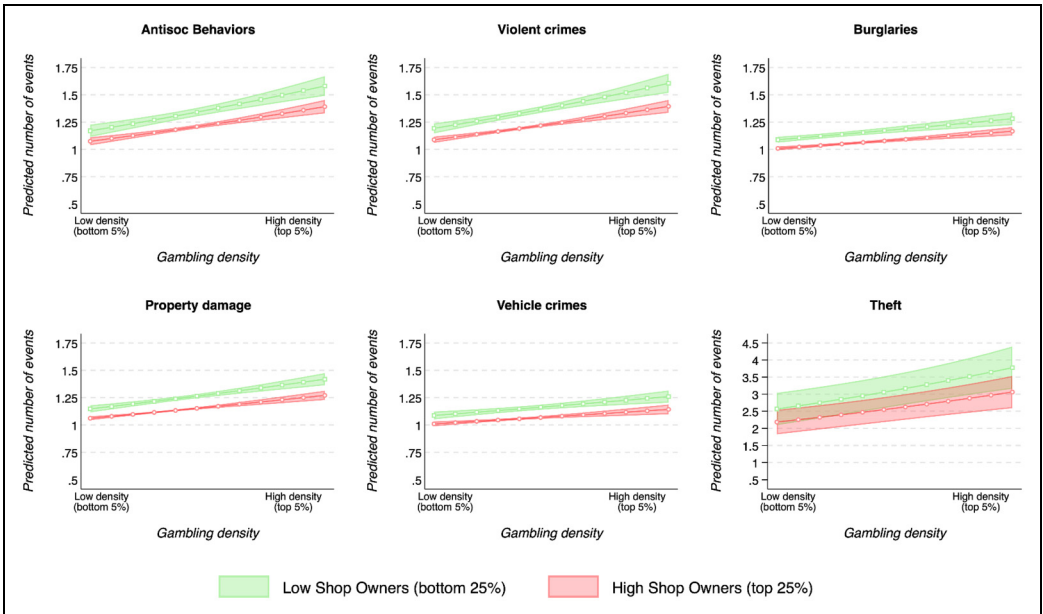*Note:* 95% CIs, theft on a different scale.



**Figure 3.** Predicted crime events by gambling density and small owners per 100 m². 
*Note:* 95% CIs, theft on a different scale.

neighbourhoods but significantly so only for burglaries and theft. Previous studies have also failed to find pronounced negative effects at high levels of deprivation for violent crime (Steidley et al. 2017) perhaps signalling a levelling effect across crime types apart from opportunistic crime incidents such as burglaries, vehicle crimes and theft. More interestingly, we find that high property ownership does not shield residents from the negative effects of high gambling density: while areas with low gambling density and high proportion of homeowners report a lower crime incidence than areas with a low proportion of homeowners, as the gambling density increases the crime incidence grows at a greater rate, reaching crime levels close to the ones observed in areas with a low proportion of homeowners. This holds for all types of crime (see Figure 2). Thus, contrary to our expectations, the evidence suggests that having a stronger presence of gambling premises in an area with a high proportion of homeowners is associated with a higher vulnerability to crime.

On the other hand, small business owners contribute significantly to residential organization – with an increase in gambling density and the proportion of small business owners, there is a lower incidence of all types of crimes. Figure 3 shows that it is, in particular, in areas with high density of small businesses that there is no relationship between the density of gambling outlets and types of crime. Small business owners can ensure stability by directly providing surveillance over the neighbourhood, and in the case of local shops indirectly by signalling that this is a neighbourhood for which the community cares, by looking after their property. The latter, depending on opening hours, can even provide security to the area (Crowley and Stainback, 2019). This finding supports our research expectations and suggests clearly that small business owners offer sheltering effects to the community (being negatively associated with crime types) but also acting to reduce the negative effect of criminogenic places such as gambling outlets.

## Discussion

Proponents of licensed betting premises argue that gambling is often misconstrued by the media as a pathological activity and a form of disease, as irrational or dangerous, and frequently as immoral, a pastime that is usually popular with working class men (betting shops) and women (bingos) but that is frowned upon by the middle-class sensibility of more well-to-do residents (Brooks, 2012; Laybourn, 2007; Neal, 1998). Gambling outlets can be seen as a feature of regeneration schemes of local authorities in Britain (Jones et al., 1994) that move away from empty shop windows and increase guardianship. Supporters of betting shops have argued that they can become sites for the formulation of meaningful social bonds, especially between working class men although recent ethnographic data usually paints gambling premises as very gendered spaces with uncertain role in the local communities (Cassidy, 2012; Cassidy, 2014).

Our analysis does not align with positive interpretations of the impact of gambling premises. A higher density of gambling outlets is associated with an increase in all types of crime controlling for other criminogenic places and other MSOA-level factors. This effect is pronounced for anti-social behaviour and for inter-personal crime such as violent crime. The effect is comparable to that of evening activities (such as pubs, nightclubs, cinemas and theatres) – established criminogenic places in the literature, while the evidence is much more mixed for retailers, other organizations and commercial services for which the observed associations can be negative or if positive, either insignificant or weaker than the relationship observed for gambling and evening activities outlets. The impact of gambling premises is reinforced in areas with greater levels of social deprivation only for theft, vehicle theft and burglaries. Interestingly, higher proportion of homeowners does not provide shielding effects for communities exposed to high density of gambling outlets, but greater presence of small business owners does. Our analysis of the associations between gambling outlets and crime has a number of practical policy implications which are related to the examination of the heterogeneous effects of gambling outlets dependent upon the levels of deprivation and residential instability in the local area. In licensing decisions, the local council becomes a proxy for the community (Hotker et al., 2020). Most councils now acknowledge the potential

for pernicious effects of gambling premises but the quantitative evidence supporting the white paper on Gambling activities in the UK (Public Health England, 2021) remains focused on problem gambling and survey data. Our paper constitutes an important addition to the literature and importantly signals that the broader impact of gambling premises on local communities should be considered. As mentioned in the Research expectation section of the paper, our data analysis has been guided by reports produced by local authorities concerned about land-based gambling premises and their effect upon local communities. A report for the Southwark Council completed in 2014 shows that the focus in studies of gambling outlets is usually on individual health outcomes, problem gambling and the positioning of gambling outlets and pay-day loan shops (BenCaveAssociates, 2014). Although the report acknowledged that there could be a variety of wider and broader effects, it ascertained that there are considerable difficulties in quantifying the impact of gambling outlets on community well-being. The borough of Barking and Dagenham also completed a review that identifies areas of high multiple deprivation as potential problematic areas in which to place gambling activities (Lamptey, 2019). The recommendation of the review is that gambling facilities should not be located in areas with high levels of deprivation. Our study provides further insights as to the question of the positioning of different gambling outlets since we consider potential confounders and further investigate whether deprivation can re-enforce or whether residential stability can alleviate the negative impact of high gambling outlet density. We find that deprivation may make matters worse in terms of theft and burglaries, but not in terms of violent crime, anti-social behaviour or property damage. There are several reasons for this result. The data show that exposure to gambling outlets is not much higher in local areas marked by high levels of deprivation compared to non-deprived areas (Table 3). Thus, many of the very deprived local areas which are most susceptible to violent crime have not been affected by gambling density in the analysis. Furthermore, our data suggest that at high levels of deprivation, the impact of gambling outlets is focused on opportunistic types of crimes such as thefts and burglaries.

Importantly, residential stability as proxied by percentage of homeowners does not shield the community in the local area – on the contrary, local homeowners seem particularly activated at high levels of gambling density which can be related to greater reporting as well as an increasing number of targets in such areas. The presence of small business owners can however mitigate the negative effects of high gambling outlets density.

The results of our study suggest that the criminogenic impact of residing closer to gambling premises is not limited to providing criminal opportunities for perpetrators but very importantly such criminogenic attractors may hinder guardianship within the community – areas with high proportion of homeowners who also are typically long-term residents experience increasing social disorganization with the increase in number of land-based gambling premises. Moreover, the negative effect of gambling outlets is not restricted to the most deprived areas – that is to say, it cannot be minimized by simply reducing the number of gambling premises in areas that normally experience heightened levels of disorganization. Therefore, this research suggests that a viable policy instrument for controlling criminality and improving the crime rates of the local area should be the close monitoring of gambling outlet density. If the goal is to encourage the well-being and resilience of the local community and the reduction of empty spaces, this can be best achieved through supporting small businesses which clearly contribute to social organization. Although our small business owners variable does not allow us to distinguish local shops specifically, it nevertheless indicates that small business owners can provide important guardianship to the community and future work should try to disentangle the protective effects that various businesses, including the ethnic economy can have in a neighbourhood. The ability of such social infrastructure to build community relationships, encourage social capital formation and collective efficacy should not be underestimated (Sampson et al., 1997).

# Limitations

The process of allocating gambling outlets to MSOAs is not random. Do gambling outlets posit themselves in areas in which there are already quite high levels of crime to which other outlets are contributing (e.g., evening activities), or do they themselves contribute to heightened crime levels either directly or indirectly? Unfortunately, we do not have information when the gambling premises first opened doors. However, while we cannot account for endogeneity issues fully, we provide control for a number of other establishments in the local area such as the density of retailers, small businesses, evening economy outlets, commercial activities (such as pawn shops, banking) and other establishments. Another shortcoming of the present study is that we are not considering the full potential impact of gambling activities – of online gambling in particular. It is possible that online gambling has irrevocably changed the demographic of the recreational gambler who would frequent licensed betting offices – increasing the population of problem gamblers holding loyalty cards or older unemployed residents (Purves et al., 2020). Research combining information on online and offline gambling behaviour will be insightful but is beyond the scope of the present study. Importantly, however, our research provides an overview of all gambling premises and that reduces the danger of underestimating the impact of gambling outlets by just focusing on one type of gambling premises.

A further limitation is that this research is cross-sectional and we cannot take into account changing patterns over time or the timing of the criminogenic incident, day or night.[6] Neighbourhoods are dynamic local areas and it is possible that the social and institutional characteristics that define them change frequently. We have no information about licensing decisions and change in the policies of local authorities over time and thus cannot ascertain whether some local authorities are more liberal in their licensing decisions than others. Finally, we use aggregate data on crime and area infrastructure rather than individual-level data which can be problematic, particularly in heterogeneous communities. That is to say, we cannot consider individual-level factors and conditions such as mental health problems that can contribute to social disorganization. Yet, as this study argues, exploring the relationship between gambling outlets and crime in a robust way is important and carries both substantive and policy-relevant research implications.

# Conclusion

Policy makers have growing concerns about exposure to high gambling density. This study establishes a significant positive association between gambling premises and neighbourhood social disorganization which is on par with other established criminogenic places such as evening economy outlets. Moreover, this negative impact is not restricted just to deprived areas, and increased guardianship through homeowners does not shield the local community. Small business owners however do play a protective role, and this study concludes that they are important for the well-being and resilience of the local area. Our results make an important sociological contribution to the current explanation of social disorganization in local areas as well as provide empirical identification of institutions which can support efforts to reduce criminality. Further work should aim to better understand and map all the possible pathways through which collective efficacy at the local area level can be successfully encouraged and sustained.

## Data availability statement

## Funding

## ORCID iD

Neli Demireva ⓘD https://orcid.org/0000-0003-4782-9599

## Notes

1. We use data from the ONS, the UK Census, the UK Police Street-level Crime Dataset, and the POI Ordnance Survey. The variety of datasets used in this study can be accessed here: https://www.police.uk/pu/about-police.uk-crime-data/, https://www.ordnancesurvey.co.uk/business-government/tools-support/points-of-interest-support, https://www.ons.gov.uk/, https://www.nomisweb.co.uk/census/2011.
2. The Gross Gambling Yield we report is recorded for Great Britain (England, Scotland, and Wales). Category A gaming machines are machines with unlimited stakes and prizes, however no such machines are currently permitted on the territory of the UK. Instead, most premises hold combination of Category B, C or D gaming machines. B1 gaming machines with maximum prize of £10,000 (with the option of a maximum of £20,000 under certain conditions) (stake £5) are available only in casinos. B2 gaming machines also known as fixed odds betting terminals with a maximum prize of £500 (stake £2) are available in casinos, betting shops, and tracks with pool betting. B3, B3A (both have maximum prizes of £500, stake £2) and B4 (maximum prizes £400, stake £2) gaming machines are available as well in bingos, adult gaming centres, and members' clubs. Category C and D gaming machines are available in a variety of premises including arcades (Gambling Commission, 2024b). Additionally, the POI data we have lumps under arcades: Adult Gaming Centres, Unlicensed Family Entertainment Centres and Family Entertainment Centres which can hold a variety of different machines.
3. CCTV has been found to have deterring effect in car parks and in terms of property damage; its impact upon inter-personal crime and anti-social behaviour appears to be weaker (Piza et al., 2019).
4. It is possible that there are important differences between gambling outlets which are beyond the scope of this paper – as we indicate in Note 2, different gambling outlets can provide different gambling machines and different types of gambling. Without knowing these details, it will be difficult to provide a nuanced examination of the differences between gambling premises. It is likely that casinos for example operate as hot spots in a similar way to big-box retailers – they are likely to be venues that in accordance with routine activities theory attract both potential perpetrators of crime and vulnerable victims (Barthe and Stitt, 2007, Barthe and Stitt, 2009); yet, there can be presence of heightened security in such outlets which needs to be captured in order to create a detailed picture of how different premises operate as criminogenic places. Arcades are primarily found in seaside towns; bingo halls are popular with women, while betting shops with men; and further work should aim to disentangle these differences.
5. We have run robustness checks to see if limiting the number of units can have an effect upon the interpretation of the results. These results are available upon request.
6. A few studies in the literature make this distinction (Hipp, 2016, Andresen and Malleson, 2015).

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## Author biographies

**Neli Demireva** is a Professor of Sociology at the University of Essex. Her research focuses on vulnerable local communities, migration, inter-ethnic ties, social cohesion, ethnic penalties and multiculturalism. She is a member of the International Editorial Board of *Ethnic and Racial Studies.* Her work has been published in the *Journal of Ethnic and Migration Studies*, *Ethnic and Racial Studies*, *European Societies*, among others; and featured in the Independent, the Guardian, and by TEDx.

**Sergio Lo Iacono** is a lecturer in the Department of Sociology at the University of Essex. His research interests include trust, collective action dilemmas, sustainable development and climate change, and social cohesion. His work has been published in the Philosophical Transactions of the Royal Society B, Social Science and Medicine, European Sociological Review, Social Science Research, and Royal Society Open Science, among other outlets. He is also the co-editor of Trust Matters: Cross-disciplinary Essays (2021).

# Appendix

Robustness Checks

As the data shows overdispersion, we have rerun the results with negative binomial models. We did not observe a change in the pattern examined. We reported the Poisson models in the main text because of their well-known robustness (Wooldridge, 2010; Hoang and Wooldridge, 2024; Wooldridge, 1999). Below we illustrate that the results for the negative binomial model are very similar and report some of the predictors in our model – there is change only in the association for retailers significant for anti-social behaviour in the negative binomial model. Full result tables including the tables with interaction effects are available upon request.

**Table AI.** Baseline Models. Negative binomial regression with MSOA fixed effect.

| | Anti-soc behaviour | | Violent crimes | | Burglaries | | Property damage | | Vehicle crimes | | Theft | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gambling premises per 100 m$^2$ | 1.074*** | (0.014) | 1.068*** | (0.012) | 1.060*** | (0.010) | 1.059*** | (0.009) | 1.028** | (0.010) | 1.172*** | (0.036) |
| MSOA disadvantage score | 1.099*** | (0.016) | 1.185*** | (0.020) | 0.965* | (0.017) | 1.202*** | (0.016) | 0.998 | (0.019) | 0.856*** | (0.034) |
| % Own properties | 0.882*** | (0.015) | 0.910*** | (0.015) | 0.944** | (0.018) | 0.877*** | (0.011) | 1.031 | (0.021) | 0.751*** | (0.037) |
| Small owners per 100 m$^2$ | 0.861*** | (0.010) | 0.860*** | (0.009) | 0.891*** | (0.012) | 0.880*** | (0.007) | 0.904*** | (0.013) | 0.701*** | (0.026) |
| Retailers per 100 m$^2$ | 1.070** | (0.023) | 1.067** | (0.021) | 1.017 | (0.011) | 1.046** | (0.016) | 1.021 | (0.012) | 1.544*** | (0.115) |
| Evening activities per 100 m$^2$ | 1.129*** | (0.020) | 1.119*** | (0.016) | 1.058** | (0.018) | 1.060*** | (0.015) | 0.984 | (0.018) | 1.050 | (0.046) |
| Organisations per 100 m$^2$ | 1.010 | (0.018) | 1.003 | (0.016) | 0.996 | (0.007) | 0.996 | (0.011) | 0.970*** | (0.008) | 1.022 | (0.027) |
| Commercial services per 100 m$^2$ | 0.993 | (0.030) | 0.988 | (0.028) | 1.029 | (0.018) | 1.017 | (0.022) | 1.111*** | (0.034) | 1.104 | (0.098) |
| Mean price house 2015 | 1.003 | (0.010) | 1.013 | (0.010) | 1.124*** | (0.033) | 1.011 | (0.007) | 1.121*** | (0.025) | 1.142** | (0.049) |
| N | 5875 | | 5875 | | 5875 | | 5875 | | 5875 | | 5875 | |

*Note:* Standard errors in parentheses. All independent variables have been standardized. Coefficients are IRR (incidence rate ratios). *$p < .05$, **$p < .01$, ***$p < .001$.

A non-linear relationship can signify, whereby when neighbourhoods reach very high concentrations of gambling premises, they become particularly pernicious for the local communities – a U turn relationship. In our case the quadratic term is negative which suggests that the relationship is akin to an inverted U – thus the highest levels of crime across our predictors are usually not in the areas with the highest levels of gambling outlets density – perhaps a levelling effect with an increase of gambling premises density. The non-linearity of a relationship can be the sole focus of a paper, that should investigate the quadratic, cubic, and quartic form of gambling premises and other criminogenic places. Full table is available upon request.

**Table A2.** Poisson model with quadratic term for gambling premises.

| | Anti-soc behaviour | | Violent crimes | | Burglaries | | Property damage | | Vehicle crimes | | Theft | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gambling premises per 100 m$^2$ | 1.218*** | (0.019) | 1.195*** | (0.015) | 1.115*** | (0.016) | 1.131*** | (0.012) | 1.077*** | (0.015) | 1.506*** | (0.073) |
| Gambling $p$ × Gambling $p$ | 0.985*** | (0.003) | 0.986*** | (0.002) | 0.991** | (0.003) | 0.990*** | (0.002) | 0.994*** | (0.002) | 0.964*** | (0.007) |
| N | 5867 | | 5867 | | 5867 | | 5867 | | 5867 | | 5867 | |

Note: Standard errors in parentheses. All independent variables have been standardized. Coefficients are IRR (incidence rate ratios). * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$.