



Social Capital and Hit-and-Run Road Accidents: Evidence from Italy

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Abstract

We use data on Italian road accidents involving pedestrians in the period 2000–2016 to study the link between social capital and the driver’s decision to flee. Running away is a serious crime which affects the victim’s probability to survive after the accident. We merge detailed police records on road accidents with data on social capital at the province level and find a strong negative correlation between social capital and the decision to run away. The analysis is in line with previous studies suggesting that social capital is an important driver of human behaviour even in situations characterized by strict time constraints and dramatic psychological conditions.

Keywords Social capital · Crime · Hit-and-run · Road accidents

JEL Classification Z13 · D91 · K42 · R41

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1 Introduction

Social capital – defined as “the ability of people to work together for common purposes in groups and organizations” (Fukuyama 1995, p. 10) and as “those persistent and shared values and beliefs that help a group overcome the free rider problem in the pursuit of socially valuable activities” (Guiso et al. 2011)—is an intangible but important driver of human behaviour. An extensive literature has found it to be positively associated with economic and financial development (Tabellini 2010; Guiso et al. 2004), firms’ financial performance (Lins et al. 2017), borrowers’ loan conditions and repayment (Hasan et al. 2020), economic mobility (Chetty et al. 2022; Güell et al. 2018), political accountability (Nannicini et al. 2013), and health outcomes (Folland 2007; Kim et al. 2011; Xue et al. 2020), and negatively associated with crime rates (Lederman et al. 2002; Buonanno et al. 2009; Akçomak and Ter Weel 2012) and road accidents (Nagler 2013).

In a recent work, Castriota et al. (2023; CRT hereafter) show the importance of social capital in a new context, hit-and-run road accidents. They analyse the decision to flee after a fatal accident involving pedestrians in the United States. They find that social capital at the county level is negatively associated with the decision to flee, with an increase in social capital by one standard deviation associated with a decrease in the probability of hit-and-run by around 10.5%. They exploit the availability of the ZIP code of the driver when known¹ to implement a falsification test supporting a causal interpretation of the result. In particular, they show that the negative and statistically significant relationship between the probability of fleeing and local social capital is present only for local drivers and not for those who are out-of-county.

In this paper, we study the relationship between social capital and hit-and-run accidents in the Italian context and find that an increase by one standard deviation in social capital at the provincial level is associated with a lower probability of hit-and-run by around 12.5%, a figure comparable to the one found for the US. One limitation of CRT is that US data include only fatal accidents. Whether an accident results in a fatality may be partly endogenous to the decision to flee, given that in several circumstances a fleeing driver is likely to delay the emergency response, thus reducing survival rates (Tay et al. 2009),² and also endogenous to social capital, if social capital has an impact on the quality of local health services. One important advantage of using Italian data is that records also include accidents with injuries. There are, however, also disadvantages in that, for instance, Italian records do not specify the ZIP code of drivers or information on whether fleeing drivers have been subsequently identified, making it unfeasible to repeat some of the analysis performed in CRT. From this point of view, the analysis conducted here and the analysis in CRT can thus be seen as complementing each other.

Another contribution of this paper is that we show the robustness of the negative relationship between fleeing an accident and social capital in a different institutional context. CRT have been the first to look at this issue and have documented it for the US.

¹ Known drivers are those not fleeing and those who fled but were subsequently identified, something that happens in approximately half of hit-and-run cases in the US context.

² For a recent case in the Italian context, see [in Italian]: https://www.ilgazzettino.it/nordest/verona/negrar_ragazzo_investito_ucciso_pirata_chi_e_vittima_chris_obeng_abom-7555240.html.

There is no guarantee, however, that this holds beyond the—important but clearly not universal—American case, and it is thus important to extend the analysis to different countries. The Italian case is particularly relevant, considering the large and long-lasting differences in social capital existing within the country—in particular between the Centre-North and the South—(Bigoni et al. 2016; Bracco et al. 2015), differences that have greatly inspired the literature, starting at least with Banfield (1958). Indeed, several of the contributions listed in the opening paragraph concern the Italian case and many more exist in the literature on social capital.³ Thus, another contribution of this paper is to assess the replicability of a recent empirical finding in an institutional context, Italy, that is different from the widely studied US case and very relevant for the literature on social capital.

Finally, the paper contributes to our understanding of hit-and-run in Italy, an issue that is of high policy relevance given the dire consequences of such acts, often triggering indignation in the public opinion and calls for strong policy interventions.⁴ Castriota and Tonin (2023) find that the likelihood of Italian drivers fleeing after an accident increases by around 20% with darkness and the consequent decrease in the probability of detection. They suggest that policies increasing the likelihood of apprehension could be effective in reducing hit-and-run despite it being an unplanned decision taken under strict time constraints and dramatic psychological conditions. This paper goes beyond formal sanctions and explores instead the role of the social environment, as summarized by the concept of social capital, as a potential deterrent for hit-and-run.

More generally, this paper contributes to a strand of literature investigating the role of social capital in situations characterized by extreme and stressful conditions. A number of studies show the importance of social capital in coping with natural disasters (Aldrich 2012): Liu et al. (2022) investigate the role of social capital in earthquake recovery in Nepal; Munasinghe (2007) discusses the role of social capital by comparing the behaviour of citizens after the 2004 tsunami in Asia and the 2005 hurricane Katrina in New Orleans; Zahnnow et al. (2019) study a flood in Brisbane, Australia. Frey et al. (2010) analyse the sinking of the Titanic – a quasi-natural experiment where passengers were suddenly put in a life-and-death situation – and find that “social norms of helping” such as “women and children first” persevered also during such a tragic event and influenced the probability to survive. On the other hand, Elinder and Erixson (2012) study 18 maritime disasters, finding instead evidence of “every man for himself” behaviour. All these examples concern disasters involving whole communities or large groups. The case of hit-and-run is clearly different, as it is an extreme and stressful condition directly involving in most of the cases just the driver and the victim,⁵ thus social capital may have a different—possibly more subdued—role.

³ A simple EconLit search for (“social capital” & “Italy”) gives 331 results [6 September 2023].

⁴ For example, the current Minister of infrastructures and transport in Italy proposes highly increased sanctions. See, for instance [in Italian]: <https://stream24.ilsole24ore.com/video/italia/salvini-pirati-strada-almeno-dieci-anni-senza-patente/AEB14XOC>.

⁵ From this point of view, the paper is related to the literature about the role of social capital in helping others in dyadic conditions, e.g., the classic “lost wallet” scenario (see, for instance, Tannenbaum et al. 2022).

The rest of the paper is organized as follows. Section 2 describes the database on road accidents and social capital, Sect. 3 provides descriptive statistics, Sect. 4 discusses the results of the econometric analysis, while the last section concludes.

2 Data

Accident data come from the Italian Institute of Statistics (ISTAT). We have access to comprehensive records of all road accidents involving injured or deceased individuals over the period 2000–2016. The dataset contains detailed information regarding each collision, encompassing aspects such as location (Province), time of occurrence, number of participants and their respective attributes, types of vehicles involved, weather conditions, road types, as well as the total count of injured and deceased individuals. Notably, the data also includes information on whether an individual has fled after an accident. Following CRT (2023), we focus on accidents with pedestrians because in these cases serious damages to the vehicle and serious injuries to the driver are rare events, therefore they seldom prevent the driver from fleeing. Hence, the variation in the decision to run away is independent of such confounders.

When it comes to measuring social capital, the literature offers various approaches due to the multifaceted nature of the concept (Dasgupta and Serageldin 2000; Christoforou 2013). One approach to operationalize social capital uses trust towards individuals and institutions, usually measured through survey questions (Glaeser et al. 2000; Guiso et al. 2008; Akçomak and Ter Weel 2009; Lins et al. 2017). Another perspective involves considering social capital in terms of membership in groups, networks, and voluntary associations (Putnam et al. 1994; Alesina and La Ferrara 2002; Sobel 2002) or higher voter turnout (e.g., Putnam 2000; Cartocci 2007; Buonanno et al. 2009). Furthermore, the strength of social capital can be captured through voluntary blood donations, as proposed by Guiso et al. (2004).

In this paper, to facilitate a comparison of our findings with other research on this subject and in particular the work by CRT (2023), we developed social capital indexes that resemble as much as possible those used in "The Geography of Social Capital in America" project (2018) at the county level. These indexes have also been employed in studies conducted by Ding et al. (2020), Borgonovi et al. (2021), and Milosh et al. (2021). Specifically, we constructed a provincial-level social capital index called *Social Capital*, which comprises the following sub-indexes: *Community Health* based on data about members of sport associations, blood donors and newspaper-readers per thousand inhabitants; *Institutional Health* captured by the voter turnout in referenda; and *Collective Efficacy*, that is the number of voluntary homicides per thousand inhabitants. Additionally, we formulated an alternative measure, *Social Capital (2)*, by excluding the collective efficacy variable from its computation. The reason behind this exclusion is that previous works concerning Italy have not commonly considered this aspect (Cartocci 2007; Righi 2013; Nifo and Vecchione 2014; Calcagnini and Perugini 2019). Note that a higher score on these social capital indexes implies a higher level of social capital in the respective provinces. It is important to point out that, although we tried to build for Italy social capital indicators similar to the ones used for the US by CRT (2023), perfect adherence was not possible.

The data comes from a variety of sources: information on members and teams affiliated with sports associations (CONI and EDP),⁶ blood donors and donations, and non-sportive newspaper circulation has been retrieved from Cartocci (2007), while we have consulted the Italian Ministry of the Interior website to obtain data on the referendum participation. The number of voluntary homicides is collected by ISTAT. The social capital indicators are time invariant and the data refer to the period 1990–2016. See Table 5 in the Appendix for details on the variables and sources employed to define the index and the sub-indexes at the provincial level.⁷

Information pertaining to additional control variables at aggregate level such as unemployment rate and vehicle density is sourced from ISTAT (Italian National Institute of Statistics) and the Ministry of Transportation and Infrastructures; while information on spending on road infrastructure from Openpolis Foundation.⁸

As mentioned above, social capital is a multifaceted concept that relates to dimensions like personal relationships, cooperative norms and trust, social network support and civic engagement. While our measures capture some of these dimensions, it is important to assess the robustness of the relationship we study to alternative measures of social capital. To do this, we use three different social capital indexes employed and developed in the investigation of the Italian context by Calcagnini and Perugini (2019)—referred to, in this work, as *Social Capital CP* -, Calcagnini et al. (2019)—referred to as *Social Capital CGP*-, and Fini et al. (2011)—referred to as *Social Capital FGSS*. The first indicator is constructed by Principal Component Analysis (PCA) on four variables, at the provincial level, assessing these three facets of social capital: trust, social norms, and networks. Specifically, Calcagnini and Perugini (2019) choose two dimensions of generalized trust in institutions and society, namely, the duration of first-instance ordinary court proceedings and the incidence of car thefts (Micucci and Nuzzo 2003). They use blood donations, measured as the number of blood bags per million inhabitants, to proxy civic engagement and people's inclination to cooperate, as done in Guiso et al. (2004). For social inclusion and networks, following the approach of Mattisson et al. (2015), they utilize the length of bike lanes.

Regarding the *Social Capital CGP* measure, it was developed through PCA on 26 variables that capture networks, trust, and social norms at the provincial level. Specifically, with respect to networks, akin to Putnam et al. (1994), Calcagnini et al. (2019)

⁶ CONI stands for *Italian National Olympic Committee* representing the governing body of sport in Italy. Teams with EDP affiliation are more oriented towards multi-sports, offered to a large number of potential participants, whose practice can be more or less continuous, if not occasional, or even only expressed in individual events.

⁷ The provincial social capital indexes (*Social Capital* and *Social Capital (2)*) and *Community Health Subindex* are obtained by PCA (Principal Component Analysis) (see, among others, Alesina and La Ferrara 2000; Cartocci 2007; Akçomak and Ter Weel 2012; Righi 2013; The geography of social capital in America, 2018; Calcagnini and Perugini 2019). The variables used to build the indexes have been standardized to avoid the variable with the highest variance dominating the resulting index. Following "The Geography of Social Capital in America" project (2018), as the collective efficacy index moves in the opposite direction than the other social capital measures (i.e., an increase in the number of voluntary homicides should correspond to a decrease in social capital), we use the opposite of the variable to make it positively related to social capital.

⁸ This information is available at the municipality level, and we have aggregated it at the provincial one. See: <https://www.openpolis.it/spese-per-viabilita-e-infrastrutture-stradali-nei-comuni/>.

gauge social capital characteristics related to social participation and networks using metrics such as the number of tickets sold for public events or museums, and the number of libraries. Additionally, they include variables associated with firm innovation, such as the number of patents or individuals with a doctorate, recognizing that innovative firms are more likely to engage in information exchange and mutual interaction (Hauser et al. 2007). Furthermore, variables related to economic development, including the employment rate, the number of registered firms, and the length of cycling lanes, are selected. According to Jordan et al. (2010), economic development can enhance individuals' ability to participate in community and associational activities, thereby fostering higher levels of social capital. Turning to trust, they consider variables related to education, which is seen as a direct promoter of social capital accumulation by aiding individuals in developing civic skills and cognitive capacities that facilitate participation in groups and associations (Milligan et al. 2004). Additionally, given that interpersonal altruism supports trust (Glaeser et al. 2000), they include variables such as the number of cooperatives, voluntary members, or not-for-profit organizations. Moreover, recognizing the link between health status and social capital in various studies (Fiorillo 2008), variables related to health status and health care institutions are also included. With respect to social norms, they use variables reflecting civic and political participation (Guiso et al. 2004).⁹

Lastly, *Social Capital FGSS* is assessed at the regional level by combining variables associated with the concept of free-riding behaviours in market transactions, as outlined by Micucci and Nuzzo (2005). The indicator is specifically formulated by incorporating data on crime rates, bankruptcy rates, forgery rates, and instances of commercial fraud.

In Sect. 4, we will also explore the relationship between hit-and-run and these alternative measures of social capital.

3 Descriptive Statistics

Table 1 provides a comprehensive overview of the variables used in the econometric analysis, along with the main summary statistics. The analysis covers the period from 2000 to 2016, during which there were in Italy a total of 320,835 accidents involving pedestrians. Among these accidents, 2% (6766 accidents) were classified as hit-and-run incidents, where the driver fled the crash scene.

Looking at Fig. 1, the distribution of hit-and-run pedestrian accidents over the country is heterogeneous and clear patterns cannot be identified. Provinces with high and low hit-and-run rates are present in the North, in the Centre and in the South of the country. According to Table 2, the rate of hit-and-run for pedestrian crashes is at the highest mainly during the night (specifically from midnight to 4 am), during the weekend and in clear weather conditions. Also, the rate is higher in urban areas and on non-local streets. Given that there are many factors, beside social capital, that may

⁹ For a comprehensive description of the variables utilized to construct this measure, refer to Calcagnini et al. (2019).

Table 1 Description and summary statistics of the variables used in the estimations

Variable	Description	Mean	StdD	Min	Max	Obs
Hit-and-run	Dummy = 1 if the driver run after the accident	0.02	0.14	0	1	320,835
Social capital	Social Capital Index	0	1	- 4.88	1.69	320,835
Social capital (2)	Social Capital Index built without including the Collective Efficacy sub-index	0	1	- 2.79	1.97	320,835
Collective efficacy	Collective Efficacy Sub-Index (see Table 5)	0	1	- 11.01	1.08	320,835
Community health	Family Unity Sub-Index (see Table 5)	0	1	- 2.23	2.08	320,835
Institutional health	Community Health Sub-Index (see Table 5)	0	1	- 3.29	2.15	320,835
Urban	Dummy = 1 if the accident occurs in urban area (see table notes)	0.96	0.20	0	1	320,835
Clear weather	Dummy = 1 for accident occurred during good weather condition	0.80	0.40	0	1	320,835
Holiday	Dummy = 1 for accident occurred during national holidays	0.016	0.126	0	1	320,835
Two way road	Dummy = 1 for accident occurred on a two-way road type	0.65	0.48	0	1	320,835
Unemployment rate	Unemployment rate at the provincial level (in percentage)	8.26	4.66	2	25	320,835
Spending on safety	Per capita spending on road infrastructure at the provincial level (in euros)	136.13	86.15	32.30	726.22	320,835

Table 1 (continued)

Variable	Description	Mean	StdD	Min	Max	Obs
Vehicle density	Number of vehicles over population at the provincial level	0.84	0.09	0.6	1.7	320,835
Total death	Number of pedestrian deaths in the accident	0.04	0.19	0	4	320,835
Total injured	Number of pedestrians injured in the accident	1.13	0.46	0	13	320,835
Female pedestrian	Dummy = 1 if the victim is female (only if there is one pedestrian in the accident)	0.52	0.50	0	1	275,058
Age pedestrian	Age of the victim (only if there is one pedestrian in the accident)	48.38	25.14	0	98	275,058
Robustness						
Social capital (CGP)	Social Capital Index developed by Calcagnini et al. (2019)	0	1	- 2.84	1.75	320,835
Social capital (CP)	Social Capital Index developed by Calcagnini and Perugini (2019)	0	1	- 1.91	2.19	314,918
Social capital (FGSS)	Social Capital Index developed by Fini et al. (2011)	0	1	- 1.45	1.68	320,179

The social capital measures [social capital, social capital (2), collective efficacy, community health, institutional health, social capital (CGP), social capital (CP)], unemployment rate, spending on safety, vehicle density are defined at the provincial level. Social capital (FGSS) is defined at the regional level. See Table 5 for a detailed description of the sub-indexes' social capital definitions. Urban areas include streets in the inhabited center regardless of the type of street (i.e., urban, provincial, regional, or state road), while non-urban areas refers to streets outside the inhabited center and highways

be related to the propensity to flee after an accident, in what follows we also describe the rich set of control variables we use in the econometric analysis.

Concerning social capital indexes, the main right-hand-side variables of interest, these are standardized to make results easier to interpret, so they all have mean zero and standard deviation one. Figure 2 shows the *Social Capital* Index by province. As it has been widely documented by the literature on social capital, there is a geographical divide, with the Centre-North part of the country displaying higher levels of social

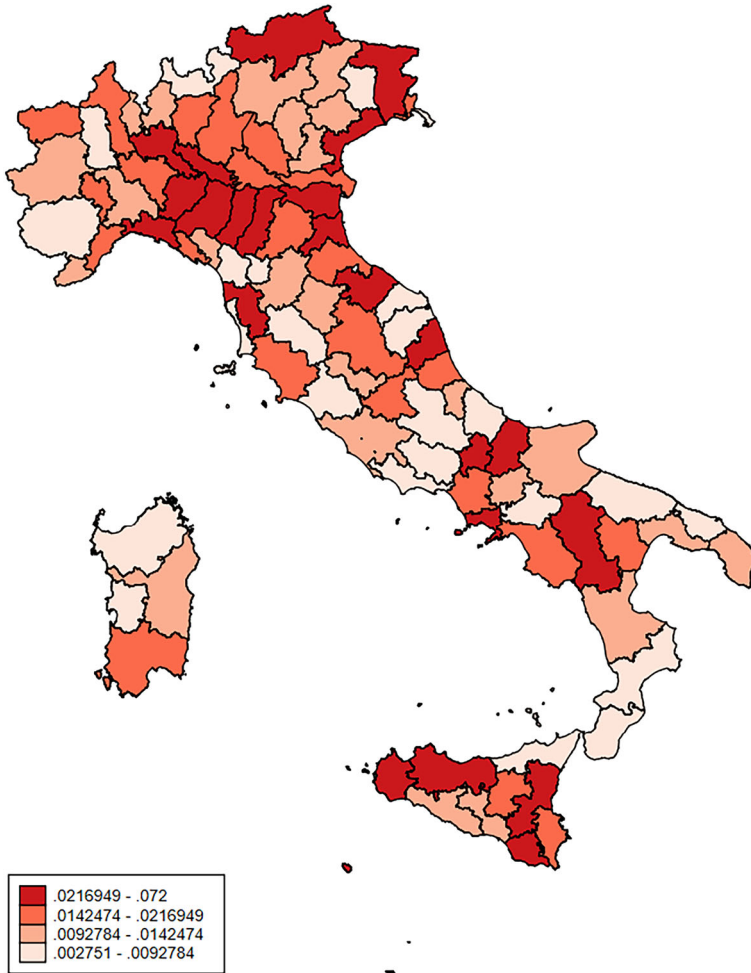


Fig. 1 Percentage of pedestrian hit-and-run accident in Italy, by province

capital. Studies such as Banfield (1958) and Putnam et al. (1994) indeed observed huge differences in social capital between the North and the South and used them to explain the economic divide.

As control variables, beside those related to the time when the accident happened, we use the type of street where the accident occurred (*Urban*), and the weather conditions (*Clear Weather*). We also account for road characteristics (*Two way Road*) and whether the accident took place during a holiday period (*Holiday*). These variables play a role in influencing the driver's decision to flee or stay at the accident scene, as indicated by previous studies (Solnick and Hemenway 1994, 1995; Johnson 1997; Tay et al. 2008, 2009; MacLeod et al. 2012). For instance, a crash in a rural area, under poor lighting, rain, and wind, could lead drivers to flee as there is a lower likelihood of being identified by witnesses. The variable *Holiday* partly captures alcohol and drugs

Table 2 Descriptive statistics

	Total accidents	Hit-and-run	% hit-and-run
	320,835	6766	2.11
Region			
North	177,819	4079	2.29
Centre	89,816	1272	1.42
South	53,200	1415	2.66
Time of day			
Midnight–3:59	8410	554	6.59
4:00–7:59 am	8217	315	3.83
8:00–11:59 am	85,543	1515	1.77
Noon–3:59 pm	66,066	1219	1.85
4:00–7:59 pm	101,187	1910	1.89
8:00–11:59 pm	42,444	1210	2.85
Period of week			
Weekday	230,513	4720	2.05
Weekend	83,556	2046	2.45
Season			
Winter	87,121	1929	2.21
Spring	73,988	1638	2.21
Summer	64,289	1347	2.10
Autumn	88,671	1852	2.09
Weather condition			
Clear weather	250,206	5686	2.27
No clear weather	63,863	1080	1.69
Type of area			
Inhabitant center	300,691	6514	2.17
Other	13,378	252	1.88
Type of street			
Non-local	282,497	6,269	2.22
Local	38,338	497	1.30

"Local street" includes only accidents occurring on urban streets and extra-urban municipal streets, while "Non-local Street" includes only accidents occurring on provincial, regional, or state streets (both within and outside inhabited centers) and highways.

consumption, which can affect the propensity to flee given the higher penalties under these conditions. We also control for local economic and infrastructural conditions by using the provincial unemployment rate (*Unemployment Rate*); the local per capita spending on road infrastructures (*Spending on Safety*); and the vehicle density (*Vehicle Density*). Moreover, we also use as controls, variables capturing the seriousness of the accident (the number of dead or injured pedestrians) and, for the large subset of accidents involving only one pedestrian, the characteristics of the victim, namely

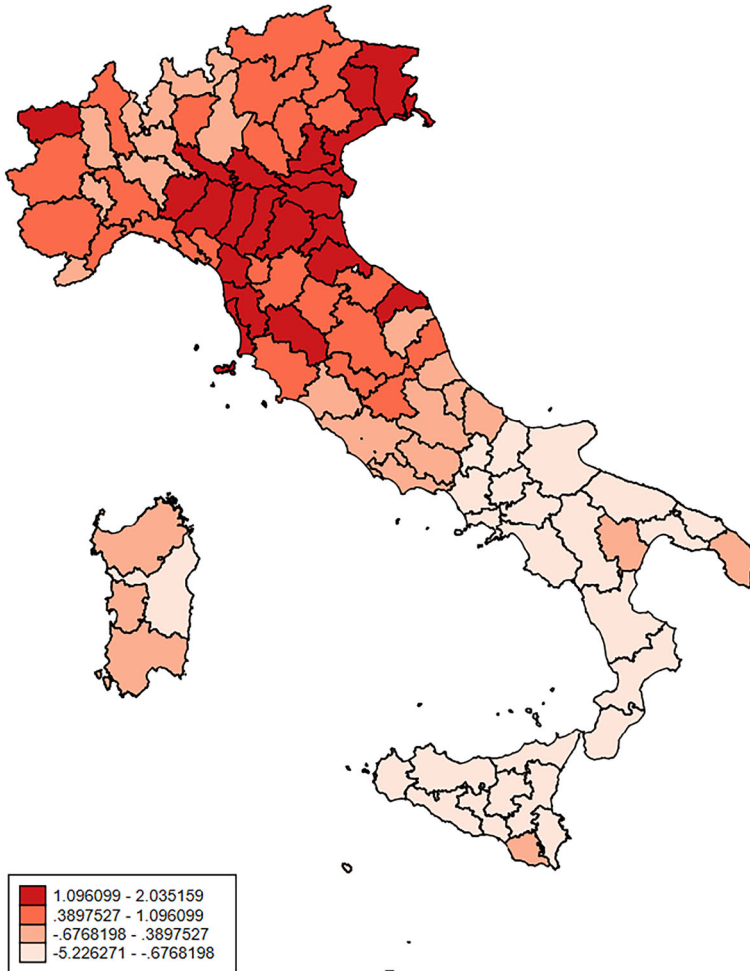


Fig. 2 Social Capital Index Scores in Italy, by province

gender (*Female Pedestrian*) and age (*Age Pedestrian*), as they may also influence the driver's behaviour.

4 Econometric Model

To test whether and to what extent the social capital endowment, measured at the province level, is associated with the likelihood of fleeing after a fatal accident involving a pedestrian, we estimate the following logit model, closely resembling the one estimated in CRT:

$$\begin{aligned}
\text{Prob}(\text{HitandRun}_i = 1|X) = F & \left(\beta_0 + \beta_1 \text{SocialCapital}_p \right. \\
& + \phi X_i + \zeta Z_p + \sum_{h=1}^{23} \gamma_h \text{Hour}_h + \sum_{d=1}^6 \gamma_d \text{Day}_d \\
& \left. + \sum_{m=1}^{11} \omega_m \text{Month}_m + \sum_{t=2000}^{2015} \sum_{s=1}^3 \alpha_{ts} \text{Year}_t * \text{MacroArea}_s \right) \quad (1)
\end{aligned}$$

The dependent variable is a dummy equal to 1 if the driver fled after the accident. The key regressor of the analysis is the social capital index (*Social Capital*), or alternatively the *Social Capital* (2), and its sub-indexes, in the province p where the accident occurred. As a robustness check, we use the alternative indexes mentioned above. Furthermore, we include a vector of control variables, X_i , that contains characteristics of the context in which the crash occurs and its characteristics such as *Urban*, *Clear Weather*, *Holiday*, and *Two-way Road*, *Total Deaths* and *Total Injured*. The vector Z include variables at the provincial level as *Unemployment Rate*, *Spending on Safety*, and *Vehicle Density*. Lastly, we add dummy variables to control for time and space fixed effects (hour of the day, day of the week, month of the year, and the interaction between year and macro-areas – that is North, Centre and South of Italy). As a robustness check, we have a specification controlling for characteristics of the accident victim (sex, age and age square) when there is a single one.

Table 3, columns 1–5, shows the results of the baseline regression (marginal effects and standard errors corrected for heteroskedasticity). Column 1 includes the overall social capital index (*Social Capital*) while, in columns 2–5, we replace the main indicator with the alternative social capital measure (*Social Capital* (2)) and the three sub-indexes (*Collective Efficacy*, *Community Health*, *Institutional Health*). Except for *Collective Efficacy*, which is not significant, the level of social capital has a negative and robust association with the probability of fleeing. Looking at column 1, one standard deviation increase in *Social Capital* is associated with a reduction in the probability of hit-and-run of around 12.5% (that is, a decrease of 0.0025 percentage points over a baseline of 0.02). The same results are obtained when focusing on accidents with only one pedestrian and adding controls related to the victims' characteristics (columns 6–10). With regard to the control variables, hit-and-run appears more likely to occur in urban areas, during holidays, with good weather conditions and with higher vehicle density. The positive coefficient for urban areas when looking at accidents with only one pedestrian involved is against the hypothesis we formulated, but in line with what found in other papers discussed in the previous sections (Solnick and Hemenway 1995; MacLeod et al. 2012; Castriota et al. 2023). The positive coefficient for clear weather is also unexpected. Here, the literature is rather mixed: Castriota et al. (2023) find a negative coefficient; Tay et al. (2009) report an insignificant coefficient, while Castriota and Tonin (2023) a positive one. A possible explanation for a positive coefficient could be, as noticed in Tay et al. (2008), that “factors that reduce the likelihood of blame or fault will also increase the likelihood of reporting crashes. Such mitigating factors include wet weather [...]”. Indeed, in our dataset rain is the dominant cause for lack of

Table 3 Estimation results

	Accidents with only one pedestrian									
	1	2	3	4	5	6	7	8	9	10
All accidents										
Social capital	-0.0025*** (0.000)					-0.0024*** (0.001)				
Social capital (2)		-0.0029*** (0.000)					-0.0028*** (0.001)			
Collective efficacy			0.0000 (0.000)					0.0000 (0.000)		
Community health				-0.0018*** (0.000)					-0.0015*** (0.001)	
Institutional health					-0.0033*** (0.000)					-0.0034*** (0.000)
Urban	0.0003 (0.001)	0.0003 (0.001)	0.0003 (0.001)	0.0003 (0.001)	0.0002 (0.001)	0.0036** (0.002)	0.0036** (0.002)	0.0036** (0.002)	0.0036** (0.002)	0.0035** (0.002)
Clear weather	0.0056*** (0.001)	0.0056*** (0.001)	0.0057*** (0.001)	0.0056*** (0.001)	0.0057*** (0.001)	0.0073*** (0.001)	0.0073*** (0.001)	0.0074*** (0.001)	0.0073*** (0.001)	0.0073*** (0.001)
Holiday	0.0086*** (0.002)	0.0086*** (0.002)	0.0085*** (0.002)	0.0085*** (0.002)	0.0086*** (0.002)	0.0074*** (0.002)	0.0074*** (0.002)	0.0074*** (0.002)	0.0074*** (0.002)	0.0074*** (0.002)
Two way road	-0.0044*** (0.001)	-0.0044*** (0.001)	-0.0045*** (0.001)	-0.0044*** (0.001)	-0.0043*** (0.001)	-0.0049*** (0.001)	-0.0048*** (0.001)	-0.0049*** (0.001)	-0.0049*** (0.001)	-0.0048*** (0.001)

Table 3 (continued)

	Accidents with only one pedestrian									
	1	2	3	4	5	6	7	8	9	10
Unemployment rate	-0.0010*** (0.000)	-0.0011*** (0.000)	-0.0007*** (0.000)	-0.0010*** (0.000)	-0.0009*** (0.000)	-0.0012*** (0.000)	-0.0013*** (0.000)	-0.0009*** (0.000)	-0.0011*** (0.000)	-0.0011*** (0.000)
Spending on safety	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)
Vehicle density	0.0319*** (0.003)	0.0317*** (0.003)	0.0324*** (0.003)	0.0323*** (0.003)	0.0294*** (0.003)	0.0343*** (0.004)	0.0341*** (0.004)	0.0348*** (0.004)	0.0347*** (0.004)	0.0317*** (0.004)
Total death	-0.0352*** (0.002)	-0.0352*** (0.002)	-0.0352*** (0.002)	-0.0352*** (0.002)	-0.0351*** (0.002)	-0.0352*** (0.002)	-0.0352*** (0.002)	-0.0352*** (0.002)	-0.0352*** (0.002)	-0.0352*** (0.002)
Total injured	-0.0282*** (0.001)	-0.0282*** (0.001)	-0.0281*** (0.001)	-0.0282*** (0.001)	-0.0282*** (0.001)	-0.0282*** (0.001)	-0.0282*** (0.001)	-0.0282*** (0.001)	-0.0282*** (0.001)	-0.0282*** (0.001)
Female pedestrian										
Age pedestrian										
Age pedestrian (squared)										
Observations	320,835	320,835	320,835	320,835	320,835	275,058	275,058	275,058	275,058	275,058
R ²	0.043	0.043	0.039	0.039	0.040	0.033	0.034	0.033	0.033	0.034

For the description of variables see Table 1. The dependent variable is hit-and-run. Estimation method: logit model. Results are expressed as marginal effects on the probability to flee after the accident. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The standard errors reported in parentheses are corrected for heteroskedasticity. Hour, days of the week, month, and year × macro area dummies always included but not reported

Table 4 Estimation results using alternative measures of Social Capital

	All accidents					
	1	2	3	4	5	6
Social capital (CGP)	-0.0022*** (0.000)	-0.0030*** (0.001)	-0.0022*** (0.000)	-0.0024*** (0.001)	-0.0031*** (0.001)	-0.0021*** (0.000)
Social capital (CFP)						
Social capital (FGSS)						
Urban	0.0005 (0.001)	0.0004 (0.001)	0.0001 (0.001)	0.0038** (0.002)	0.0036** (0.002)	0.0034** (0.002)
Clear weather	0.0058*** (0.001)	0.0053*** (0.001)	0.0056*** (0.001)	0.0074*** (0.001)	0.0070*** (0.001)	0.0073*** (0.001)
Holiday	0.0085*** (0.002)	0.0084*** (0.002)	0.0085*** (0.002)	0.0073*** (0.002)	0.0072*** (0.002)	0.0075*** (0.002)
Two way road	-0.0046*** (0.001)	-0.0045*** (0.001)	-0.0043*** (0.001)	-0.0051*** (0.001)	-0.0050*** (0.001)	-0.0047*** (0.001)
Unemployment rate	-0.0009*** (0.000)	-0.0012*** (0.000)	-0.0009*** (0.000)	-0.0011*** (0.000)	-0.0014*** (0.000)	-0.0010*** (0.000)
Spending on safety	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)	-0.0001*** (0.000)
Vehicle density	0.0315*** (0.003)	0.0314*** (0.003)	0.0297*** (0.003)	0.0338*** (0.004)	0.0338*** (0.004)	0.0322*** (0.004)
Total death	-0.0352*** (0.002)	-0.0350*** (0.002)	-0.0356*** (0.002)			
Total injured	-0.0281*** (0.001)	-0.0281*** (0.001)	-0.0283*** (0.001)			
Female pedestrian				-0.0053*** (0.001)	-0.0053*** (0.001)	-0.0054*** (0.001)
Age pedestrian				0.0006*** (0.000)	0.0006*** (0.000)	0.0006*** (0.000)
Age pedestrian (squared)				-0.0000*** (0.000)	-0.0000*** (0.000)	-0.0000*** (0.000)
Observations	320,835	314,918	320,179	275,058	269,933	274,483
R2	0.039	0.040	0.040	0.033	0.034	0.034

For the description of variables see Table 1. The dependent variable is hit-and-run. Estimation method: Logit model. Results are expressed as marginal effects on the probability to flee after the accident. Superscripts ***, ** and * denote statistical significance at the 1, 5 and 10 percent level, respectively. The standard errors reported in parentheses are corrected for heteroskedasticity. Hour, month, and year × macro area dummies always included but not reported

clear weather.¹⁰ Concerning other control variables, there is a lower likelihood to flee after the crash on two-way roads and in provinces with higher unemployment rates and per-capita spending on road infrastructures. Moreover, the number of dead and injured pedestrians in the accident show a negative coefficient, thus the probability of flying away decreases with the seriousness of the accident. Concerning the victim characteristics, female sex negatively influences the choice to leave the scene of the crash, while age has a non-linear effect in that the likelihood of fleeing is lower for young and old victims (the inflection point is at approximately at the age of 38).

In Table 4 we report the results obtained by using the three alternative measures of social capital discussed in Sect. 2. In columns 1–3 we consider the whole sample, while in columns 4–6 we focus on accidents with only one pedestrian. The findings related to the *Social Capital CGP* are in line with the previous results. Indeed, focusing on column 1, one standard deviation increase in *Social Capital CGP* is associated with a reduction in the probability of hit-and-run of around 11% (that is, a decrease of 0.0022 percentage points over a baseline of 0.02). The second alternative measure of social capital reported in column 2, that is, *Social Capital CP*, has a stronger impact, in that a one standard deviation increase is associated with a reduction in the probability of hit-and-run of around 15%. Lastly, results are also confirmed by accounting for *Social Capital FGSS*, defined in this case only at the regional level.

5 Conclusions

Using microdata on road accidents with injuries or fatalities involving pedestrians, we have shown a negative relationship between the likelihood of a driver fleeing and measures of social capital at the provincial level in Italy. The magnitude of this relationship is very similar to recent evidence from the US.

These results point to a role of social capital in guiding the behaviour of drivers in the dramatic circumstances immediately following an accident in which a pedestrian has been killed or injured. This suggests that social capital exerts its influence even in a fast, instinctive, and emotional setting, or "System 1" in the language of Kahneman (2011).

In terms of policy implications, these findings complement the existing literature and suggest that interventions targeted to promote civic norms and pro-social behaviour could thus have a beneficial impact across a wide range of domains, including road accidents. There may also be a role in campaigns aimed at reducing hit-and-run behaviour for appeals leveraging on social capital, for instance by underlining the impact of hit-and-runs on local communities or underlining the moral duty that people have towards each other to provide assistance in case of an accident. This, of course, would be a complement and not a substitute to more "traditional" measures like penalties and increased detection probabilities.

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¹⁰ In our dataset, 79.8% of accidents happens with clear weather, 12.6% in rainy conditions, 6.6% in what is classified as "other" weather conditions.

Declarations

Conflict of interest None.

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Appendix

See Table 5.

Table 5 Provincial level social capital indicators (Italy)

Indicators	Data source
Community Health Subindex	
The number of members and teams (per thousand inhabitants—year 2002) of EDP and CONI	Cartocci (2007)
The number of blood donors and donation (per thousand inhabitants—year 2002)	Cartocci (2007)
The number of no-sportive newspaper (per thousand inhabitants—year 2001–2002)	Cartocci (2007)
Institutional Health Subindex	
Voter turnout in referenda (1990–2016)	Ministry of the Interior website
Collective efficacy	
Voluntary homicide (per thousand inhabitants—years 2004–2016)	ISTAT

Source: Authors' elaboration

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