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Does Social Capital Make You Stay? Investigating the Relationship Between Community Values and Hit-and-Run Accidents in Sweden

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Abstract: Research on social capital has shown links between high social capital and various desirable outcomes. In this thesis we examine whether social capital impacts behaviour in the very stressful situations that are hit-and-runs. Previous research has shown evidence for such a relationship in the US and Italy, but no such study has been done in Sweden. We use voter turnout as a proxy for social capital, and in addition to that we also use an index over citizens' satisfaction with their municipalities, and the number of study associations to explore alternative measures of social capital. Using simple linear regressions, we find evidence of a negative relationship between social capital in and the rate of hit-and-runs in Swedish municipalities. These findings highlight the role of social capital in encouraging people to act in a way that benefits the community, even in stressful situations.

Keywords: Social Capital, Voter Turnout, Civic Engagement, Traffic Offenses, Hit-and-Run

JEL: D72, D91, K42, R41

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1. Introduction

Social capital refers to “features of social organization, such as networks, norms, and social trust, that facilitate coordination and cooperation for mutual benefit” (Putnam, 1995). While it is hard to measure, a community with high social capital will feature high trust in institutions and more civic engagement, and its inhabitants will participate in voluntary activities such as blood donations and charity to a larger extent. High social capital leads to positive outcomes through mechanisms such as effective social networks, collaboration, and mutual support.

This paper aims to study how social capital relates to traffic accidents where the people involved have escaped the site of the accident and/or failed to notify the proper authorities, which we will hereby refer to as hit-and-runs. This is a serious crime since it delays medical care for potential victims. Running from a traffic accident is often a split-second decision, which makes it stand out from other criminal offenses in the sense that it is not a premeditated crime, and the decision is made almost instinctively. A negative relationship between hit-and-runs and social capital shows the role of social capital in “guiding behavior (...) even in a fast, instinctive, and emotional setting” (Castriota et al., 2023). Communities with high social capital will foster higher levels of trust, mutual responsibility, and norms of accountability which is likely to create a higher sense of obligation within the driver. Additionally, we also believe that communities with high levels of civic engagement and trust in institutions will be more likely to trust the legal process rather than evade it.

We examine the relationship between hit-and-run incidents and social capital at the municipal level by conducting a simple linear regression analysis. Given that social capital is inherently intangible and challenging to measure, we use three proxies that we hypothesize to be strongly correlated with it as indicators of its level. They are: (1) Voter Turnout; (2) Satisfaction Index; and (3) Study Association Activities. We choose these based on our judgment of the available data, supported by literature evidence. We control for factors such as average monthly salary, urbanization level, population, and traffic density to isolate the effect of social capital on hit-and-run rates. Additionally, our paper is set on a period around the COVID-19 pandemic, which brings the necessity to investigate its impact on the studied data.

2. Literature Review

We have conducted a systematic literature review through a search in the SSE Library with keywords such as “social capital”, “hit-and-run”, and “traffic accidents”, among others to find papers relevant to this paper. A notable, and frequently referenced, contribution to the field was made in 1995 by Putnam who explores the erosion of social capital in the US and how this corresponds to negative effects on democracy, economic well-being, and individual happiness (Putnam, 1995). This paper draws on concepts outlined by Putnam, particularly his definition of trust within the context of social capital. Since then, numerous studies have been done on the subject, where correlations have been found between high measures of social capital and countless other positive outcomes. Some examples of this include correlations with perceived health (Fiorillo & Sabatini, 2015; Sundquist et al., 2014), economic growth (Knack & Keele, 1997), and juvenile delinquency (Binik & Cornelli, 2019).

From our review, we have only found two similar studies have been conducted in this field, examining the relationship between social capital and the number of hit-and-runs in the US and Italy, respectively (Castriota et al., 2023; Castriota et al., 2024). The first study used a social capital index provided by *The Geography of Social Capital in America* project, while the second constructed its index using the same methodology. Both studies reported a significant negative association between the level of social capital and the likelihood of a driver fleeing the scene of an accident. To our knowledge, no similar study has been conducted in Sweden, and the purpose of this paper is to fill that gap in the research.

The cultural context of Sweden differs in that it ranks higher overall on the social capital index than Italy and the US (Solability, 2023), and we expect the levels to be more homogeneous, given the smaller cultural differences between regions. A contribution of this paper is strengthening the validity and robustness of their findings by showing that the same relationship exists within a different cultural context.

3. Data Analysis

3.1. Methodology

We expect the relationship between hit-and-run incidents and social capital to be negative – an increase in social capital results in a decrease in hit-and-run incidents – thus we employ simple and multiple linear regression models to analyze the correlation between social capital and the incidence of hit-and-run incidents across Swedish municipalities. We do not expect any interactions between social capital and any control variable, thus no interaction term is included in the regressions.

3.1.1. Econometric model

The general form of the regression is the following:

$$\begin{aligned} \text{Hit-and-Run Rate}_i = & \beta_0 + \beta_1 \times \text{Social Capital Proxy}_i + \beta_2 \times \text{Urbanization Level}_i \\ & + \beta_3 \times \text{Vehicles in Traffic}_i + \beta_4 \times \text{Newly Registered Cars}_i \\ & + \beta_5 \times \text{Average Monthly Salary}_i + \beta_6 \times \text{Population}_i + \epsilon_i \end{aligned}$$

Where:

- *Hit-and-Run Rate* is the number of hit-and-run incidents per 1,000 inhabitants in municipality i .
- *Social Capital Proxy* represents one of the proxies: Voter Turnout, Satisfaction Index, or Study Association Activities.
- β_0 is the intercept, and β_1 is the coefficient of interest, and β_2 to β_6 are the control variable coefficients, which are not relevant to this study.
- ϵ_i is the error term.

Each social capital proxy is analyzed in separate regression models to evaluate its effect on hit-and-run rates, including both regressions with and without control variables. Statistical significance is assessed using robust standard error estimates for each coefficient, with significance levels set at 1%, 5%, and 10%.

3.1.2. Robustness Checks

To ensure the reliability of our results, we also conducted several robustness checks, looking specifically at the non-trivial amount of outliers present in the data and the overall model-data fit.

- **Outlier Analysis**

Outliers can have a significant impact on regression results by disproportionately influencing parameter estimates, potentially biasing estimates, and reducing the robustness of a conclusion. In our dataset, certain municipalities have high values in variables such as population and number of registered vehicles, which might lead to outliers who skew the overall dynamic between the variables of interest. To address this concern, we use the Interquartile Range (IQR) to identify and exclude both extreme¹ and mild² outliers, checking whether the relationships between social capital proxies and hit-and-run incidents are not driven solely by extreme values in the data.

- **Logarithmic regression model**

To test the assumption of linearity between the variables, we explore a non-linear specification and check for better model fit. We use a log-log regression model, where both the dependent and independent variables are transformed using natural logarithms, reducing the impact of extreme values in the data spread.

- **COVID analysis**

To examine whether the COVID pandemic and distancing/agglomeration have impacted social behavior enough to influence our results, we conduct regressions before, during, and after COVID-19. We define Before COVID as 2018 and 2019, During COVID as 2020–2022, and After COVID as 2023–.

- **Severity of accident**

Our main regression uses total hit-and-run incidents independent of whether material damage has occurred or not. We will check whether the relationship changes depending on whether the hit-and-run accident had severe damage or not. Further discussion on the hit-and-run data is made in the next section.

¹ $< Q1 - 3 * IQR$ or $> Q3 + 3 * IQR$

² $< Q1 - 1.5 * IQR$ or $> Q3 + 1.5 * IQR$

3.2. Data Description

We have a total of 10 variables used in the main regressions. All variables are obtained through Statistics Sweden *Statistiska Centralbyrån (SCB)*, except for the dependent variable, hit-and-run incidents, which are obtained through the Swedish National Council for Crime Prevention *Brottsförebyggande rådet (Brå)*.

Variable	Mean	Median	Std Dev	Min	Max	Obs	Source
Dependent Variable							
Hit and Run Incidents per 1,000 population	1.66	1.41	0.92	0.07	6.76	289	Brottsförebyggande rådet (Brå)
Social Capital Proxies							
Average Voter Turnout	83.73	84.00	3.40	65.08	92.32	289	Statistiska centralbyrån (SCB)
Average Satisfaction Index	51.21	50.87	5.01	38.08	65.70	265	Statistiska centralbyrån (SCB)
Average Student Association Activities per 1,000 population	64.76	58.19	42.48	4.08	352.98	289	Statistiska centralbyrån (SCB)
Control Variables							
Average Monthly Salary	32129.30	31900.00	1375.64	29250.00	38183.33	289	Statistiska centralbyrån (SCB)
Population	25715.57	11273.00	56061.23	1616.33	736030.83	289	Statistiska centralbyrån (SCB)
Urbanisation Rate	76.77	78.00	13.83	38.50	100.00	289	Statistiska centralbyrån (SCB)
Number of Urban Areas	7.27	6.00	5.31	1.00	30.00	289	Statistiska centralbyrån (SCB)
Number of Vehicles	27575.61	16928.00	38480.81	3942.00	488897.17	289	Statistiska centralbyrån (SCB)
Newly Registered Cars	1113.64	317.00	3795.37	9.17	57128.67	289	Statistiska centralbyrån (SCB)

Table 1: *Summary Statistics of All Variables Used in the Regression Models.*

3.2.1. Hit-and-Run Incidents

The data over hit-and-runs, known as *smitningar* in Swedish, are currently reported by the Swedish National Council for Crime Prevention (Brottsförebyggande rådet - Brå) under crime codes 3007³ and 3008⁴, which respectively include incidents with both major personal injury,

³ “Hit-and-run from the scene of a traffic accident, with significant property damage, personal injury or death”

⁴ “Hit-and-run from the scene of a traffic accident, with no or minor material and personal damage”

death and/or material damages; and minor material and/or personal damages. We have chosen to include both crime codes to increase data points and improve the precision of the main regressions by lessening the impact of random variability. The data is available on a municipal level which is where our analysis will take place. Unlike other countries like the US and Italy, where similar studies have been undertaken using data only relating to personal injury and/or death (Castriota et al., 2023 & 2024), the definition of hit-and-runs in Swedish crime reporting is far loose in the sense that it includes accidents where there has only been material damage, which might inflate the number of total incidents registered. This difference is important when interpreting our results in the context of existing literature.

The Swedish Police's reporting of hit-and-runs has changed twice in the past decade, most recently in 2018 (Brå, 2024), making it impossible to compare data across different reporting periods due to variations in crime categorization. The current reporting system, implemented in 2018, defines the temporal scope of this thesis. Of Sweden's 290 municipalities, data is available for 289, and all analyses will focus exclusively on these municipalities to minimize bias.

We must also assume that all drivers involved in a hit-and-run incident are residents of the municipality in which that incident happened due to a lack of reliable and detailed information on people and vehicles involved in the traffic accidents.

3.2.2. Social Capital Proxies

Social capital is a very multifaceted concept, and quantifying it is no straightforward task. Some past studies have had access to detailed social capital indices (Castriota et al., 2023; 2024) and others have used numerous creative ways to quantify social capital, such as the number of blood donations (Buonanno et al., 2009) trust in others (Narayan & Pritchett, 1997), and the number of social meetings between individuals (Fiorillo & Sabatini, 2015). In this thesis, we will be using three proxies: Voter Turnout, a Satisfaction Index, and Study Association Activities.

Proxy 1: Voter Turnout

Voter turnout is defined here as the percentage of eligible voters who participated in municipal, regional, and national elections in 2018 and 2022 relative to the total number of eligible voters. The use of voter turnout as a proxy for social capital is supported by previous research, notably

by Sundquist et al. (2014) where the authors argue that “the devolved nature of government in Sweden” and the “very stable” voting patterns in Sweden make it a good indicator of neighborhood social capital.

Additionally, we conducted a cross-country analysis to examine the relationship between voter turnout and several indicators of social capital. We found that Voter Turnout has a positive correlation to the number of blood donations for members of the European Blood Alliance. Furthermore, we identified a significant positive relationship between Voter Turnout and the social capital scores assigned to countries in the Solability Global Sustainable Competitiveness Index. Notably, this relationship was even stronger when focusing solely on European countries, which we find particularly relevant given their cultural proximity to Sweden. See Appendix A for more details.

Proxy 2: Satisfaction Index

In addition to voter turnout another commonly used proxy for social capital is trust in institutions. To capture this, we constructed a Satisfaction Index using data from the annual citizen survey *Medborgarundersökningen* conducted by Statistikmyndigheten (SCB), which measures residents' perceptions of their local municipality, focusing on their overall satisfaction in key areas of education, services, safety, integration, trust, and perceived influence, among others (SCB, n.d.). This aligns with Putnam’s perspective that “trust necessary to back cooperation is not blind; it contains a prediction about the behavior of an independent actor” (Putnam, 1993a, 2000, 2001, as cited by Häuberer, 2011), making our approach a more nuanced measure of trust in the context of social capital.

Since participation in the survey is voluntary for municipal governments, there are some yearly variations in participation, with 24 municipalities not participating at all during the 2010–2020 period (see Appendix C for details). Consequently, our analysis is based on the 262 municipalities for which we have both hit-and-run and survey data.

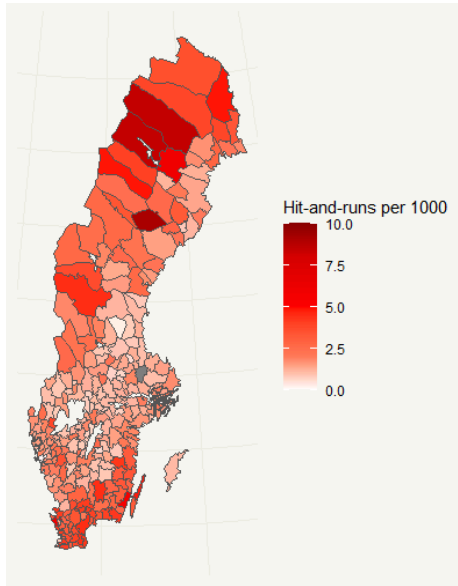
Proxy 3: Study Association Activities

Study associations, known in Swedish as *studieförbund*, are organizations in Sweden that provide adult education and promote cultural and social activities. Voluntary participation in

activities organized by these study associations reflects civic engagement and social interaction, key components of social capital (Putnam, 1995).

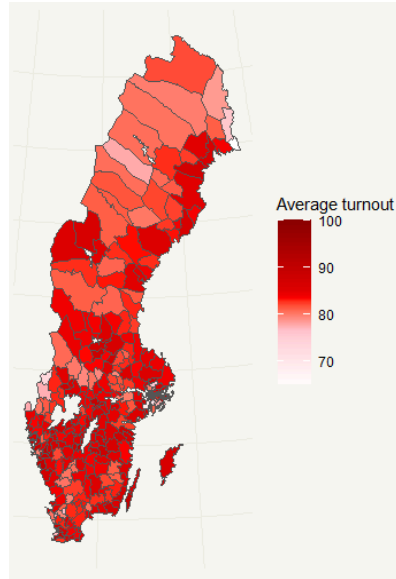
We collected data on the number of activities organized by study associations in each municipality from 2019 to 2023. However, the data contains significant year-to-year fluctuations. For example, Uppsala's activities decreased from 1,304 in 2019 to 431 in 2023, and Vallentuna's activities decreased from 370 to 85 over the same period. These fluctuations may counteract the idea that social capital is relatively stable over time, suggesting that this proxy may capture short-term variations rather than long-term levels of social capital.

3.2.3. Heatmaps



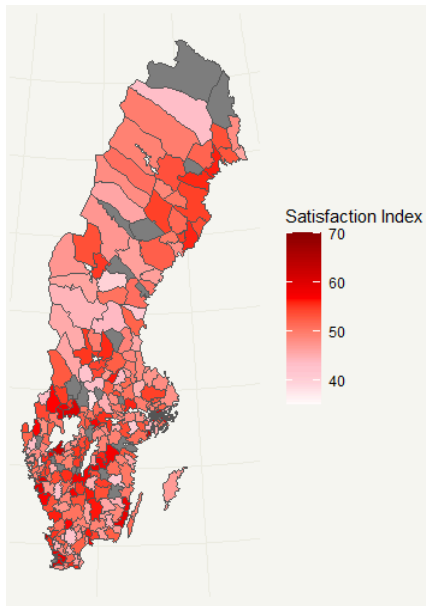
A. Hit-and-runs per 1000 inhabitants on a municipal level.

Data source: Brå (2018-2023).



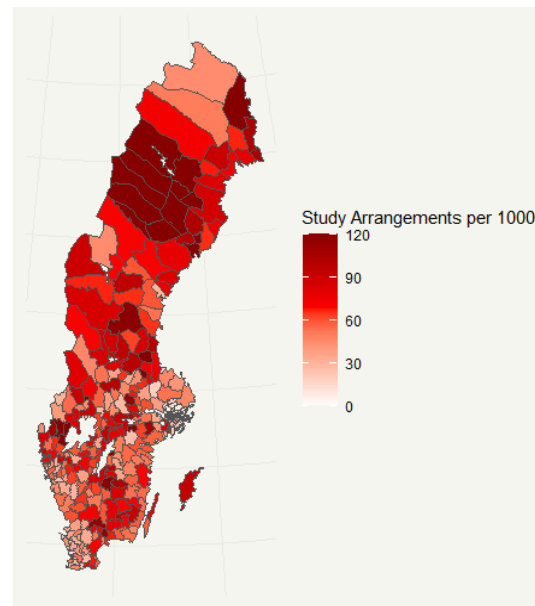
B. Voter turnout (%) at municipal, regional, and national elections in 2018 and 2022.

Data source: SCB (2018-2022).



C. Average Satisfaction Index

Data source: SCB (2010-2020).



D. Average Study Association Activities.

Data source: SCB (2019-2023).

Figure 1: Heatmaps showing hit-and-runs and all proxies for each municipality in Sweden.

Generated using the *swemaps2* R-package created by GitHub user filipwastberg.

3.2.4. Control Variables

To isolate the effects of social capital on hit-and-run incidents, we have included several control variables in our regressions which should account for other factors that might influence the rate of hit-and-run incidents across municipalities. All data has been retrieved from SCB. The control variables are:

- *Average monthly salary* - might influence the propensity to commit a hit-and-run, as economic stress or wealth levels could affect moral decision-making or perceptions of legal consequences.
- *Population size* - may influence the number of traffic incidents due to higher numbers of drivers and pedestrians.
- *Urbanization level* - urban areas tend to have higher traffic volumes, which could increase the chance of traffic accidents. Additionally, the anonymity afforded by larger urban centers might influence a driver's decision to flee the scene of an accident. Measured by the proportion of the population living in urban areas and the urbanization growth rate.
- *Traffic density* - Measured by total vehicles in traffic and newly registered passenger cars. A higher flow of vehicles on the road increases the potential for accidents to occur while newly registered cars may reflect changes in mobility patterns or economic activity.

3.3. Data Manipulation

The data manipulation process undertaken in this study involved several steps to prepare and integrate multiple datasets for analysis. This section outlines each step in detail, highlighting the methods and rationale behind the data cleaning, transformation, and merging procedures.

3.3.1. Data Cleaning

The Excel files obtained from both *Brottsförebyggande rådet (Brå)* and *Statistiska centralbyrån (SCB)* had unnecessary non-numeric columns and rows which are excluded when importing to R. All null or non-existent values are converted to NA for the regressions. All text in Swedish is translated to English. Variable and column names are renamed for simplicity and consistency. We separated the municipality name and codes into two different columns to be used as key identifiers for which municipality a specific set of data is from.

3.3.2. Dataset Aggregation

All regressions are done using a final R data frame which aggregates all datasets. We organized and aligned all data using the key identifiers of the municipality names and their codes, removing any non-unique duplicates created in the process.

3.3.3. Data Normalization

Key metrics are calculated to normalize the data and create variables that are more suitable for analysis. Total hit-and-run incidents are summed across offense types (3007 and 3008) and years (2018-2023) for each municipality. A similar process is done for all other variables, where we took the total average for the available period and specific municipality, only creating a per capita metric for hit-and-run incidents and study association activities. Voter Turnout is calculated by taking the total average across parliamentary, regional, and municipal election participation in the years 2018 and 2022.

4. Results & Discussion

This study's primary aim is to investigate the relationship between social capital and the incidence of hit-and-run accidents across Swedish municipalities. We use three different social capital proxies in our analysis, and the regression outcomes are summarized in Table 2 below.

Consolidated Regression Results for Social Capital Proxies						
	Hit-and-run incidents per 1,000 population					
	(1)	(1)	(2)	(2)	(3)	(3)
Voter Turnout (%)	-0.065*** (0.018)	-0.078*** (0.020)				
Satisfaction Index			-0.020** (0.009)	-0.014 (0.012)		
Student Association Activities					0.005*** (0.002)	0.005** (0.002)
Controls	No	Yes	No	Yes	No	Yes
Observations	289	289	265	265	289	289
R ²	0.057	0.128	0.014	0.048	0.048	0.090
Adjusted R ²	0.053	0.106	0.010	0.022	0.045	0.068
<i>Note:</i>			* p<0.1; ** p<0.05; *** p<0.01			

Table 2: *Regression Results for All Social Capital Proxies.* Data sources: Brå (2018-2023), SCB (2018-2022, 2010-2020, 2019-2023).

The results reveal a statistically significant negative relationship between Voter Turnout and hit-and-runs. The relationships between hit-and-runs and the other two proxies – Satisfaction Index and Study Association Activities – are less robust as their significance drops once control variables are included. The positive relationship between student association activities and hit-and-runs is curious and raises further questions about the robustness of the relationship which we will further explore in this study. Two highlights from the regression results are: (1) the fact that the magnitude does not change much after introducing controls, which contributes to a stronger relationship between the variables studied, and (2) the explanatory power of the model nearly doubles with the addition of controls.

4.1. Voter Turnout

This proxy is the percentage of citizens eligible to vote who voted relative to the total eligible population. The linear plot (Figure 2) highlights the negative relationship between social capital and Voter Turnout, meaning a 1% increase in Voter Turnout is associated with a decrease in hit-and-run incidents by approximately 0.078 incidents per 1,000 inhabitants. For example, in a municipality with a population of 50,000, a 1% increase in Voter Turnout could see a reduction in hit-and-run incidents by approximately 4 cases per year.

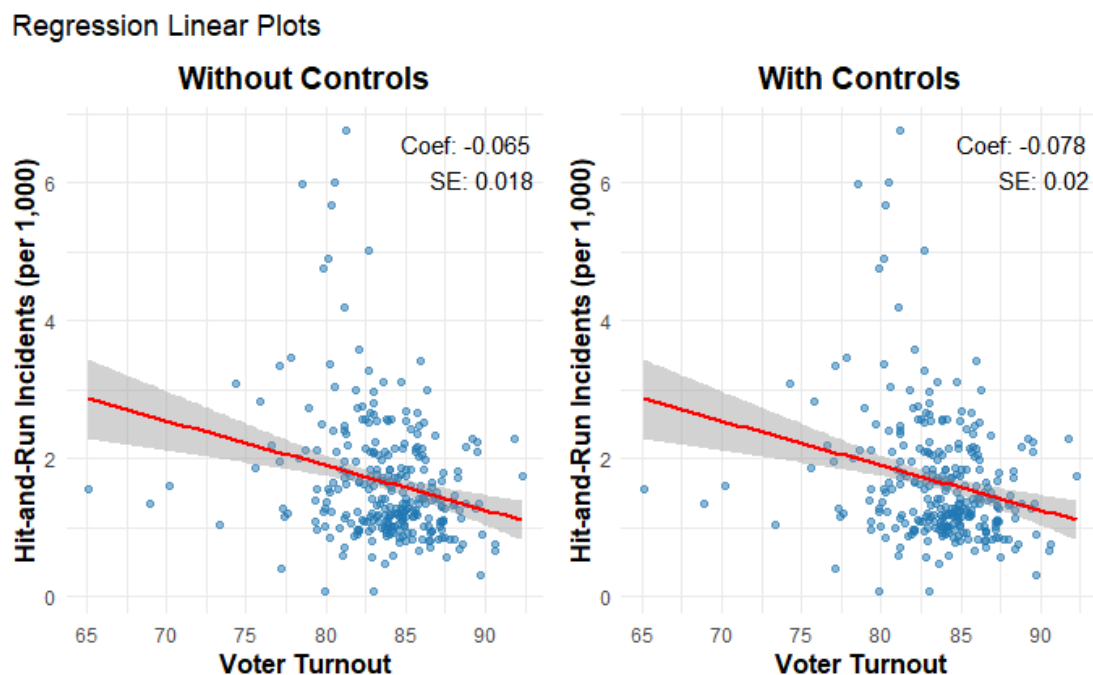


Figure 2: *Linear Plot Regression - Voter Turnout x Hit-and-Run Incidents Per 1,000 Inhabitants.*

Data sources: Brå (2018-2023), SCB (2018-2022).

4.2. Satisfaction Index

This proxy is an aggregate satisfaction index score derived from three municipal citizen surveys that measure several aspects of citizen satisfaction with their municipality, such as trust, perceived influence, and general local government satisfaction. The linear plot (Figure 3) highlights a negative relationship between the Satisfaction Index and hit-and-run incidents, with a 1-unit increase in the Satisfaction Index associated with a decrease of approximately 0.014 incidents per 1,000 inhabitants. For instance, in a municipality with a population of 50,000, an

increase of one unit in the Satisfaction Index could see a reduction of approximately 0.7 hit-and-run incidents per year.

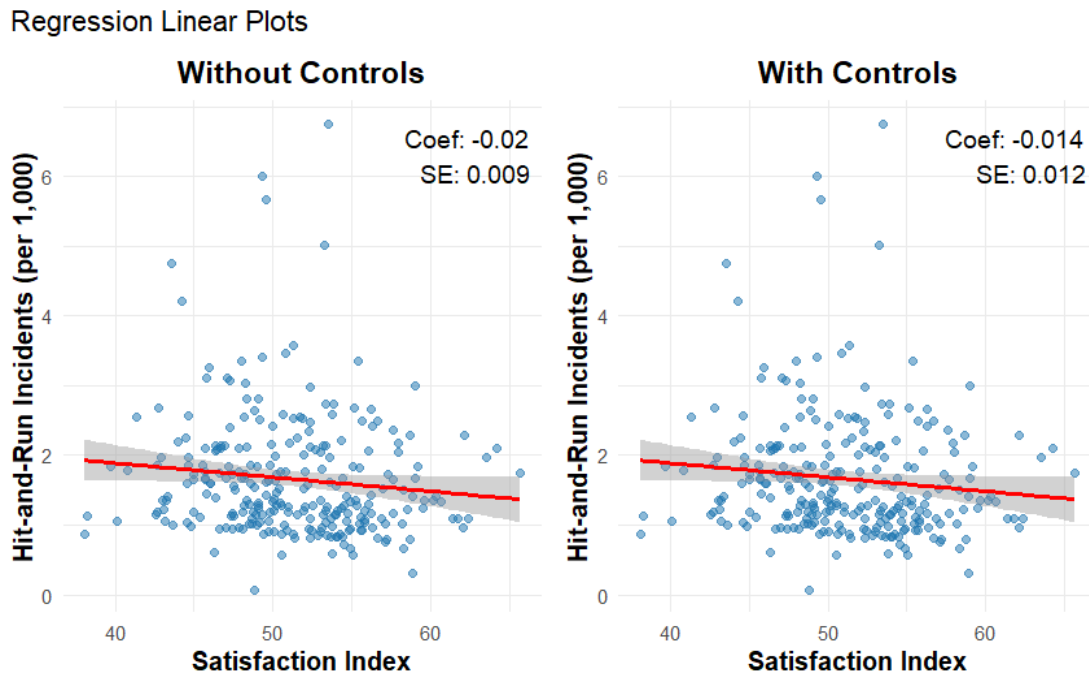


Figure 3: *Linear Plot Regression - Satisfaction Index x Hit-and-Run Incidents Per 1,000 Inhabitants.* Data sources: Brå (2018-2023), SCB (2010-2020).

4.3. Study Association Activities

This proxy measures overall participation in activities organized by study associations. The linear plot (Figure 4) suggests a positive relationship between study association activities and hit-and-run incidents, where a 1% increase in participation is associated with an increase of approximately 0.005 incidents per 1,000 inhabitants. For example, in a municipality with a population of 50,000, a 1% increase in study association activities could result in approximately 0.25 additional hit-and-run incidents per year. However, robustness checks indicate this relationship weakens significantly when outliers are removed, suggesting the initial positive trend may not be reliable.

Regression Linear Plots

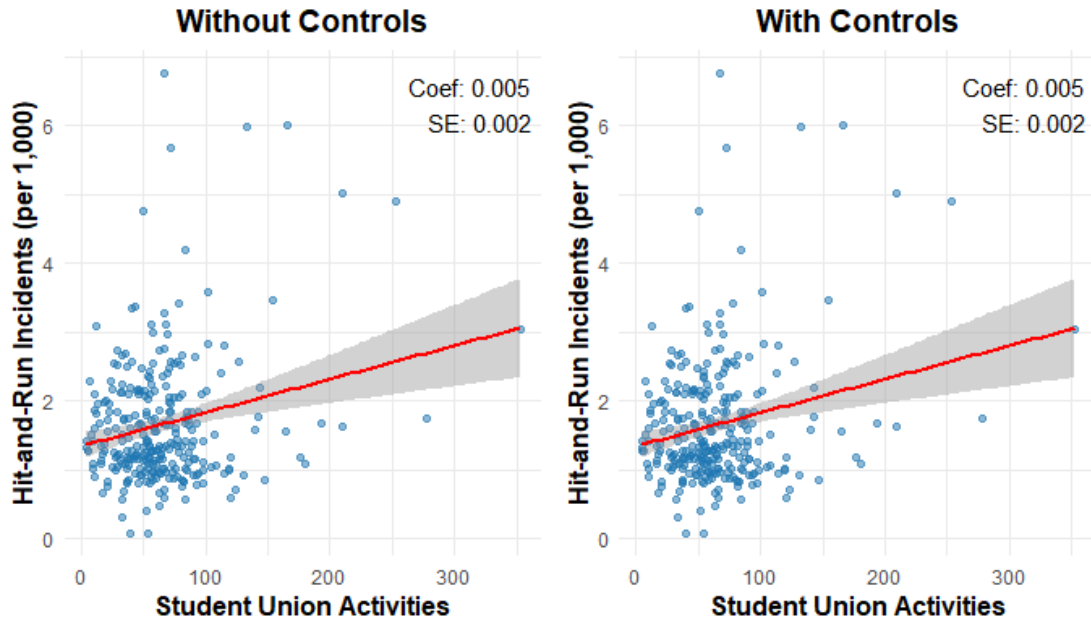


Figure 4: *Linear Plot Regression - Study Association Activities x Hit-and-Run Incidents Per 1,000 Inhabitants.* Data sources: Brå (2018-2023), SCB (2019-2023).

4.4. Robustness Checks

A series of robustness checks are performed to assess the reliability and validity of the presented results. These checks address concerns related to outliers, model-data fits, and other circumstances like the COVID-19 pandemic and the degree of severity of the incident.

4.4.1. No extreme outliers

From Table 3, The removal of extreme outliers⁵ resulted in magnitudes becoming more negative relative to the main regression. The significance for Voter Turnout and the Satisfaction Index has not changed while the significance for the study associations has been eliminated, suggesting that the original relationship was mainly driven by the municipalities with more extreme activity counts. We can also see changes in the explanatory power for each of the proxies – the first two proxies have similar explanatory power as previously, while the third proxy loses most of it. See Appendix D.1 for more information.

⁵ $< Q1 - 3 * IQR$ or $> Q3 + 3 * IQR$

Consolidated Regression Results for Social Capital Proxies (no extreme outliers)

	Hit-and-run incidents per 1,000 population					
	(1)	(1)	(2)	(2)	(3)	(3)
Voter Turnout (%)	-0.081*** (0.021)	-0.103*** (0.023)				
Satisfaction Index			-0.025** (0.010)	-0.020 (0.013)		
Student Association Activities					0.002 (0.002)	0.002 (0.003)
Controls	No	Yes	No	Yes	No	Yes
Observations	234	234	234	234	234	234
R ²	0.080	0.142	0.020	0.049	0.007	0.043
Adjusted R ²	0.076	0.115	0.016	0.020	0.002	0.014
<i>Note:</i>			*p<0.1; **p<0.05; ***p<0.01			

Table 3: *Regression Results for All Social Capital Proxies Without Extreme Outliers.* Data sources: Brå (2018-2023), SCB (2018-2022, 2010-2020, 2019-2023).

4.4.2. No mild outliers

From Table 4, we can see that the removal of mild outliers⁶ shows less pronounced effects but magnitudes become even more negative than previously. This robustness check further emphasizes the robustness of the Voter Turnout proxy as significance has not dropped. Outside of magnitude, the Satisfaction Index proxy is performing like previously, while Study Association Activities further approaches zero magnitude with no significance, weakening this proxy even further. We can see that the explanatory power for the first two proxies increases even further than before. See Appendix D.2 for more information.

⁶ < Q1 - 1.5 * IQR or > Q3 + 1.5 * IQR

Consolidated Regression Results for Social Capital Proxies (no mild outliers)						
	Hit-and-run incidents per 1,000 population					
	(1)	(1)	(2)	(2)	(3)	(3)
Voter Turnout (%)	-0.095*** (0.028)	-0.111*** (0.028)				
Satisfaction Index			-0.028** (0.012)	-0.024 (0.015)		
Student Association Activities					0.001 (0.002)	0.001 (0.002)
Controls	No	Yes	No	Yes	No	Yes
Observations	179	179	179	179	179	179
R ²	0.081	0.156	0.024	0.069	0.001	0.054
Adjusted R ²	0.076	0.121	0.019	0.031	-0.005	0.016
<i>Note:</i>			* p<0.1; ** p<0.05; *** p<0.01			

Table 4: *Regression Results for all Social Capital Proxies without mild outliers.* Data sources: Brå (2018-2023), SCB (2018-2022, 2010-2020, 2019-2023).

4.4.3. Log Regressions

Given a potential non-linear distribution of the data, we use a log-log regression to verify it and to mitigate the effect of extreme values. Table 5 shows the results of this regression. Our first proxy – Voter Turnout – has its negative correlation preserved with even higher coefficients, further reinforcing the robustness of this proxy for social capital. The second proxy – Satisfaction Index – maintains its negative correlation and shows significance once controls are introduced. Our third and final proxy still has a positive relationship correlation. A very interesting piece of information can be found in the figures for R² and adjusted R² in the Voter Turnout regression with controls – they have respectively been raised from 12.8% to 23.6% and 10.6% to 21.7%, which indicates an improvement in model fit from the original linear model from the main regression of this study. For supplementary information, see Appendix E.

Consolidated Log Regression Results for Social Capital Proxies						
	Log of Hit-and-run incidents per 1,000 population					
	(1)	(1)	(2)	(2)	(3)	(3)
Log Voter Turnout	-1.577*** (0.473)	-2.169*** (0.532)				
Log Satisfaction Index			-0.384** (0.164)	-0.328* (0.192)		
Log Student Association Activities					0.050** (0.026)	0.007 (0.032)
Controls	No	Yes	No	Yes	No	Yes
Observations	289	289	265	265	289	289
R ²	0.049	0.236	0.017	0.145	0.013	0.156
Adjusted R ²	0.045	0.217	0.014	0.121	0.010	0.135
<i>Note:</i>			*p<0.1; **p<0.05; ***p<0.01			

Table 5: *Regression Results for All Social Capital Proxies Using a Log Regression Instead of a Linear Regression.* Data sources: Brå (2018-2023), SCB (2018-2022, 2010-2020, 2019-2023).

4.4.4. COVID-19

The studied period covers before, during, and after the COVID-19 pandemic, which potentially affected social behavior and, consequently, the relationship between social capital and hit-and-run incidents. We focus on the results without controls as several controls are not present throughout the entire period, which could lead to a biased estimate.

- **Voter Turnout**

From the regression results (Table 6), we see that across all periods the relationship is negative and significant, and hovers around an average of -0.065, without much deviation from the main regression. The biggest variation happens after COVID-19, which might warrant a future investigation on whether the pandemic has had a long-term impact on the relationship between voter turnout and hit-and-run incidents than we can currently see at the time of this study.

Regression Results without Controls				
	<i>Dependent variable:</i>			
	Hit-and-Run Incidents (per 1,000)			
	Before	During	After	Total
Voter Turnout (%)	-0.066** (0.021)	-0.065*** (0.018)	-0.061*** (0.016)	-0.065*** (0.018)
Observations	289	289	289	289
R ²	0.041	0.059	0.056	0.057
Adjusted R ²	0.037	0.055	0.053	0.053
<i>Note:</i>	*p<0.05; **p<0.01; ***p<0.001			

Table 6: *Voter Turnout Regression Results For All COVID Periods.* Data sources: Brå (2018-2023), SCB (2018-2022).

- **Satisfaction Index**

The results (Table 7) indicate that while the relationship remains negative across all periods, the coefficients are only significant during the pandemic and for the overall period. The variation is also higher compared to Voter Turnout, making this proxy less reliable and robust.

Regression Results without Controls				
	<i>Dependent variable:</i>			
	Hit-and-Run Incidents (per 1,000)			
	Before	During	After	Total
Average Satisfaction Index	-0.018 (0.011)	-0.024** (0.009)	-0.012 (0.009)	-0.020* (0.009)
Observations	265	265	265	265
R ²	0.008	0.021	0.005	0.014
Adjusted R ²	0.004	0.017	0.002	0.010
<i>Note:</i>	*p<0.05; **p<0.01; ***p<0.001			

Table 7: *Satisfaction Index Regression Results For All COVID Periods.* Data sources: Brå (2018-2023), SCB (2010-2020).

- **Study Association Activities**

From Table 8, we still see a positive relationship with little to no variation in the magnitude, which indicates that COVID-19 has not significantly affected this proxy in the analysis.

Regression Results without Controls				
	<i>Dependent variable:</i>			
	Hit-and-Run Incidents (per 1,000)			
	Before	During	After	Total
Student Association Activities	0.004* (0.001)	0.004* (0.002)	0.005** (0.002)	0.005** (0.002)
Observations	289	289	289	289
R ²	0.060	0.027	0.040	0.048
Adjusted R ²	0.057	0.023	0.037	0.045
<i>Note:</i>	*p<0.05; **p<0.01; ***p<0.001			

Table 8: *Study Association Activities Regression Results For All COVID Periods.* Data sources: Brå (2018-2023), SCB (2019-2023).

4.4.5. Hit-and-Run Severity

To test whether the relationships between social capital proxies and hit-and-run incidents vary by the severity of hit-and-run incidents, we conduct two separate regressions: One where the hit-and-run cases involve only severe damage (crime code 3007⁷) and the other where there is little to no damage (crime code 3008⁸).

Our robustness check for accident severity suggests that social capital has a smaller effect on incidents with severe material or personal damage, while their counterparts with little to no damage experience an increased effect. Voter Turnout maintains a significant negative relationship with both severe and minor cases, but the effect is more pronounced in less severe incidents (coefficients ranging from -0.103 to -0.129). The Satisfaction Index shows a significant negative relationship with severe hit-and-run incidents (coefficients of -0.009 and -0.008, significant at the 1% level). However, this relationship is not statistically significant in minor cases. For severe damage cases, study association activities have a small positive coefficient (0.001) significant at the 10% level, while in minor cases, the coefficients increase to 0.008 and 0.009 with higher significance levels (1% and 5%).

Consolidated Regression Results for Social Capital Proxies (Severe only)						
	Hit-and-run incidents per 1,000 population					
	(1)	(1)	(2)	(2)	(3)	(3)
Voter Turnout (%)	-0.026*** (0.005)	-0.028*** (0.005)				
Satisfaction Index			-0.009*** (0.003)	-0.008** (0.003)		
Student Association Activities					0.001*** (0.0005)	0.001* (0.001)
Controls	No	Yes	No	Yes	No	Yes
Observations	289	289	265	265	289	289
R ²	0.100	0.206	0.030	0.115	0.045	0.119
Adjusted R ²	0.097	0.186	0.026	0.091	0.042	0.097
<i>Note:</i>			* p<0.1; ** p<0.05; *** p<0.01			

Table 9: Regression Results For Hit-and-run Incidents With Only Severe Damage. Data sources: Brå (2018-2023), SCB (2018-2022, 2010-2020, 2019-2023).

⁷ “Hit-and-run from the scene of a traffic accident, with significant property damage, personal injury or death”

⁸ “Hit-and-run from the scene of a traffic accident, with no or minor material and personal damage”

Consolidated Regression Results for Social Capital Proxies (No damage)						
	Hit-and-run incidents per 1,000 population					
	(1)	(1)	(2)	(2)	(3)	(3)
Voter Turnout (%)	-0.103*** (0.033)	-0.129*** (0.036)				
Satisfaction Index			-0.032* (0.017)	-0.021 (0.022)		
Student Association Activities					0.008*** (0.003)	0.009** (0.004)
Controls	No	Yes	No	Yes	No	Yes
Observations	289	289	265	265	289	289
R ²	0.044	0.107	0.010	0.040	0.043	0.082
Adjusted R ²	0.041	0.085	0.006	0.013	0.039	0.060
<i>Note:</i>			*p<0.1; **p<0.05; ***p<0.01			

Table 10: *Regression Results For Hit-and-run Incidents With Little to No Damage.* Data sources: Brå (2018-2023), SCB (2018-2022, 2010-2020, 2019-2023).

5. Conclusion

The objective of this thesis is to investigate the relationship between social capital and hit-and-runs, with evidence supporting a negative correlation. Among the three proxies examined - Voter Turnout, Satisfaction Index, and Study Association activities - Voter Turnout shows the strongest and most consistent negative relationship with hit-and-runs. Voter Turnout is also the only one that retains its statistical significance after controlling for other variables and doing robustness checks. We also want to highlight that Voter Turnout has the most support in the literary background for its use as a proxy and we also had the most complete data available for it. Our second proxy, Satisfaction Index, showed some promise but failed to meet the same standard as voter turnout after robustness checks. The only proxy that showed a positive (although very small) correlation with hit-and-runs was the Study Association Activities, but this also disappeared after our robustness checks.

Our findings are similar to those of previous studies in that a negative relationship between social capital and hit-and-runs has been observed in Italy, the US, and now Sweden. This suggests that social capital may have a universal effect in decreasing the occurrence of these types of crimes, even when the cultural context differs. We have also found no significant evidence that the COVID-19 pandemic significantly affected the relationship between social capital and hit-and-run incidents, however, further research is necessary before drawing definitive conclusions.

The results also add to a growing body of research that indicates that social capital has positive effects on communities in countless, complex ways, many of which we have yet to discover. It underscores the importance of fostering social capital as a means of addressing complex social issues. This is particularly relevant at a time when we are experiencing decreasing social capital (Putnam, 1995) due to decreased social interactions, the decline in civic engagement, and eroding trust in institutions, among others. The implication for policymakers is that improving social capital in terms of e.g. encouraging civic engagement and supporting social spaces will have numerous positive consequences, including reducing incidents like hit-and-runs.

While this thesis provides further insight into this relationship, several limitations must be acknowledged. The main weakness is the lack of good reliable proxies, particularly study

associations which had weak and inconsistent correlations with hit-and-runs. Another limitation is the nature of the hit-and-run data since it did not allow us to control for factors such as the municipality the driver resides in, severity of damages as well as various other conditions that previous papers had data on. Additionally, including all types of accidents might dilute the findings since it includes situations that were less stressful and emotionally charged, unlike the data used in the Italian and US studies. When separating minor and major damage we found that the relationship is stronger with only minor damages, indicating that decisions that are made in less stressful situations might have inflated the significance of the relationship. The low R^2 could also be considered a weakness of the models due to their low explanatory power. On the other hand, since the aim is not to explain the entire variation in the data but rather to demonstrate that social capital plays a statistically significant role, and therefore a low R^2 is not a large concern in this context.

Acknowledging the limitations of this study, future studies could explore a more comprehensive measurement of social capital, for example by constructing their social capital index. It could also be relevant to explore the possibility of using crime statistics that are more narrowly categorized to not include material damage and minor personal injuries.

Our findings highlight the role of social capital in shaping behaviors, even in instinctive and high-pressure scenarios. However, the global decline in social capital raises serious concerns about its potential negative side effects. Such a decline could exacerbate societal issues, even when it comes to crimes such as hit-and-runs. Strengthening social capital is not only vital for addressing specific challenges like hit-and-runs but is also essential for fostering healthier, more cohesive communities worldwide.

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Appendix A - Cross-country analysis (voter turnout and measures of social capital)

Blood donations on voter turnout	
=====	
	Dependent variable:

	Blood donations

Voter turnout	18.520 (18.360)
Constant	27.076** (12.216)

Observations	26
R2	0.041
Adjusted R2	0.001
Residual Std. Error	12.399 (df = 24)
F Statistic	1.018 (df = 1; 24)
=====	
Note:	*p<0.1; **p<0.05; ***p<0.01

Table A1: *Simple Linear Regression Results of Blood Donations on Voter Turnout.* Data sources: European Blood Alliance (2020), International IDEA (2019-2024).

Social Capital on All Countries Voting Turnout	
=====	
	Dependent variable:

	Social Capital Score

Voter turnout	8.878** (4.100)
Constant	38.453*** (2.651)

Observations	149
R2	0.031
Adjusted R2	0.024
Residual Std. Error	9.882 (df = 147)
F Statistic	4.689** (df = 1; 147)
=====	
Note:	*p<0.1; **p<0.05; ***p<0.01

Table A2: *Simple Linear Regression Results of Social Capital Score Regressed on Voter Turnout (149 Countries).* Data Sources: Solability (2024), International IDEA (2019-2024)

Regressing Social Capital on Voter Turnout (Europe only)	
=====	
Dependent variable:	

Social Capital Score	

Voter turnout	13.893** (5.244)
Constant	48.244*** (3.278)

Observations	36
R2	0.171
Adjusted R2	0.147
Residual Std. Error	3.899 (df = 34)
F Statistic	7.017** (df = 1; 34)
=====	
Note:	*p<0.1; **p<0.05; ***p<0.01

Table A3: *Simple Linear Regression Results of Social Capital Score on Voter Turnout in European Countries Classified as Electoral Democracies.* Data Sources: International IDEA (2019-2024), Freedom House (2024), Solability (2024).

When conducting simple linear regressions between voter turnout and other indicators of social capital we find positive correlations, indicating that voter turnout also has a high correlation with social capital. We use the number of votes as a percentage of the voting age population (International IDEA) for the most recent national election in each country. The regression results for blood donations per capita in 2020 (European Blood Alliance, 2020) and shows a positive coefficient. When regressing social capital and Solability's social capital index (Solability, 2023), we find significant, positive relationships both when using all the countries we have data for (149 in total) as well as only European countries. The results for European countries are particularly relevant considering their relative cultural proximity with Sweden. The results of the cross country analysis show support for our use of voter turnout as a proxy for social capital since we find evidence of positive relationships with other indicators of social capital.

Appendix B - COVID Period Analysis

The studied period covers before, during, and after the COVID-19 pandemic, which could cause potential issues with the relationship between social capital and hit-and-run incidents.

B.1 - Voter Turnout

Table 1: Combined Regression Results for all COVID periods

	hit_and_run							
	Before COVID		During COVID		After COVID		Total Period	
Voter Turnout (%)	-0.066**	-0.084***	-0.065***	-0.078***	-0.061***	-0.068***	-0.065***	-0.078***
	(0.021)	(0.022)	(0.018)	(0.020)	(0.016)	(0.017)	(0.018)	(0.020)
Controls:	NO	YES	NO	YES	NO	YES	NO	YES
Observations	289	289	289	289	289	289	289	289
R ²	0.041	0.099	0.059	0.131	0.056	0.113	0.057	0.128
Adjusted R ²	0.037	0.076	0.055	0.109	0.053	0.091	0.053	0.106
<i>Note:</i>					*p<0.05; **p<0.01; ***p<0.001			
					Standard errors in parentheses.			

Table B1: Combined Regression Results Before, During and After COVID for Voter Turnout on hit-and-runs. Data sources: Brå (2018-2023), SCB (2018-2022).

B.2 - Study Association Activities

Combined Regression Results (With and Without Controls)

	Dependent variable:							
	Hit-and-Run Incidents (per 1,000)							
	Before		During		After		Total	
Studentförbund Activities	-0.00004***	-0.0001***	-0.0001***	-0.0001***	-0.0001	-0.0001	-0.0001	-0.0001
	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Control:	NO	YES	NO	YES	NO	YES	NO	YES
Observations	289	289	289	289	289	289	289	289
R ²	0.024	0.031	0.024	0.031	0.044	0.056	0.050	0.056
Adjusted R ²	0.020	0.028	0.020	0.027	0.021	0.032	0.026	0.033
<i>Note:</i>					*p<0.05; **p<0.01; ***p<0.001			

Table B2: Combined Regression Results Before, During and After COVID Study Association Activities on Hit-and-runs. Data sources: Brå (2018-2023), SCB (2019-2023).

B.3 - Satisfaction Index

Combined Regression Results (With and Without Controls)								
<i>Dependent variable:</i>								
Hit-and-Run Incidents (per 1,000)								
	Before		During		After		Total	
Satisfaction Index	-0.018 (0.011)	-0.024** (0.009)	-0.012 (0.009)	-0.020* (0.009)	-0.015 (0.013)	-0.019 (0.012)	-0.001 (0.014)	-0.014 (0.012)
Control:	NO	YES	NO	YES	NO	YES	NO	YES
Observations	265	265	265	265	265	265	265	265
R ²	0.008	0.021	0.005	0.014	0.036	0.056	0.035	0.048
Adjusted R ²	0.004	0.017	0.002	0.010	0.010	0.031	0.009	0.022
<i>Note:</i>					*p<0.05; **p<0.01; ***p<0.001			

Table B3: *Combined Regression Results Before, During and After COVID for the Satisfaction Index on Hit-and-runs.* Data sources: Brå (2018-2023), SCB (2010-2020).

Appendix C - Satisfaction Index Survey

Our Satisfaction Index is constructed by taking the average of three index scores from SCB's citizen survey, from 2010 to 2020:

1. **Citizen Satisfaction Index (*Nöjd-Medborgar-Index*, NMI):** Measures general satisfaction with municipal services.
2. **Influence Satisfaction Index (*Nöjd-Inflytande-Index*, NII):** Assesses residents' perceptions of their influence over municipal decisions.
3. **Regional Satisfaction Index (*Nöjd-Region-Index*, NRI):** Evaluates satisfaction with regional services and governance.

Not all municipalities have participated in the survey in the studied period (2010-2020) and are therefore missing in the dataset.

1. Stockholm (Kommunkod: 0180)
2. Ydre (Kommunkod: 0512)
3. Norrköping (Kommunkod: 0581)
4. Mullsjö (Kommunkod: 0642)
5. Habo (Kommunkod: 0643)
6. Hultsfred (Kommunkod: 0860)
7. Malmö (Kommunkod: 1280)
8. Färgelanda (Kommunkod: 1439)
9. Essunga (Kommunkod: 1445)
10. Herrljunga (Kommunkod: 1466)
11. Munkfors (Kommunkod: 1762)
12. Filipstad (Kommunkod: 1782)
13. Hagfors (Kommunkod: 1783)
14. Laxå (Kommunkod: 1860)
15. Ljusnarsberg (Kommunkod: 1864)
16. Surahammar (Kommunkod: 1907)
17. Ovanåker (Kommunkod: 2121)
18. Timrå (Kommunkod: 2262)

19. Ragunda (Kommunkod: 2303)
20. Dorotea (Kommunkod: 2425)
21. Åsele (Kommunkod: 2463)
22. Pajala (Kommunkod: 2521)
23. Älvsbyn (Kommunkod: 2560)
24. Kiruna (Kommunkod: 2584)

Appendix D - Linear plots without outliers

D.1 - No Extreme Outliers

Extreme outliers are data points that are more extreme than $Q1 - 3 * IQR$ or $Q3 + 3 * IQR$.

Regression Linear Plots for avg_voter_turnout (Without Outliers)

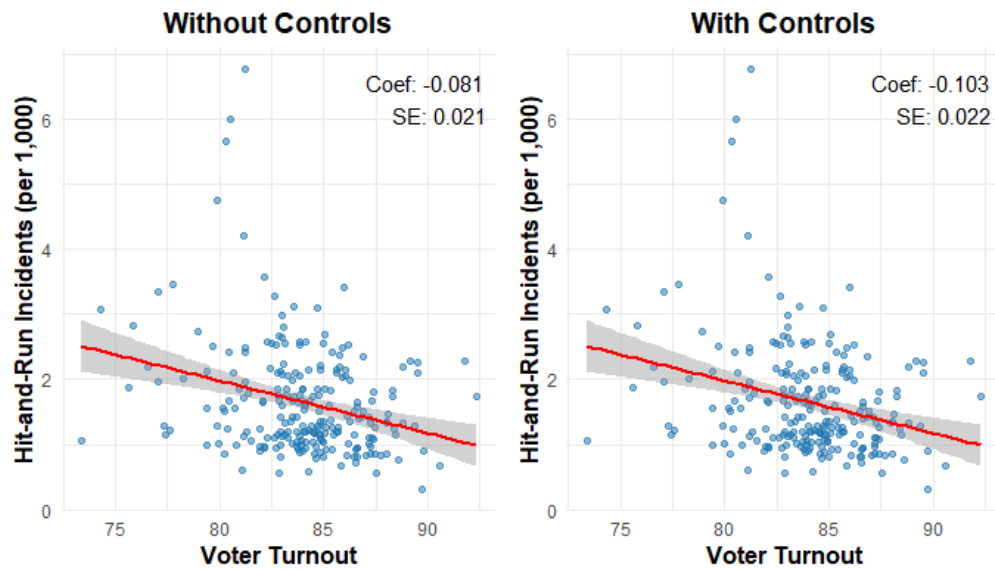


Figure D1: *Scatter Plots of Voter Turnout on Hit-and-runs Without Extreme Outliers, With and Without Controls.* Data sources: Brå (2018-2023), SCB (2018-2022).

Regression Linear Plots for avg_satisfaction_index (Without Outliers)

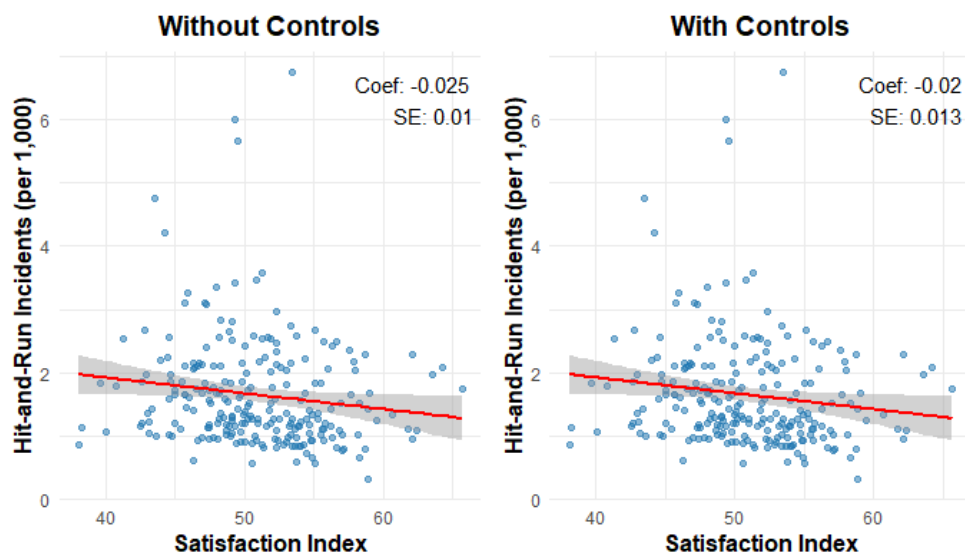


Figure D2: *Scatter Plots of the Satisfaction Index on Hit-and-runs Without Extreme Outliers, With and Without Controls.* Data sources: Brå (2018-2023), SCB (2010-2020).

Regression Linear Plots for avg_studieforbund_activities (Without Outliers)

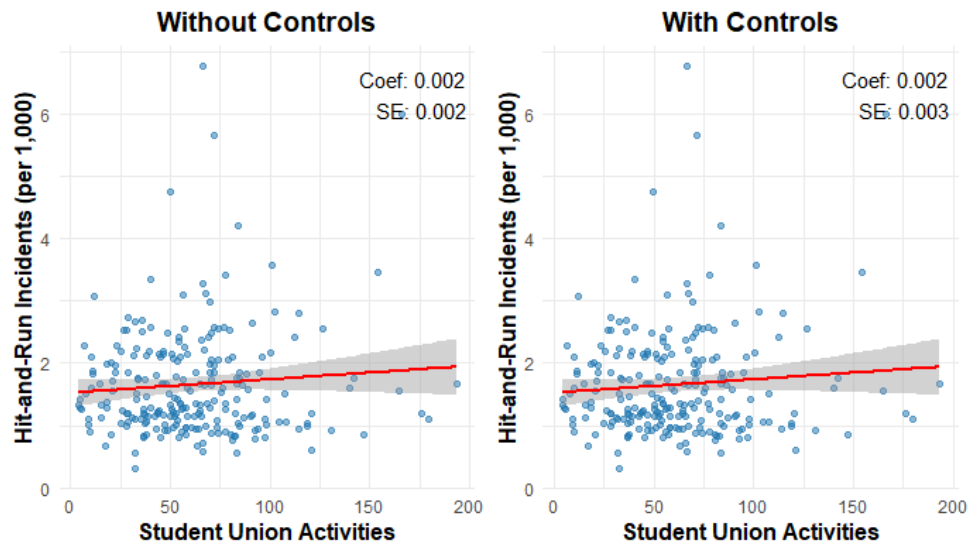


Figure D3: *Scatter Plots of Study Association Activities on Hit-and-runs Without Extreme Outliers, With and Without Controls.* Data sources: Brå (2018-2023), SCB (2019-2023).

D.2 - No Mild Outliers

Mild outliers are data points that are more extreme than $Q1 - 1.5 * IQR$ or $Q3 + 1.5 * IQR$.

Regression Linear Plots for avg_voter_turnout (Without Outliers)

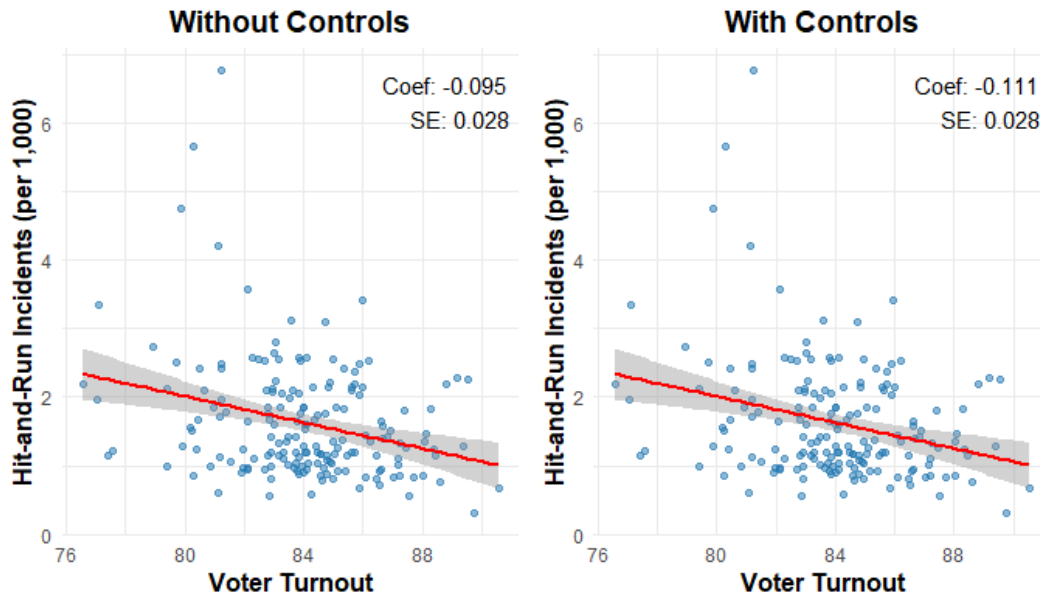


Figure D4: *Scatter Plots of Voter Turnout on Hit-and-runs Without Mild Outliers, With and Without Controls.* Data sources: Brå (2018-2023), SCB (2018-2022).

Regression Linear Plots for avg_satisfaction_index (Without Outliers)

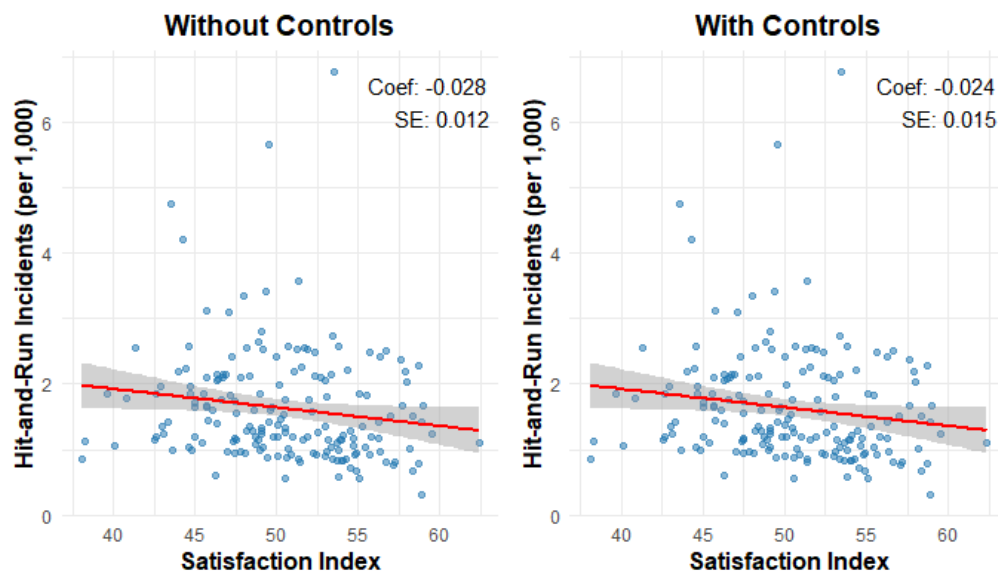


Figure D5: *Scatter Plots of the Satisfaction Index on Hit-and-runs Without Mild Outliers, With and Without Controls.* Data sources: Brå (2018-2023), SCB (2010-2020).

Regression Linear Plots for avg_studieforbund_activities (Without Outliers)

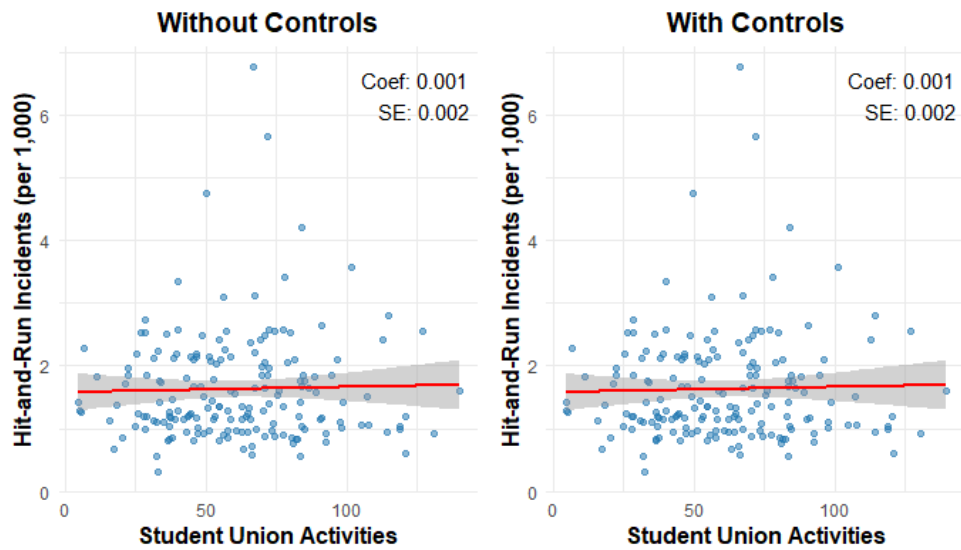


Figure D6: *Scatter Plots of Study Association Activities on Hit-and-runs Without Mild Outliers, With and Without Controls.* Data sources: Brå (2018-2023), SCB (2019-2023).

Appendix E - Log regression plots

Log Regression Linear Plots for avg_voter_turnout

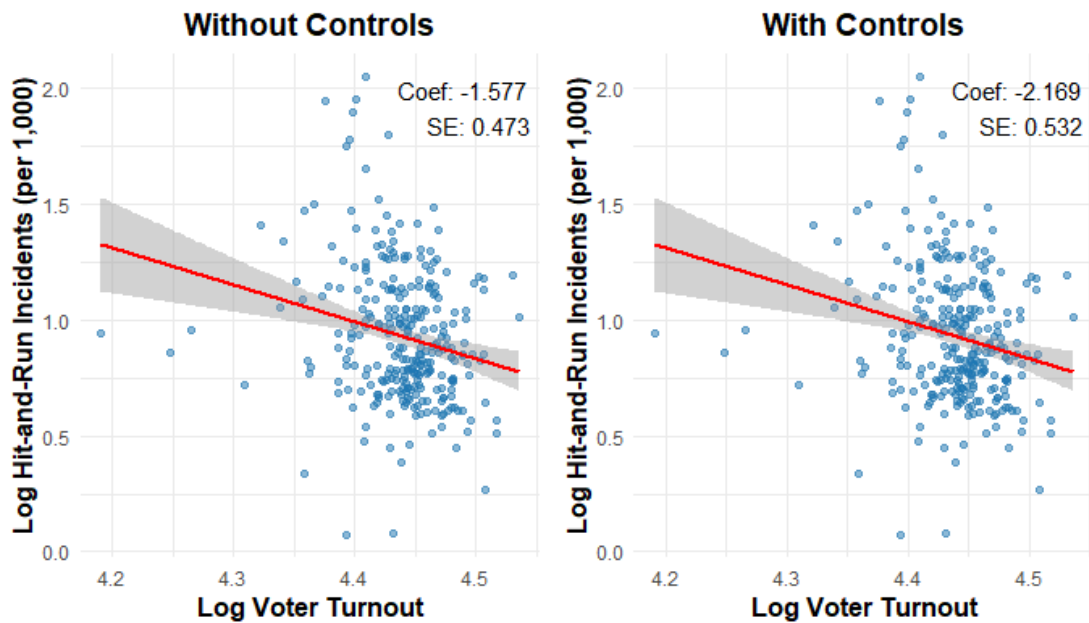


Figure E1: Log regression results of Voter Turnout on Hit-and-runs, With and Without Controls.

Data sources: Brå (2018-2023), SCB (2018-2022).

Log Regression Linear Plots for avg_satisfaction_index

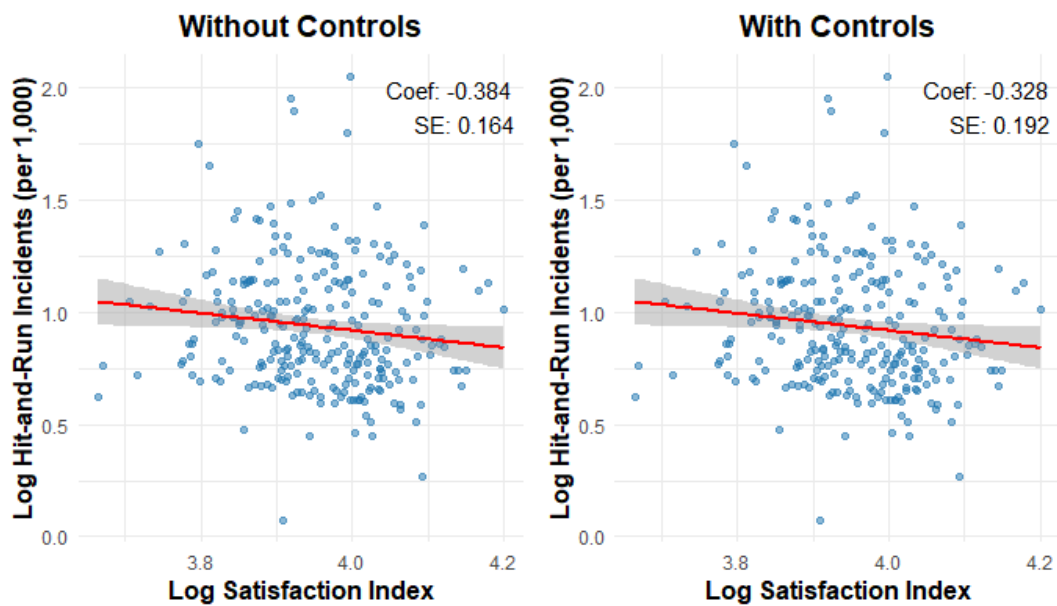


Figure E2: *Log Regression Results of the Satisfaction Index on Hit-and-runs, With and Without Controls.* Data sources: Brå (2018-2023), SCB (2010-2020).

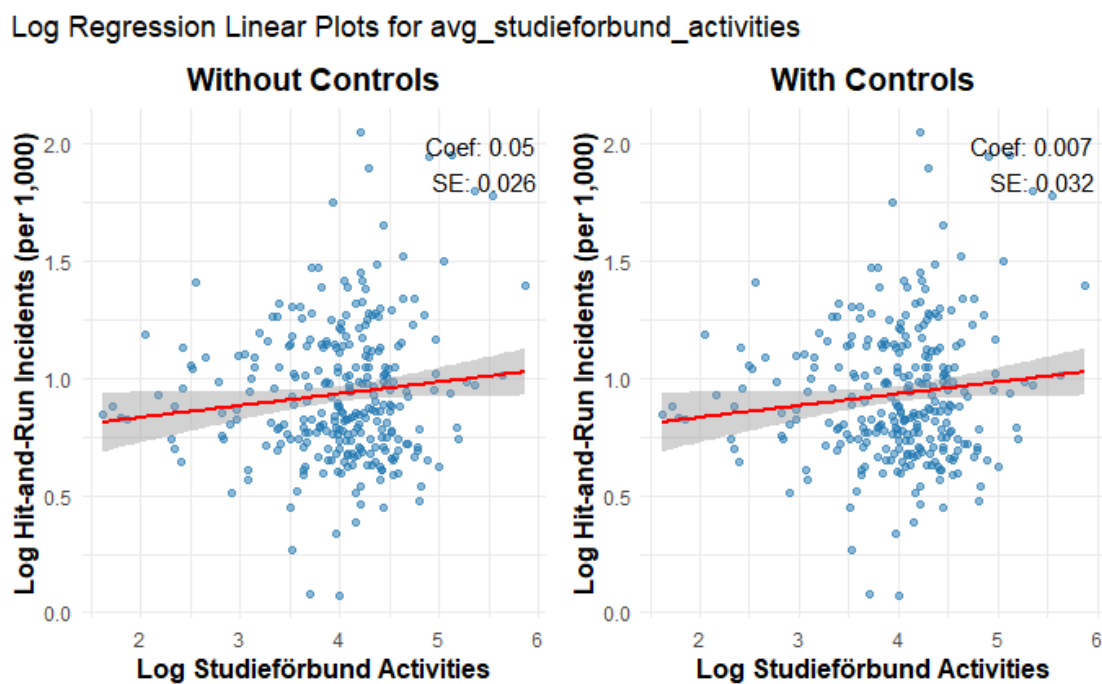


Figure E3: *Log Regression Results of Study Association Activities on Hit-and-runs, With and Without Controls.* Data sources: Brå (2018-2023), SCB (2019-2023).

Appendix F - AI Disclosure

As per SSE guidelines for students on the use of GenAI in thesis writing, we are disclosing our use of AI usage in this thesis.

What AI tools have been used and how?

We have used OpenAI's LLM models, GPT4.0, o1-preview, and o1-mini-preview to assist us with the R coding used for the data analysis, specifically in helping us merge different datasets, repeating chunks of code with different variables, customizing graphs and tables, translating, and general coding error corrections.

In what ways have these tools contributed to increasing the quality of the thesis?

These tools have aided in reducing the amount of time with manual, non-creative work like debugging code, allowing us to spend more time on the creative and theoretical aspects of the thesis.

What potential risks were found using AI and what measures were taken to reduce these risks?

The models used are known for hallucinating, i.e, inventing non-existent facts and treating them as if they are real, thus we did not use them in any aspects of the planning nor writing of the thesis. Since we have used AI for the coding, the biggest risk we found is for the code correction fixing the error but having an unintended outcome. We have reduced the risk of this by manually and routinely checking and monitoring the changes stemming from chunks of code at every step.

What are the insights gained from using AI tools in the thesis writing process?

AI tools enhance the thesis writing process by allowing us to spend less time on repetitive, "manual" tasks and more time on reading literature, thinking about the structure and methodology of the thesis, and writing. Due to this, the thesis writing experience was more efficient.