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Permanent School Closures and Crime: Evidence from Scotland*

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Abstract

School closures occur regularly, driven by declining school performance, depopulation, school buildings not meeting safety regulations, and a range of other factors. This has given rise to a large literature examining the effect of school closures on educational outcomes, but only a limited literature on the effect of these closures on local crime rates. In this paper we study the effects of permanent school closures on crime. We leverage the closure of over 200 schools in Scotland between the school years 2006/07 and 2018/19, and employ a staggered difference-in-differences design. Our results show that neighbourhoods affected by school closures experience a reduction in crime of about 10% of a standard deviation, relative to areas where schools remained open. This effect is mainly driven by a reduction in vandalism and property crimes. We provide evidence on several mechanisms explaining the negative crime effect, such as changes in neighbourhood composition and displacement of crime-prone youth.

JEL classification numbers: I38, R20, K42
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1 Introduction

School closure, or consolidation, is a widely adopted practice in developed (Berry and West, 2010, Engberg et al., 2012, Beuchert et al., 2018) and developing countries alike (Dongre and Tewary, 2020).[1] In the US, for example, 2% of schools closed on average every year between 2003 and 2013, affecting over 200,000 pupils every year (Gallagher and Gold, 2017). Faced with declining school performance and depopulation, local governments consolidate by closing under-enrolled schools and relocating pupils elsewhere, or by merging two or more schools.[2] In other cases, for example the recent RAAC scandal in the UK, schools are forced to close due extraneous factors, such as their buildings not meeting safety regulations.[3] Proponents of the practice argue that permanent closures boost school efficiency, while opponents claim that since closures are unevenly distributed across space, it is the most deprived communities that bear most of the burden (Tieken and Auldridge-Reveles, 2019).

A large academic literature investigates the effects that permanent school closures have on the educational outcomes of both displaced pupils and those in receiving schools (see Berry and West, 2010, Engberg et al., 2012, Brummet, 2014, Beuchert et al., 2018, Steinberg and MacDonald, 2019, Taghizadeh, 2020a,b, Bifulco and Schwegman, 2020, Kim, 2023). Pupils switching schools as a result of a school closure may experience a change of educational environment (Holmlund and Böhlmark, 2019), for example due to moving to larger schools (De Haan et al., 2016). It is widely understood that school closures tend to benefit displaced pupils when these are relocated to better performing schools. It is less established whether pupils in receiving schools are negatively affected, and if so, whether such effects persist over time. To date, only Steinberg and MacDonald (2019) provide evidence of detrimental effects on school behaviour, both for displaced pupils and those in receiving schools.

Although there is extensive evidence linking school exclusions to later criminal behaviour

[1] As permanent school closures are often paired with two or more schools merging into a single school, we use the terms 'consolidation' and 'closure' interchangeably.

[2] See for example, 'More than 90 English primary schools to close or face closure for lack of pupils', The Guardian, 29-05-2023.

[3] See for example, 'UK public buildings feared to be at risk of collapse as concrete crumbles', The Guardian, 14-06-2023.

(see, e.g. Bacher-Hicks et al. 2019, Buchmueller et al. 2025), relatively few studies have examined how school closures influence local crime rates (Steinberg et al., 2019, Brazil, 2020). Theoretical frameworks from sociology and criminology provide ambiguous predictions about these effects. On one hand, the presence of schools may increase crime by attracting potential offenders and targets. According to social disorganisation theory, the concentration of diverse groups –such as residents, pupils, and teachers– around schools can weaken informal social controls that deter crime (Shaw and McKay, 1942). Likewise, routine activity theory argues that schools heighten criminal opportunities by concentrating potential victims (Cohen and Felson, 1979). On the other hand, closing schools may have adverse effects. Vacant buildings can signal neglect and decay, thereby inviting criminal activity in line with the broken windows theory (Kelling et al., 1982), while the displacement of pupils may shift or even increase crime elsewhere—for instance, if students must cross rival gang territories (Hagedorn, 2017). A small empirical literature mostly comprised of case studies from large U.S. cities finds either a negative effect on crime rates (Steinberg et al., 2019) or an ambiguous effect on crime rates where the sign of the effect depends on the type of land use after the closure (Brazil, 2020).

In this paper, we provide new evidence that substantially extends this small empirical literature. To do this, we leverage a large school consolidation effort that took place in Scotland between 2006 and 2020, which resulted in the closure of over 200 schools, circa 10% of the entire stock. Our panel data set comprises all 6,976 neighbourhoods (Datazones) in Scotland, spanning from the school year 2006/07 to 2018/19. We combine recorded crime data with the geo-referenced episodes of school closures that occurred during our thirteen year sample period. Given that decisions about which schools to close are not made randomly, a simple comparison of neighbourhoods in which schools were closed to those in which they were not closed will most likely return biased estimates. In order to identify the causal effect of the closures on local crime rates, we leverage variation in the timing of school closures in a difference-in-differences (DiD) framework. Specifically, we utilise the Callaway and Sant'Anna's (2021) approach (CSDiD) estimator. This allows us to estimate ATT effects that are robust to potential treatment effect heterogeneity under standard DiD assumptions

(parallel trends and no anticipation effects)[4].

Our results show that neighbourhoods affected by school closures experience a reduction in overall crime of about 4-7 crimes per 1,000 person annually, relative to areas where schools remained open. This reduction corresponds to 4-10% of a standard deviation. To disentangle potential mechanisms, we look at the effects of school closures by crime type and school type. We find that the effect is driven by secondary school closures, and by property crimes and vandalism. Knife crime around schools, which have become a particular policy concern in recent years[5], are also shown to be reduced. This aligns with established criminological research indicating that crime — particularly property and violent offenses — tend to peak during adolescence (Farrington, 1986). Importantly, we show that areas experiencing school openings see a nearly symmetrical rise in crime, suggesting that school closures, which are more prevalent in disadvantaged neighborhoods, may displace youth who are at higher risk of offending. Finally, we observe modest shifts in the socio-economic composition of neighborhoods following school closures, pointing to potential gentrification dynamics.

Our findings provide an important contribution to the small existing literature on the effect of school closures on local crime rates. The two closest papers that we are aware of are Steinberg et al. (2019) and Brazil (2020).[6]. Relative to these papers our study has a number of differences. In Steinberg et al. (2019) closures were specifically targeting what the authors define as 'chronically underperforming' schools. Moreover, the authors specify how their context is characterised not only by lower academic achievement, but also higher levels of youth violence relative to statewide averages. In our case school closures are primarily driven by demographic shifts, as well as the need to provide better buildings, rather than by school outcomes (Scottish Government, 2023a).

[4]Recent work has stressed the limitations of using the standard two-way fixed effects (TWFE) approach when estimating DiD models with variation in treatment timing (see Roth et al., 2023 for a review). These arise from the possibility that treatment effect heterogeneity leads to the inaccurate, and at times even negative, weights being assigned to group and period specific effects in the overall treatment effect (the Average Treatment Effect on the Treated, or ATT).

[5]See for example, 'Young people taking knives to school, BBC finds', *BBC News*, 9 October 2025.

[6]We acknowledge the work by Brinig and Garnett (2009), who look at the effect of closing parochial schools in Chicago, and MacDonald et al. (2018) who investigate the effect of opening public chartered schools in Philadelphia. While valuable contributions, we believe their work deals with a context and policy that differs considerably from ours. Specifically, they explore closures of very specific types of schools, which only involve a minority of the school population.

Furthermore, the baseline crime environment is markedly different: while Philadelphia recorded an annual crime rate of approximately 128 incidents per 1,000 people between 2006 and 2012 (Steinberg et al., 2019), Scotland's rate over the same period was closer to 30 per 1,000, with Glasgow —its highest-crime city— reaching around 60 per 1,000.[7] Brazil's study is more comparable in that it does not focus exclusively on underperforming schools.

Moreover, by leveraging national-level data rather than focusing on a single city, our analysis captures a broader range of socio-economic and geographic contexts, thereby offering more generalisable insights into the relationship between school closures and crime. To our knowledge, this is the first study to examine this issue within a UK—and more broadly, European—setting.[8] Existing European research on school closures is limited and tends to focus on different outcomes: the impact of closing undersized schools on local population dynamics and income levels (Di Cataldo and Romani (2024) (Italy) and Kindström (2023) (Sweden)); how school closures influence voting behaviour (Foertsch (2024) (Germany) and Isaksson (2023) (Sweden)). None of these studies examine the link between school closures and crime.

The rest of this article is structured as follows. Section 2 outlines the conceptual and institutional background. Section 3 outlines the data we use and describes the sample construction. In Section 4 we discuss the empirical strategy and we reset our results in Section 5. Section 6 concludes.

2 Background

2.1 Conceptual Background

Through what channels does the presence of schools affect local crime rates? According to social disorganisation theory (Shaw and McKay, 1942), the intersection between deprivation, social fragmentation and residential mobility prevents the formation of social ties and trust, thus affecting

[7]These figures underscore the relatively lower prevalence of crime in Scotland, even in its most affected urban areas.

[8]The closest UK evidence is from a study of the closure of youth clubs in London (Villa, 2024), which shows that this led to increased youth offending and poorer educational outcomes.

informal social control, for example the supervision of young people.[9]. Within this context, the presence of a school can potentially fragment a neighbourhood, leading to more crime. The convergence in the same place of a wide range of agents, e.g. teachers, school staff, parents of pupils and residents makes it difficult to establish and enforce an informal system of control. Wo and Park (2020) find support for this explanation in their study of crime around Chicago public schools.

Another potential channel is given by routine activity theory, first proposed by Cohen and Felson (1979). It posits that crime results from the spatial and temporal convergence of victims, offenders, and the absence of guardians. Neighbourhoods characterised by a higher ratio of non-residents to residents (Brantingham and Brantingham, 1995, Roman, 2004), for example due to the presence of a school, provide a wider pool of potential victims (Murray and Swatt, 2013, Willits et al., 2013, Groff and Lockwood, 2014). Guardianship might also be limited: school guardians' jurisdictions are confined to school grounds, while residents might be willing to guard only within a limited distance from their homes. Schools provide a particularly important context to study crime rates given that criminal (and anti-social) behaviour typically peaks in teenage years (Farrington, 1986). Schools might gather victims and perpetrators in the same place, thus reducing the opportunity cost of crime (MacDonald, 2015, Cook, 2017). Schools also facilitate interactions, so that offenders can influence their peers (Glaeser et al., 1996). There are a handful of studies leveraging quasi-random variation in school attendance, showing that violent crimes increase on days when school is in session (Jacob and Lefgren, 2003, Luallen, 2006, Akee et al., 2014). This link is even stronger in highly segregated schools (Akee et al., 2014, Billings et al., 2014, 2019).

Given this positive link between schools and crime, one might posit that closing down schools, especially highly segregated and deprived ones, might reduce crime. However, there are also channels through which school closures could increase crime. First, schools represent just one form of land use (Weisburd et al., 2012), and their closure – and consequently their empty estates – might contribute to an atmosphere of decay and lawlessness which encourages crime, in line with the broken window theory (Kelling et al. 1982). This connects to a well established literature exploring

[9]Some empirical evidence on this is provided by Sampson and Groves (1989) and Sampson et al. (1997). In this vein, a recent study by Braakmann (2023) finds that high residential turnover is a strong determinant of crime.

how changes in land use affects crime rates.[10] In addition, displaced pupils coming from a variety of different neighbourhoods (Nerenberg, 2021) may find themselves having to commute to new schools and in the process may become targets of crimes (Stults and Hasbrouck, 2015, Hagedorn, 2017). Time spent in school may also reduce crime through an incapacitation effect (Bell et al. 2022).[11] If school closures increase school absenteeism (through longer commuting times) and, in more extreme cases, dropouts, then there is scope for an increase in crime.

2.2 Institutional Background

Scotland is one of the four devolved nations of the United Kingdom and is divided into 32 Local Authorities (LAs). This level of local government is responsible for the provision of a range of services, including education. School funding is provided by the Scottish Government (SG) to each LA largely based on the size of the school population and the level of deprivation. The SG have an executive agency, Education Scotland (ES), to oversee delivery of education in Scotland. It is within the discretion of each LA to request the closure of one or more of the schools within their jurisdiction.

School closures, or more generally, consolidations, can be undertaken for a variety of reasons (detailed statistics presented later in this paper). Common reasons include being in response to local demographic changes or in order to improve the school estate to comply with current standards. If an LA proposes some sort of consolidation it must comply with a detailed procedure described by the Schools (Consultation) (Scotland) Act 2010. This procedure is based on a consultation process with a specific timeline, where the LA is meant to prepare a proposal indicating the reason for the closure, as well as its financial and educational implications. In Appendix B we provide a summary of the timeline of school closure procedures, as outlined in the Schools (Consultations) (Scotland) Act 2010.

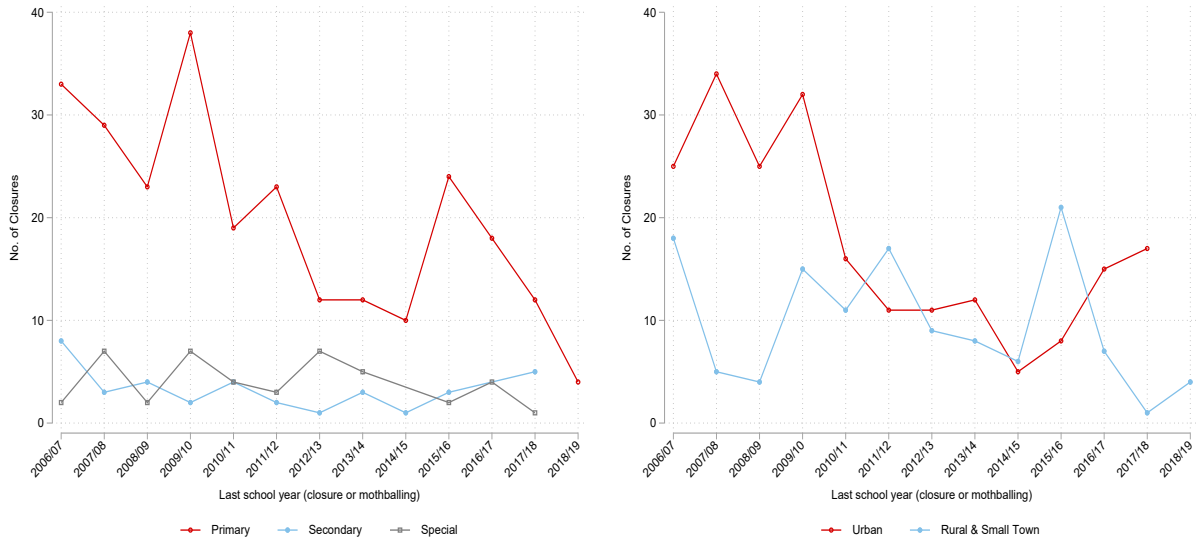
[10] This includes how crime changes near vacant commercial premises or homes (Chang and Jacobson, 2017, Ellen et al., 2013, Cui and Walsh, 2015, Braakmann and Zambiasi, 2025), regenerated or demolished public housing estates (Aliprantis and Hartley, 2015, Spader et al., 2016, Sandler, 2017, Borbely and Rossi, 2023), closed police stations (Facchetti, 2021, Blesse and Diegmann, 2022) and commercial land use, especially alcohol outlets (Han et al., 2016, Twinam, 2017).

[11] Using UK data, Boshoff et al. (2025) find that during school holidays, students commit more serious crimes (both property and violent) and fewer minor crimes, compared to school term.

Pupils typically enter primary school in August of the year they turn five and stay in primary schools for seven years (stages P1 to P7), until they then move to secondary schools for additional six years (S1 to S6). The Scottish educational system also includes special schools, i.e. those specialised in helping pupils with emotional, behavioural and/or social difficulties, among other additional needs. These schools typically include all year groups from primary to secondary. The school year begins in the second week of August, and concludes at the end of June, for a total of 180 school days, at most.

Between school years 2006/07 and 2018/19, 337 schools closed down. Figure 1 shows trends by school type, i.e. primary, secondary and special as well as by type of area.

Figure 1. Trends in Closures



Notes: Left-hand panel presents the total number of closed schools by sector, i.e. primary, secondary or special schools. Right-hand panel presents the total number of closed schools by area classification.

The left-hand panel of Figure 1 shows how most closures affected primary schools (about 70% of all closures), followed by special (about 21%) and secondary schools. In addition, as shown in the right-hand panel of Figure 1, especially in the earlier part of the sample period, circa 63% of closures occurred in urban areas.

3 Data

We use data on crime and school closures aggregated to the Scottish Datazone level. Datazones are the second lowest level of territorial designation in Scotland (similar to U.S. census blocks and English Lower Layer Super Output Areas) and are composed of aggregates of the country's 46,351 Output Areas. They are designed to include roughly between 500 and 1,000 residents each and to constitute geographically homogeneous areas. We combine four sources of data: *i)* crime data from Police Scotland; *ii)* data on school closures and consolidation; *iii)* school-level data on various outcomes and school characteristics and *iv)* Data Zone-level demographic data from the Scottish Census 2001, 2011 and 2022, which we use as pre-treatment, baseline controls as well as as outcome variables.

3.1 Crime Data

We use monthly data at the Datazone level on reported crimes and offences from January 2007 to December 2020, provided by Police Scotland in response to a Freedom of Information (FOI) request.[12] Our data consist of monthly Datazone level crime counts (for different crime categories) for the time period 2007 to 2020. To avoid low cell sizes (few or zero crimes) in many Datazones, we aggregate the crime data to the annual (school year) level. We construct a balanced panel of Datazones over the thirteen year period covering the period between school years 2006/07 and 2018/19 (more detail on this below). The data consist of all available subcategories of crimes. We aggregate crime data across five major crime subcategories: violent crimes (non-sexual), sexual crimes, crimes of dishonesty, fire-raising and vandalism, and other crimes. These subcategories are described in more detail in Table A1.

3.2 School Closures and Mergers

Information on schools and their location is collected from the 'School education statistics' (Scottish Government, 2023b) data set published by the Scottish Government. Alongside information on

[12] FOI 22-1505.

pupil and schools characteristics, these data include a register of all schools, alongside information on school mergers. In particular, we observe the month and year of a closure, as well as whether it was part of a merger. We can track where pupils from a closed school were displaced to, at least for the first school year following the closure. In addition, we merge a set of other data sources: *i)* the Scottish Healthy Living Survey, which contains school-level information on free school meals registration and uptake; *ii)* the Attendance and Absence Survey, which provides attendance rates as well as information on exclusions as disciplinary measures; and *iii)* other school information on size of the school population, pupil-to-teacher ratios, and school location. Unfortunately, we do not have consistent information on academic attainment. This is not available for special schools, whereas for primary and secondary schools it only became publicly available starting from the school year 2015/2016.[13]

We supplement this information on school closures and mergers with data obtained through Freedom of Information requests, submitted individually to each of the 32 Local Authorities in Scotland. Through this we collected information on the reason for closure, as well as post-closure land use of each school building. Typically, closures may close for more than one reason at the same time. Of the circa 250 closures that occurred between 2007 and 2019, and for which this information is available, at least 55% included "building condition" as one of the reasons for closure (for 32% overall this was the only reason), and at least 51% of proposals listed "low numbers" as one of the reasons (for 28% overall this was the only reason). Only 8% of all closures occurred because of "educational concerns".

3.3 Neighbourhood-level Covariates and Outcomes

Measures of neighbourhood quality are important both as covariates (see Section 4), and to explore potential channels through which school closures impact crime. We therefore use finely grained

[13]It is also worth noting that the way academic attainment is assessed differs substantially across primary and secondary schools. In primary school, assessments are teacher-based. By the end of the school year, teachers establish whether each pupil meets the expected level in literacy and numeracy for a specific school stage. Such information is released as the school-level percentage of all pupils meeting the expected level but, for confidentiality reasons, values are binned into categories, i.e. $\geq 90\%$, $\leq 90\%$ *and* $\geq 80\%$ etc. Nation-wide statistics, however, reveal little variation in the data. In school year 2018/2019, about 80% of all pupils met the expect level in reading, 86% in listening and talking, 79% in numeracy and 75% in writing.

data from successive censuses (2001, 2011 and 2022) at the Datazone level. These covariates include unemployment rate, the share of families with dependent children, the share of inhabitants by occupational level, and the share of households living in social housing.

3.4 Analytical Sample

We construct a panel dataset covering all 6,976 Scottish Datazones from the 2006/07 school year through to December of the 2019/20 school year. Our analysis focuses on school closures that occurred between March 2007 and the summer of 2019. To arrive at our analytic sample, we make some further adjustments to the sample.

First, we remove all Datazones that experienced both a school closure and a school opening, regardless of whether these events occurred in the same year or at different times. For the analysis of school closures and crime, we further exclude any Datazones that saw a school opening at any point, in order to minimise potential violations of the Stable Unit Treatment Value Assumption (SUTVA), as crime spillovers may occur from areas with closures to those with new schools opening. Similarly, when analysing the impact of school openings, we exclude Datazones that experienced closures.

Second, we exclude five local authorities—Highland, Orkney Islands, Shetland Islands, Western Isles, and Argyll & Bute — collectively referred to as the "Highlands and Islands" region. This decision is motivated by two considerations. First, crime patterns and the composition of crime types differ markedly between urban and remote rural areas (Police Scotland, 2025). Second, under the Schools (Consultation) (Scotland) Act 2010, there is a formal "presumption against closure" for rural schools, particularly in remote areas. This policy requires that any proposal to close a rural school must present a compelling case and demonstrate that no viable alternative exists (Scottish Government, 2013). Closures in this region typically involve schools with very low enrolment: we find that schools closed in the Highlands and Islands had an average roll of 30 pupils, which is less than one-fifth the average for closures elsewhere in Scotland, and half the average for other predominantly rural areas such as Dumfries & Galloway and the Scottish Borders. Additionally,

Datazones in the Highlands and Islands are significantly larger in geographic size than those elsewhere. While the average Datazone in Scotland covers 11.17 km² (median: 0.21 km²), those in the Highlands and Islands average 71.63 km² (median: 0.82 km²). This level of spatial aggregation makes it unlikely that we can detect meaningful effects.[14]

Our final sample for the school closure analysis includes 6,099 Datazones, of which 196 experienced at least one school closure between 2006/07 and 2018/19. In cases where a Datazone experienced multiple closures, we treat the first closure as the treatment event. Among these 196 closures, 148 involved primary schools, 17 secondary schools, and 31 special schools. For the school opening analysis, we use a sample of 6,050 Datazones, 55 of which saw a new school open. Of these, 39 were primary schools, 6 secondary schools, and 10 special schools.

4 Empirical Strategy

4.1 Treatment and Control Comparisons

Our aim is to examine whether school closures lead to changes in crime rates at the neighbourhood (Data Zone) level. This carries a number of methodological challenges. A simple comparison between areas affected by the closures and areas with operational schools (or no schools at all) will likely pick up spurious correlations. After all, schools are not closed randomly. For example, local authorities might decide to close underperforming schools, or those with falling enrolment. Table 1 corroborates this by showing that closed schools are typically smaller, have larger shares of pupils on free school meals, lower attendance, as well as higher exclusion rates.

[14]When we restrict our sample to areas outside the Highlands and Islands, the average Datazone size drops to 6.18 km² (median: 0.20 km²).

Table 1. Summary Statistics - Schools

	(1) All Schools		(2) Open Schools		(3) Closed Schools		(4) Balancing: $x_i = \beta_0 + \beta_1 D_i + e_i$	
	Mean	SD	Mean	SD	Mean	SD	$\widehat{\beta_1}$	SE
School Roll in September	281.80	287.30	295.46	293.00	144.74	169.78	-150.72***	(13.52)
No. of FTE Teachers	20.42	22.67	21.17	23.18	12.88	14.77	-8.28***	(1.15)
Pupil-Teacher Ratio (FTE)	14.18	4.19	14.52	3.97	10.76	4.79	-3.76***	(0.35)
Religious School (1/0)	0.17	0.38	0.17	0.38	0.15	0.36	-0.03	(0.03)
Attendance Rate	94.17	3.00	94.29	2.75	92.97	4.68	-1.32***	(0.34)
Unauthorised Absence Rate	1.48	1.65	1.46	1.49	1.78	2.84	0.32	(0.20)
Exclusion Rate	0.62	3.41	0.49	2.59	1.93	7.81	1.44**	(0.56)
% Free School Meals	0.33	0.17	0.33	0.16	0.38	0.24	0.05***	(0.02)
Gross Internal Area (sq-metres)	3339.18	3789.70	3435.23	3855.39	2226.51	2691.46	-1208.73***	(221.57)
Site Curtilage (sq-metres)	20653.13	24950.95	21158.07	25503.84	14792.38	16221.63	-6365.69***	(1355.74)
Schools	2,253		2,049		204		2,253	

Notes: This descriptive analysis is based on the schools included in the final sample of Data Zones, i.e. after the restriction described in Section 3.4 was applied. This includes school years from 2006/07 to 2018/19.

The characteristics of closed schools might be correlated with neighbourhood characteristics, therefore we would expect Datazones with closed schools to be systematically different from those where schools remain open. Table 2 shows the results of a descriptive analysis of Datazone characteristics, based on whether they contained schools, and whether they experienced closures. This analysis is done using the 6,099 Datazones in our analytical sample from school year 2006/07 to 2018/19.

Table 2. Summary Statistics - Blocks

					Ever School						Balancing: $x_i = \beta_0 + \beta_1 D_i + e_i$					
	(1) All Data Zones		(2) Never School		(3) All Data Zones		(4) No Closures		(5) Closures		(6) School vs Non-School		(7) Closed vs Never school		(8) Closed vs No Closures	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	$\widehat{\beta_1}$	SE	$\widehat{\beta_1}$	SE	$\widehat{\beta_1}$	SE
Crime Rate (per 1,000)	56.10	109.99	56.39	121.23	55.35	73.00	53.04	71.60	72.94	80.80	-1.045	(2.36)	16.549***	(5.33)	19.900***	(5.31)
Average pop growth rate 2001-2006	-0.45	1.98	-0.54	2.00	-0.20	1.88	-0.14	1.85	-0.67	2.05	0.336***	(0.05)	-0.136	(0.15)	-0.535***	(0.15)
Total enrollment	82.01	224.74	0.00	0.00	295.63	344.87	317.50	348.27	128.59	263.46	295.633***	(8.17)	128.591***	(17.50)	-188.914***	(19.60)
Total primary school enrollment	47.03	110.61	0.00	0.00	169.53	152.76	183.35	152.01	64.02	111.73	169.534***	(3.59)	64.017***	(6.91)	-119.336***	(7.89)
Total secondary school enrollment	34.33	184.39	0.00	0.00	123.76	333.91	131.92	343.92	61.47	235.27	123.760***	(7.96)	61.472***	(15.91)	-70.448***	(18.16)
Total special school enrollment	0.64	7.23	0.00	0.00	2.30	13.58	2.20	13.50	3.03	14.19	2.298***	(0.31)	3.032***	(0.71)	0.831	(0.78)
Unemployment rate	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.04	0.09	0.06	0.000	(0.00)	0.023***	(0.00)	0.026***	(0.00)
No Qualification	0.33	0.13	0.32	0.14	0.35	0.12	0.34	0.12	0.39	0.13	0.025***	(0.00)	0.069***	(0.01)	0.050***	(0.01)
Urban Area	0.75	0.43	0.80	0.40	0.61	0.49	0.60	0.49	0.74	0.44	-0.185***	(0.01)	-0.060*	(0.03)	0.142***	(0.03)
Pop Density (2001 pop/2011 area)	46.48	43.62	52.28	47.10	31.38	27.67	30.82	27.25	35.68	30.31	-20.894***	(0.98)	-16.593***	(2.28)	4.864**	(2.28)
ln(average house price)	11.74	0.58	11.74	0.59	11.74	0.57	11.76	0.56	11.58	0.65	-0.001	(0.01)	-0.159***	(0.04)	-0.178***	(0.04)
Data Zones	6,099		4,407		1,692		1,496		196		6,099		1,692		1,692	

Notes: Neighbourhood-level variables, i.e. unemployment rate, the number of people without qualifications, population density, are from the Census 2001. The average population growth rate corresponds to the annual geometric mean growth rate between 2001 and 2011, projected back to 2006. House price data are taken from the Registers of Scotland.

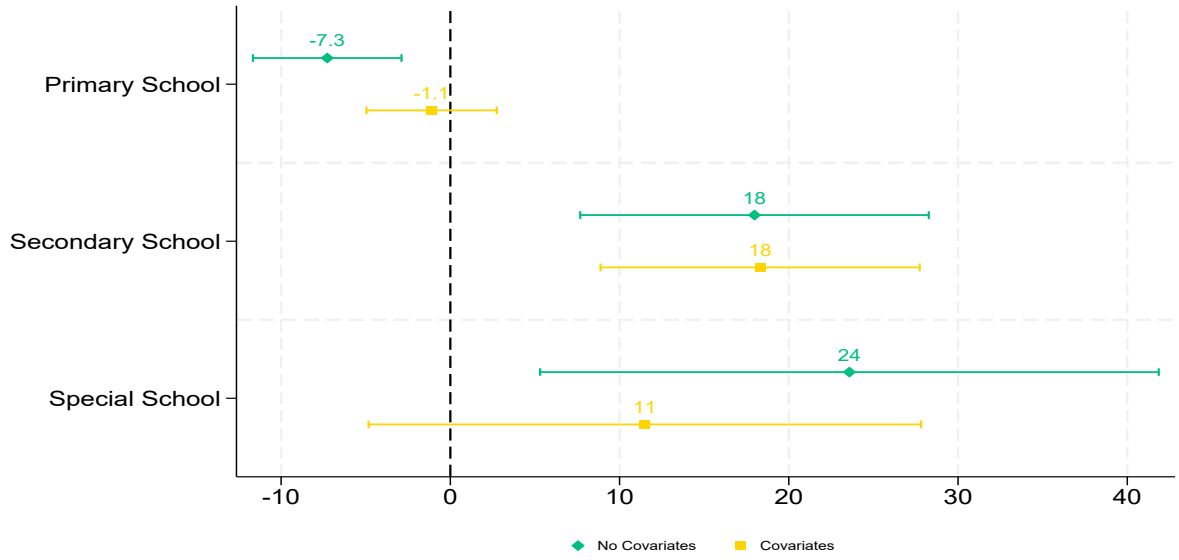
In column (6), we compare school areas (at least one school at some point in our time period),

to non-school areas (those which have never had a school during our sample period). School areas are characterised by 0.33 percentage points (pp) higher population growth in the 2001-2006 period, 2.5pp higher number of people with no qualification, and are 18.5pp less likely to be in urban areas. This is also reflected in a lower level of population density (20.8 fewer people per hectare). Unsurprisingly, school areas have a larger school population (295 more pupils, which is the average). Perhaps surprisingly in light of some of the existing literature (see Section 2.1), areas with schools are also not characterised by higher crime rates. In fact, areas with at least one school within the period under analysis experience, on average, 1 fewer crime per 1,000 people, although this difference is not statistically significant. This coefficient, however, masks some heterogeneity across different types of schools.

Figure 2 sheds some light on this. The point estimates are from regressions of the crime rate per 1,000 people on three variables, indicating the number of primary, secondary and special in a given Datazone - school year combination. The results show that while one extra primary school in a given Datazone - school year is associated with lower crime rates (about 1.1 to 7.3 fewer crimes per 1,000 people), one additional secondary school is associated with 18 more crimes per 1,000 people on average. The gap is even wider for special schools (11-24 more crimes per 1,000 people), however, we should interpret this result with caution. The negative (and not statistically significant) correlation in Table 2 is in fact driven by the larger weight of primary schools, making up about 80% of the entire school stock, compared to circa 14% for secondary and the remaining 6% for special schools. Taken together, these correlations are consistent with the some of the existing literature reviewed in Section 2.1, which shows that areas with schools (especially secondary) have more crimes.

Columns (7) and (8) of Table 2 compare areas with at least one school closure to "never-treated" areas. Specifically, column (7) uses areas that never had a school (and therefore none have been closed) as its reference group, whereas column (8) uses areas that had at least one school at some point during this time period. Hence, column (8) compares closed school areas to areas with continuing schools, whereas column (7) compares closed school areas to areas with no closures, but because there was never a school in the first place. What emerges is that areas with closed

Figure 2. Difference in Crime Rates by Presence of School



Notes: The point estimates are from regressions of the crime rates per 1,000 inhabitants on three variables, indicating the number of primary, secondary and special schools in a given Data Zone/School Year. The analysis was conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones from school year 2006/07 to 2018/19. We use year fixed effects, but due to the little variation in the presence of schools within the panel we do not add block fixed effects. Covariates are population growth rate, unemployment rate, fraction of people without qualifications, an indicator for urban areas and population density, as of the 2001 census. Standard errors are clustered at the Data Zone level, and the whiskers are 95% confidence intervals.

schools have a very different socio-economic profile compared to non-closure areas, regardless of how these are defined. For example, areas experiencing at least one closure experience, on average, 16.5 (19.9) more crimes per 1,000 people compared to areas without schools (continuing schools). In addition, closure areas have 2.3pp (2.6pp) more unemployed people, 6.9pp (5pp) more people with no qualification, and 15.9% (17.8%) lower house prices compared to areas with no schools (continuing schools). All these differences are significant at the 1% level.

The selection of the comparison group reveals some notable discrepancies. For example, areas that experienced school closures are significantly more likely to be urban –and thus more densely populated– than areas with continuing schools (by 14.3 percentage points), and to a lesser extent compared to areas without any schools (6 percentage points, though this difference is not statistically significant at the 5% level). Similarly, population growth in closure areas varies depending on the

comparison group: when compared to continuing school areas, closure zones show a statistically significant decline of 0.53 percentage points (at the 1% level), whereas the difference relative to no-school areas is smaller (–0.13 percentage points) and not statistically significant. In terms of school population, closure areas have fewer pupils on average than continuing school areas—188 pupils across all school sectors—but, perhaps unsurprisingly, more than areas that have never hosted a school, with an average difference of 128 pupils.

Overall, columns (7) and (8) reveal some differences between the two different definitions of the control group. We will account for these differences in our identification strategy.

4.2 Identification Strategy

To estimate the impact of school closures on crime, we employ a difference-in-differences (DiD) strategy. This approach compares changes in crime rates across Datazones before and after a school closure occurs. The key source of identifying variation lies in the staggered timing of closures, allowing us to use both never-treated areas (those that never experienced a closure) and not-yet-treated areas (those where closures occur later) as valid comparison groups.

In our identification, we rely on the fact that school closures occur at different points in time. In this setup, the simplest way to estimate the effects of closures on crime rates is by using the standard two-way fixed effects (TWFE) estimator, which can be formalised as:

$$Y_{it} = \theta_i + \theta_t + D_{it}\delta + \eta_{it} \tag{1}$$

where our outcome is the crime rate per 1,000 people in Datazone - Closure unit 'i' at year 't', θ_i and θ_t are unit and year fixed effects, respectively, while D_{it} is a treatment indicator for school closures in unit 'i' at time 't'. The coefficient of interest is δ which measures the effect of closures on crime rates.

However, an emerging literature discusses how the standard TWFE approach might not be suitable to estimate difference-in-differences models in this context due to the possibility of hetero-

geneous treatment effects (see Roth et al. (2023) for a review). To overcome this issue, we apply a DiD approach developed by Callaway and Sant'Anna (2021). This "CSDiD" approach estimates group-time treatment effects for each treatment timing group relative to either a never treated or not yet treated group (Callaway and Sant'Anna, 2021). In our case, both of these are included in the matched comparison group. We can then calculate the average treatment effect on the treated (ATT) for each group-time combination which is then aggregated into an overall ATT estimate. This is done formally by estimating $ATT(g,t) = E[Y_{it}^{1}(g) - Y_{it}^{0}(0)|G_g = 1]$ at every (g,t) point, where 'g' are treatment timing group identifiers, 't' are our time units, and Y_{it} are outcomes for unit 'i' at time 't' .[15] We estimate these ATTs using the regression method presented in Callaway and Sant'Anna (2021).

Moreover, with CSDiD, we can use first difference results for each timing group's pre-treatment period to represent placebo estimates, which can then be aggregated across groups to create 'event study' style plots where we can test for the presence of pre-trends.

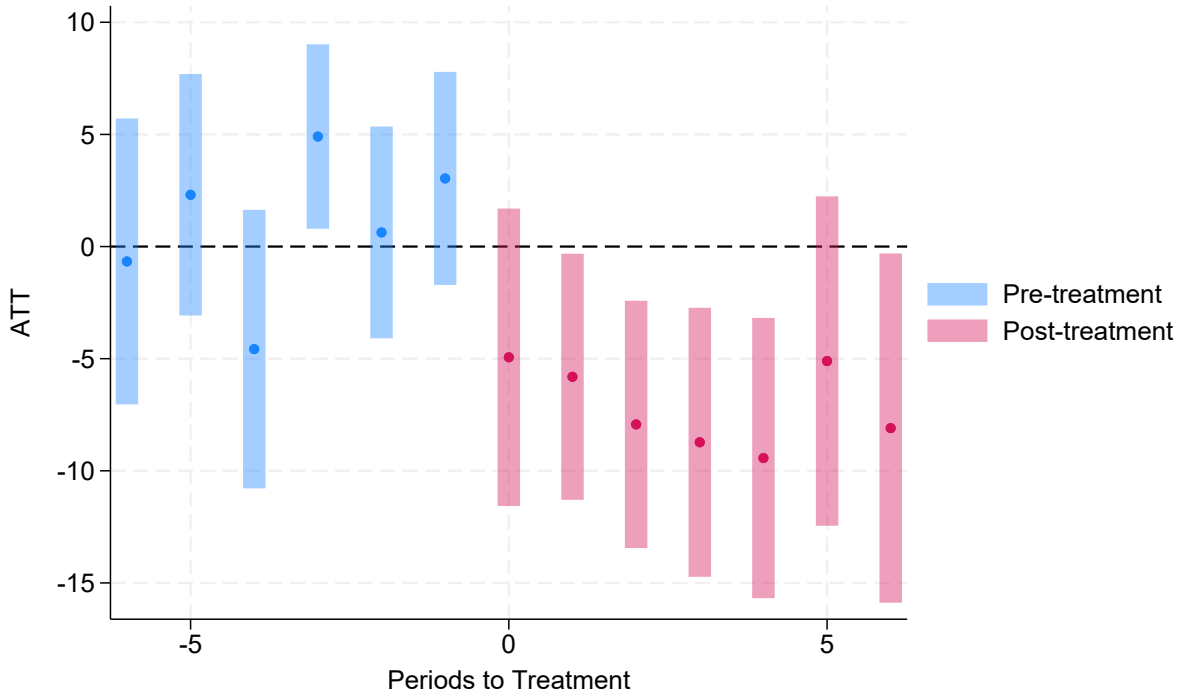
For δ in Equation 1 to identify the ATT, we need one main assumption to hold: parallel trends. In other words, absent school closures, closure and non-closure areas would have experienced similar trends in crime rates. This is a strong assumption. As we saw in Table 2, closure areas experienced a different population growth rate in the lead up to closure, compared to non-closure areas. For this reason, we believe that parallel trends assumption is more likely to hold conditional on pre-closure population growth rates.

To assess the dynamic effects of school closures on crime, we estimate an event study specification of Equation 1. The results, presented in Figure 3, indicate persistent and similarly sized negative effects. Crime reductions begin to materialise within one year of a school closure, although the first post-treatment coefficient is not statistically significant at the 5% level. Point estimates suggest that the effect grows only moderately over time. Regarding pre-trends, the estimated average treatment effect on the treated (ATT) in the pre-treatment period is modest —0.94 crimes per 1,000 inhabitants—and not statistically significant. However, the final three lead coefficients suggest that

[15] In its simplest version, the estimated $ATT(g,t)$'s are a series of all possible 2×2 DiD estimates at every possible point in time (period) and for each group compared against the comparison group.

crime may have increased in closure areas in the years leading up to the event, by approximately 1 to 5 crimes per 1,000 inhabitants. While this pattern could pose a threat to the validity of the parallel trends assumption, we argue that it is unlikely to undermine our identification strategy. First, two of the three lead coefficients are not statistically significant at the 5% level. Second, the positive direction of the estimates implies that any violation of the parallel trends assumption would likely attenuate our results, rather than inflate them.

Figure 3. Event study plot - Changes in crime



Notes: The outcome variable is the overall crime rate per 1,000 inhabitants. The analysis is conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Covariates are: population growth rate, an indicator for urban areas and population density, as of the 2001 census. Standard errors are clustered at the Data Zone level, and the whiskers are 95% confidence intervals.

5 Results

Table 3 reports our ATT estimates for different DiD specifications. The dependent variable in all cases is the crime rate per 1,000 people. All specifications use the CSDiD method. Columns (1) and

(2) use data on all 6,099 Data Zones in the analytical sample, whereas columns (3) and (4) restrict the focus to school areas, i.e. areas with at least one school over our time period. Therefore, these specifications compare areas with closed schools to areas with an open schools, whereas columns (1) and (2) compare areas with closed schools to any other non-closure area, whether these had a school or not. In addition, columns (2) and (4) control for baseline covariates, i.e. population growth, fraction of people without qualification, unemployment rate, population density and an indicator for urban areas, using doubly-robust estimator (Sant'Anna and Zhao 2020).

Table 3. Main estimates

	(1)	(2)	(3)	(4)
School closes in neighbourhood	-7.97**	-4.36	-8.19**	-6.36**
	(3.19)	(2.85)	(3.27)	(3.17)
Mean DV	56.10	56.10	55.35	55.35
SD DV	109.99	109.99	73.00	73.00
Observations	85386	85386	23688	23688
Year FE	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes
School areas only	No	No	Yes	Yes
Base Controls	No	Yes	No	Yes

Notes: The outcome variable is the overall crime rate per 1,000 inhabitants. The analysis was conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Covariates are: population growth rate, unemployment rate, fraction of people without qualifications, an indicator for urban areas and population density, as of the 2001 census. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

The results suggest a reduction of 4-8 crimes per 1,000 people in Data Zones with at least one school closure. All but one coefficients are significant at the 5% level.[16]

In summary, our results in Table 3 suggest that closures reduce the overall crime rate by roughly 7 crimes per 1,000 people (per year), which corresponds to around 10% of a standard deviation in our sample. These results are quite consistent across different specifications and are not hugely sensitive to different definitions of the control group.

[16] Table A2 reports estimates using Two-way fixed effects regression. The estimates are smaller in magnitude, which is expected as heterogeneous treatment effects in staggered timing may lead to severe bias, and none of them is statistically significant.

5.1 Spatial spillovers

In our main specification described in Section 4 we assume the effect of school closures to be limited to the Datazone in which the school is located. That is, thus far we have ignored any potential spillover effect in areas in close vicinity of closed schools.

To account for spillover effects to neighbouring data zones, we implement a spatial rings analysis commonly used in the literature Aliprantis and Hartley 2015, Sandler 2017, Borbely and Rossi 2023, Blanco and Neri 2025). We operationalise this by drawing a 1,000-metre radius around the centroid of each Datazone containing a closed school. We then retain all Datazones whose centroid falls within this circle, and assign them to either the treatment or control group, depending on their distance to the centroid of the Datazone containing the school. We then divide this main circle into five concentric circles: within 200m; between 200m and 400m; between 400m and 600m; between 600m and 800m; between 800m and 1,000m. The latter, outermost ring includes all Datazones in the control group, whereas the first four rings include all Datazones in the treatment group. Based on the rings a Datazone belongs to, this will be treated with a different distance to the closed school. We estimate this using a DiD approach, leveraging the difference in timing of closure as one source of variation. The other source of variation is distance: we compare areas which are close enough to each other and share similar observed and unobserved characteristics and are exposed to similar trends, but are not directly affected by the closure. The results are presented in Table 4.

Table 4. Main estimates - Rings

	Crime Rate			
	(1)	(2)	(3)	(4)
Closure within 200m	-0.84	-1.20	-1.56	-2.07*
	(1.07)	(0.93)	(1.42)	(1.16)
Closure within 200m to 400m	-2.23***	-1.62**	-3.91***	-3.25**
	(0.80)	(0.71)	(1.45)	(1.31)
Closure within 400m to 600m	-3.08***	-2.48***	-3.33**	-3.20**
	(0.97)	(0.88)	(1.50)	(1.26)
Closure within 600m to 800m	-1.99**	-1.59*	-1.95	-2.18*
	(0.91)	(0.83)	(1.47)	(1.28)
All Inner Rings	-2.34***	-1.86***	-2.76**	-2.78**
	(0.75)	(0.67)	(1.27)	(1.10)
Year FE	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes
Year FE X Base Controls	No	Yes	No	Yes
School areas only	No	No	Yes	Yes

Notes: The outcome variable is the overall crime rate per 1,000 inhabitants. The analysis was conducted on the analytical sample of all Data Zones whose centroids fall within a 1,000km radius from the school, from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Covariates are: population growth rate, unemployment rate, fraction of people without qualifications, an indicator for urban areas and population density, as of the 2001 census. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

Columns (1)-(2) use all Datazones whose centroids fall within the 1,000-metre ring, whereas in the specifications reported in columns (3)-(4) we drop those Datazones that never had a school. In columns (2) and (4) we control for the usual baseline covariates, interacted with year fixed effects. All specifications include Datazone and year fixed effects. The last row, "All Inner Rings", reports coefficients for a separate set of four specifications (columns (1)-(4)) where the first four rings are pooled together. In other words, we compare crime rates of all Datazones whose centroid falls within 800m radius, to those of Datazones whose centroids fall in the outermost ring (800-1,000m).

Overall, our estimates suggest that crime rates do not change in the close vicinity of closed schools; the coefficient for the innermost rings ranges between -0.84 and 2, but is never statistically significant at any conventional level. However, crime reduction is concentrated in the 200m-400m (between -2.48 and -3.33) and the 400m-600m (between -1.62 and -3.25) rings. Finally, when we look at the bottom row, we find crime reductions between 1.86 and 2.78 crimes per 1,000 within an 800m radius from the school, compared to the areas within 800 and 1000 metres away. These results are

not sensitive to the choice of distance radii. [17]

5.2 Mechanisms

In this section, we examine two potential mechanisms through which school closures may influence crime: (i) the displacement of victims and perpetrators, and (ii) gentrification. If the observed effects are primarily driven by the criminal activity or victimisation of pupils, we would expect three patterns to emerge. First, the impact should be concentrated among secondary school closures, where students are older and more likely to be involved in or affected by crime. Second, the effect should be driven by crime types typically associated with juveniles. Third, we would expect to see roughly symmetrical changes in crime rates in areas where new schools open, i.e. where pupils from closed schools are relocated. Alternatively, if school closures are followed by significant shifts in the demographic composition of affected neighbourhoods, gentrification may be the dominant mechanism. This would imply that changes in crime are less about pupil displacement and more about broader socio-economic transformations.

5.2.1 "Pupils-as-offenders"

Table 5 presents variations of the specification from column (1) of Table 3, restricting the sample by school type: primary (columns (1)–(2)), secondary (columns (3)–(4)), and special schools (columns (5)–(6)). Columns (1), (3), and (5) compare closure areas to all non-closure areas, while columns (2), (4), and (6) limit the control group to areas with continuing schools.

The estimated crime reduction is strongest—and statistically significant at the 5% level—for secondary school closures, with a decrease of approximately 12 crimes per 1,000 inhabitants. Primary school closures also show a significant effect, though smaller in magnitude, with a reduction of around 7 crimes per 1,000 inhabitants. In contrast, the estimates for special school closures are not statistically significant at conventional levels.

[17] We run the same exercise on a 2,000 metres radius and using 400 metres increments, but the results are virtually unchanged. These results are available upon request.

These findings align with existing evidence that secondary school-aged pupils (12–18 years old) are more likely to engage in criminal or anti-social behaviour (Farrington, 1986, Steinberg et al., 2019). While the effect of primary school closures is smaller, it remains substantial and statistically significant. This is not entirely unexpected, given that pupils in the upper years of primary school (ages 10–12) may also be involved in criminal activity.[18]

Table 5. Effect by school type

	primary		secondary		special	
	(1)	(2)	(3)	(4)	(5)	(6)
School closes in neighbourhood	-7.67**	-7.67**	-12.69**	-12.14**	-6.19	-6.69
	(3.70)	(3.74)	(5.19)	(5.26)	(9.31)	(9.36)
Mean DV	55.92	54.66	55.60	53.29	55.67	53.60
SD DV	110.09	72.19	110.68	71.51	110.79	72.64
Observations	84714	23016	82880	21182	83076	21378
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes	Yes	Yes
School area only	No	Yes	No	Yes	No	Yes

Notes: The outcome variable is the overall crime rate per 1,000 inhabitants. The analysis was conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Covariates are: population growth rate, unemployment rate, fraction of people without qualifications, an indicator for urban areas and population density, as of the 2001 census. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

Furthermore, Table 6 reports results for different aggregate crime categories. Column 1 of Panel A shows the estimated effect on overall crime rates, like in column 1 of Table 3, whereas column (2) to (6) use major crime categories as classified by Police Scotland. These are: Violent non-sexual crimes, Sexual crimes, Dishonesty and theft, Vandalism, and Other crimes (see Table A1 for further details). In addition, in Panel B we use other categories of crime: Assault, Shoplifting, Alcohol related crimes, Drug-related crimes, Knife crimes, and Offensive weapons. The last two categories include both possession and use of a weapon in a different crime.

[18]For example, a recent BBC investigation reported that in 2024, at least 10% of knife crimes in England and Wales were committed by primary-school-aged children, with some cases involving children as young as four or six. See for example, 'Young people taking knives to school, BBC finds', *BBC News*, 9 October 2025.

Table 6. Main estimates - Crime categories

	All Crimes	Violent Crimes	Sexual Crimes	Dishonesty & Theft	Vandalism	Other
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Major crime categories						
School closes in neighbourhood	-7.97**	-1.68*	0.01	-2.60**	-2.12**	-1.58*
	(3.19)	(1.00)	(0.15)	(1.31)	(0.98)	(0.86)
Mean DV	56.10	12.66	1.25	21.96	11.45	8.78
SD DV	109.99	31.08	2.70	56.11	12.86	21.48
	Assault	Shoplifting	Alcohol	Drugs	Knife crimes	Offensive weapon
Panel B: Other crime categories						
School closes in neighbourhood	1.84*	-0.04	-0.46	-0.55	-0.26**	-0.36**
	(1.02)	(0.63)	(1.37)	(0.68)	(0.12)	(0.17)
Mean DV	16.68	5.08	5.28	5.87	0.51	0.39
SD DV	34.35	29.57	29.69	16.43	1.50	1.39
Observations	85386	85386	85386	85386	85386	85386
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The outcome variables are crime rates per 1,000 inhabitants (see Table A1 for further details). The analysis was conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Covariates are: population growth rate, unemployment rate, fraction of people without qualifications, an indicator for urban areas and population density, as of the 2001 census. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

We find that the overall reduction in crime following school closures is primarily driven by declines in Dishonesty and Theft (property crimes) and Vandalism. For both categories, the estimates indicate a decrease of approximately 2 offences per 1,000 inhabitants, with both effects statistically significant at the 5% level. Violent and Other crimes also show a reduction—around 1.5 offences per 1,000 inhabitants – but these estimates are only significant at the 10% level.

In Panel B, we examine more granular crime classifications. We find no statistically or economically significant changes in Assaults, Shoplifting, or Alcohol- and Drug-related offences following school closures. However, we do observe a notable decline in incidents involving possession or use of knives and other offensive weapons. This finding aligns with recent trends in knife crime, particularly among young people (1919 Magazine, 2025). Although knife crime in the UK has generally declined since 2022, a substantial proportion of these incidents continue to occur in or

around schools (BBC, 2025).

Finally, we investigate whether crime rates change in those neighbourhoods where pupils from closed schools are displaced. In particular, we look at the effect of the opening of new schools. Table 7 presents our estimates, using the CSDiD method. In columns (1) and (2), we compare areas with opening schools to areas that never experience an opening (or a closure) but either area may have had a school already. In columns (3) and (4), we narrow the focus to areas that only had a school following a new opening; therefore, we estimate the effect of opening a new school where there was none, compared to areas with no schools. Finally, columns (2) and (4) add pre-treatment baseline covariates as in Table 3.

Table 7. Openings

	(1)	(2)	(3)	(4)
School opens in neighbourhood	5.12	12.35**	5.08	11.45**
	(3.61)	(5.12)	(3.62)	(4.92)
Mean DV	55.71	55.71	56.40	56.40
SD DV	109.93	109.93	120.89	120.89
Observations	84700	84700	62468	62468
Year FE	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes
New school	No	No	Yes	Yes
Base Controls	No	Yes	No	Yes

Notes: The outcome variable is the overall crime rate per 1,000 inhabitants. The analysis was conducted on the analytical sample (see Section 3.4) made of 6,050 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Covariates are: population growth rate, unemployment rate, fraction of people without qualifications, an indicator for urban areas and population density, as of the 2001 census. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

Our estimates suggest that the opening of a new school is associated with an increase of approximately 5 crimes per 1,000 inhabitants, regardless of whether a school previously existed in the area (column (1)) or not (column (3)). This effect is roughly symmetrical to the reduction in crime observed in areas where schools close, pointing to a potential displacement of criminal activity from closure to opening areas. However, neither estimate is statistically significant.

When baseline covariates are included (columns (2) and (4)), the estimated effect more than doubles, indicating a statistically significant increase of 11-12 crimes per 1,000 inhabitants at the 5%

level.

When we examine the composition of the crime increase following school openings, the picture is less straightforward than in the case of closures, where the decline was clearly driven by offences plausibly linked to youth involvement. In Table A3, we replicate the analysis from Table 6, using school openings as the treatment. We rely on the most parsimonious specification – column (1) of Table 7 – which provides the most conservative estimates. The results in Table A3 suggest that the increase in crime following school openings is primarily concentrated in violent non-sexual crimes, sexual offences, vandalism, and other crimes. Of these, only violent and sexual crimes are statistically significant at the 5% level. Panel B shows modest increases in assault, drug-related offences, and knife or weapon possession, but none of these estimates reach statistical significance.

Taken together, the results from Tables 5, 6, and 7 are consistent with established evidence that criminal behaviour tends to peak during adolescence and is concentrated in specific types of offences (Farrington, 1986). This suggests that the observed reduction in crime following school closures may be partly driven by the displacement of crime–prone youth. This interpretation is further supported by the socio–demographic profile of pupils attending schools that were closed (see Table 1).

5.2.2 Gentrification

While Section 5.2.1 presents strong evidence in favour of a crime displacement mechanism, it remains possible that our results are also capturing changes in neighbourhood composition or shifts in footfall following school closures. To investigate these alternative channels, Table 8 examines the impact of closures on the housing market, while Table 9 explores demographic changes using census data.

Unfortunately, we lack a direct measure of footfall. However, we proxy residential turnover using the number of property sales at the Datazone level - a variable previously linked to higher crime rates (Braakmann, 2023). This allows us to assess whether increased mobility or neighbourhood churn may be contributing to the observed crime patterns.

Table 8 uses (the log of) Data Zone-level average house prices as well as the number of sales as outcomes. We can see that regardless of the specification, school closures had no impact on the housing market. While there seems to be a 3% reduction in house prices, and a reduction by less than one sale, none of these estimates are statistically significant.

Table 8. Housing outcomes

	lp(mean hp)	# of sales	lp(mean hp)	# of sales	lp(mean hp)	# of sales
	(1)	(2)	(3)	(4)	(5)	(6)
School closes in neighbourhood	-0.03	-0.35	-0.03	-0.94	-0.03	-0.79
	(0.02)	(0.89)	(0.02)	(0.91)	(0.02)	(0.94)
Mean DV	11.74	12.99	14.14	11.74	13.47	14.14
SD DV	0.58	11.66	1.01	0.57	11.77	1.02
Observations	80538	85061	22416	23627	22416	23627
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes	Yes	Yes
School areas only	No	No	Yes	Yes	Yes	Yes
Based controls	No	No	No	No	Yes	Yes

Notes: The outcome variables are the (log of) average house price and total number of residential sales at the Data Zone/School year level. The analysis was conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Covariates are: population growth rate, unemployment rate, fraction of people without qualifications, an indicator for urban areas and population density, as of the 2001 census. Columns (1)-(2) compare closure areas to any non-closure areas, columns (3)-(4) only use continuing schools as part of the control group, whereas columns (5)-(6) add baseline covariates to the specifications in columns (3)-(4). All specifications use the CSDiD approach. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

Table 9 uses overall population (columns (1)-(2)), fraction of families with dependent children (columns (3)-(4)), fraction of people with no qualification (columns (5)-(6)), fraction of households living in social housing (columns (7)-(8)), fraction of 16-65 people in standard occupational classification 1, i.e. "Managers, directors and senior officials" (columns (9)-(10)), unemployment rate (columns (11)-(12)), fraction of household renting privately (columns (13)-(14)) and owning the property they occupy (column (15)-(16)). These regressions are based on a panel of Datazones observed over three years of census, i.e. 2001, 2011 and 2022. The staggered set-up is maintained by assignment treatment status starting from the census wave immediately after the year of closure. For example, if a Datazone experiences closure in 2007, the treatment indicator will be 0 in 2001, and 1 in 2011 and 2022. If a Datazone experiences closure in 2015, then the treatment indicator is turned off in 2001 and 2011, and on in 2022.

Table 9. Demographic changes

	Population		Fam w children		No qualification		Social housing		SOC1		Unempl rate		Rental		Home ownership	
	CSDID (1)	TWFE (2)	CSDID (3)	TWFE (4)	CSDID (5)	TWFE (6)	CSDID (7)	TWFE (8)	CSDID (9)	TWFE (10)	CSDID (11)	TWFE (12)	CSDID (13)	TWFE (14)	CSDID (15)	TWFE (16)
School Closure	17.38	19.19	-0.00	-0.00	-0.02***	-0.02***	0.01	0.00	0.01***	0.01***	-0.01***	-0.01***	-0.00	-0.00	0.00	0.01
	(19.67)	(22.17)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Observations	18294	18294	18294	18294	18294	18294	18294	18294	18294	18294	18294	18294	18294	18294	18294	18294
Mean DV	775.10	775.10	0.27	0.27	0.26	0.26	0.24	0.24	0.12	0.12	0.06	0.06	0.10	0.10	0.64	0.64
SD DV	213.39	213.39	0.10	0.10	0.13	0.13	0.21	0.21	0.04	0.04	0.04	0.04	0.10	0.10	0.22	0.22
School Opening	214.37***	273.98***	0.03**	0.03***	-0.02	-0.02	-0.01	-0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.01	0.02
	(81.24)	(106.22)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)
Observations	18146	18146	18146	18146	18146	18146	18146	18146	18146	18146	18146	18146	18146	18146	18146	18146
Mean DV	776.22	776.22	0.27	0.27	0.26	0.26	0.23	0.23	0.12	0.12	0.06	0.06	0.10	0.10	0.65	0.65
SD DV	219.64	219.64	0.10	0.10	0.13	0.13	0.20	0.20	0.04	0.04	0.04	0.04	0.10	0.10	0.22	0.22

Notes: The analysis was conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones and census 2001, 2011 and 2022. We use census and Data Zone fixed effects. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

The top panel reports the results for school closures. We can see that school closures did not lead to any significant change in population or in the fraction of families with children. Neither coefficient is statistically significant, and neither is economically meaningful. In addition, we observe no change in the housing tenure profile of the neighbourhood - the fractions of households renting privately or from the council or owning their home are not statistically different from zero. On the other hand, the fraction of people without qualifications and the unemployment rate decreased by 2 and 1 percentage points, respectively, while the fraction of workers in managerial positions increased by 1 percentage point.

The bottom panel shows the results after school openings. Following the opening of a new school, the population increased on average by 214-274 more people, which is more than 100% of one standard deviation. In addition, the number of families with dependent children also increased by 3 percentage points, which amounts to 30% of one standard deviation. Both sets of results are statistically significant at the 5% level. [19]

We also run a heterogeneity analysis by post-closure land use. In particular, we investigate what happens to crime rates when the school building remains empty, or is turned into housing, or a community centre or demolished, and the site is left as brownland. We do not find any

[19] In this table, CSDiD and TWFE yield similar results - this is because by using only three time periods, our approach here is almost equivalent to a standard 2×2 DiD, and therefore TWFE identifies the correct ATT (Roth et al. 2023).

insightful results from this analysis, possibly on the account of the numerous missing values in the post-closure land use information collected through our FOIs. Results are reported in Table A4.

Overall, Section 5.2.2 suggests gentrification may have played a minor role in explaining this result, at least on closures, whereas the increase in crime observed in new opening areas may be driven by increased footfall and/or population.

5.3 Robustness

We want to exclude the possibility that the observed effect is attributable to changes in reporting behaviour, rather than to a genuine crime reduction. Table A5 report estimates of Equation 1 using different specific types of crime. Due to insurance reasons, vehicle crimes and housebreaking are characterised by high rates of reporting. Therefore, a reduction in these types of offences can be interpreted as a genuine reduction in criminal activity, as opposed to a change in reporting. Our estimates in columns (1) and (2) suggest a reduction in vehicle crime (theft of motor vehicle) and housebreaking (including attempted, in dwelling or other premises) by 0.27 and 0.81 crimes per 1,000, respectively, which corresponds to about 20% of one standard deviation in either case. Both estimates are significant at the 5% level. These results rule out the possibility that the change in crime observed following school closures is due to lower reporting of crime.

In addition, we run a placebo test using crimes unlikely to be affected by school closures as outcomes. These are corruption, fraud and wildlife offences, which we report in columns (3), (4), and (5) respectively. In all cases, the effects are small and not statistically significant, which is a sign that our treatment is not picking up any general change in crime trends.

6 Conclusion

This paper examined whether permanent school closures affect local crime rates, focusing on Scotland, where local governments closed around 350 schools between the 2006/07 and 2018/19 school years. Using a staggered difference-in-differences design, we found that closures were followed

by a reduction of around 10 per cent of a standard deviation in local crime rates. Disaggregated by offence type, we observed declines in violent and property crimes as well as acts of vandalism. Consistent with previous studies, the findings suggest that part of this effect may be driven by the displacement of crime-prone youth and potential victims. We also find some evidence of subsequent gentrification in affected areas.

Permanent school closures are a relatively common occurrence with wide-ranging consequences. Parents and teachers often voice concerns about the disruption these closures cause for pupils and the unequal effects they may have across communities. However, closing under-performing or under-enrolled schools can enable scarce educational resources to be reallocated in ways that enhance academic outcomes. Policymakers must therefore weigh the interests of multiple stakeholders –including displaced students, those in receiving schools, parents, teachers, and the wider local community– when assessing whether to close a school.

While policymakers can draw on a substantial body of research examining the educational impacts of school closures, far less is known about their broader community effects. This paper helps to fill that evidence gap by showing that school closures can influence local crime rates. The findings underscore that neighbourhood residents –whether directly connected to a school or not– have a stake in closure decisions. They also highlight the importance of considering school closures within the wider context of public service planning and delivery, emphasising the need for local governments to coordinate across service providers to enhance community outcomes.

Several avenues remain for future research. Further work could investigate the longer-term crime impacts of closures and explore a wider set of related outcomes at an individual (e.g. employment, earnings, etc) and community level (e.g. broader indicators of social wellbeing). This would help further enhance the evidence base available to local policymakers in considering decisions about school closures; strengthening any appraisal. In addition, analyses using more granular neighbourhood-level data would help to uncover the mechanisms through which school closures shape community composition and local dynamics.

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Appendix A

A Additional Tables and Figures

Table A1. Crime Classifications

Crime and Office Group Name	Crime Description
Overall Crime	Attempted Murder, Fireraising, Fraud, Housebreaking (houses and other premises), Murder, Possession of drugs, Other drugs offences (incl. importation), Possession of offensive weapon (incl. restriction), Robbery and assault with intent to rob, Theft by shoplifting, Theft from a Motor Vehicle, Insecure etc, Theft of a motor vehicle, Vandalism (incl. reckless damage, etc.), Other Group 1, 2, 3 and 5 crime.
Non-Sexual Crimes of Violence	Attempted Murder, Cruel & Unnatural treatment of children, Culpable Homicide, common law, Culpable Homicide, (others), Domestic Abuse (of female), Domestic Abuse (of male), Murder, Offensive weapon (used in other criminal activity), Possession of offensive weapon (incl. restriction), Robbery and assault with intent to rob, Reckless conduct (with firearms), Serious Assault (incl. culpable & reckless conduct - causing injury), Threatening and abusive behaviour, Other Group 1 Crime.
Sexual Crimes	All Group 2 crimes.
Crimes of dishonesty	Attempt theft of motor vehicle, Common Theft, Fraud, Failure to insure against third party risks, Housebreaking (houses and other premises), Theft by shoplifting, Theft of a motor vehicle, Threats and extortion, Other Group 3 crimes.
Fire-raising, vandalism	Culpable & reckless conduct (not firearms), Fireraising, Vandalism (incl. reckless damage, etc.).
Other Crimes	Bladed/pointed instrument (used in other criminal activity), Carrying of knives/bladed instruments, Offensive weapon (used in other criminal activity), Other drugs offences (incl. importation), Possession of drugs, Production, manufacture or cultivation of drugs, Supply of drugs (incl. possession with intent), Possession of offensive weapon (incl. restriction), Other 5 crimes.
Offences	Dangerous driving, Driving Carelessly, Driving without a licence, Driving while disqualified, Drivers neglect of traffic directions (NOT pedestrian crossings), Speeding, Drink, Drug driving offences incl. Failure to provide a specimen, Other alcohol related offences, Minor Assault, Other Group 6 and Group 7 offences.

Notes: This table provides a breakdown of the six measures of crime used in this paper.

Table A2. Main estimates - TWFE

	(1)	(2)	(3)	(4)
School closes in neighbourhood	-3.72	-2.78	-3.98	-3.06
	(2.46)	(2.22)	(2.53)	(2.31)
Mean DV	56.10	56.10	55.35	55.35
SD DV	109.99	109.99	73.00	73.00
Observations	85386	85386	23688	23688
Year FE	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes
School areas only	No	No	Yes	Yes
Base Controls	No	Yes	No	Yes

Notes: The outcome variable is the overall crime rate per 1,000 inhabitants. The analysis was conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Covariates are: population growth rate, unemployment rate, fraction of people without qualifications, an indicator for urban areas and population density, as of the 2001 census. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

B Timeline of School Closures (Schools Consultations Scotland Act 2010)

1. *For rural school closure proposals only, the education authority must meet the preliminary requirements before publishing such a proposal paper*. In particular, the LA needs to identify the reason for the proposal, alongside a consideration of the possible alternatives to closure and an assessment of the educational benefits and the effects on the wider community. If closure results to be the most appropriate response, then the LA would proceed to Phase 2.

2. *An education authority consults on a proposal – for a minimum of six weeks, including at least 30 school days*. This includes a statement on the educational benefits of the closure, as well as financial information. For rural schools the authority must provide a detailed assessment of all possible alternatives to closure. This procedure concludes with the publication of the proposal paper.

3. *Preparation of Education Scotland's report on the educational aspects of the proposal - to be completed within a maximum of three weeks*. After ES receives the proposal paper, an inspector provide the LA with a report including the feedback on the educational benefits originally stated in the proposal paper.

4. *Consultation report - within no specified timescale, the authority prepares and publishes a consultation report*. This constitutes a response to the ES report, and how the LA intends to address any concern raised by ES.

5. *Authority decision - a minimum of three weeks after the publication of the consultation report the authority publishes its final decision*. If the LA makes a closure decision, it must notify the Scottish Ministers and, in case of a rural school's closure also publish a notice on the website on the intention to close the school.

Table A3. Openings - crime categories

	All Crimes	Violent Crimes	Sexual Crimes	Dishonesty & Theft	Vandalism	Other
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Major crime categories						
School opens in neighbourhood	5.12	1.65**	0.68**	-0.63	1.79	1.64
	(3.61)	(0.82)	(0.27)	(1.54)	(1.76)	(1.18)
Mean DV	55.71	12.60	1.25	21.82	11.36	8.67
SD DV	109.93	31.17	2.70	55.94	12.83	21.68
	Assault	Shoplifting	Alcohol	Drugs	Knife crimes	Offensive weapon
Panel B: Other crime categories						
School opens in neighbourhood	3.19	-1.36	0.53	1.11	0.01	0.18
	(2.13)	(1.04)	(2.06)	(0.85)	(0.19)	(0.19)
Mean DV	16.62	5.00	5.17	5.80	0.50	0.39
SD DV	34.47	29.22	29.24	16.75	1.50	1.38
Observations	84700	84700	84700	84700	84700	84700
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The outcome variables are crime rates per 1,000 inhabitants (see Table A1 for further details). The analysis was conducted on the analytical sample (see Section 3.4) made of 6,050 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Covariates are: population growth rate, unemployment rate, fraction of people without qualifications, an indicator for urban areas and population density, as of the 2001 census. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

Table A4. Effect by land use type

	empty building		empty land		housing		community	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
School closes in neighbourhood	-1.47	-1.47	4.00	4.00	1.26	1.26	-0.04	-0.04
	(6.51)	(6.51)	(6.69)	(6.69)	(5.71)	(5.71)	(10.15)	(10.15)
Mean DV	55.16	55.16	55.25	55.25	55.39	55.39	55.20	55.20
SD DV	110.57	110.57	110.53	110.53	110.61	110.61	110.62	110.62
Observations	81620	81620	81704	81704	81816	81816	81508	81508
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Matching	No	Yes	No	Yes	No	Yes	No	Yes

Notes: The outcome variable is the overall crime rate per 1,000 inhabitants. The analysis was conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

Table A5. Robustness checks

	Vehicle crimes	Housebreaking	Corruption	Fraud	Wildlife offence
	(1)	(2)	(3)	(4)	(5)
School closes in neighbourhood	-0.27**	-0.81***	0.02	-0.07	-0.00
	(0.14)	(0.31)	(0.15)	(0.21)	(0.03)
Mean DV	1.03	3.14	1.64	1.38	0.03
SD DV	1.59	3.97	3.02	4.69	0.37 ′
Observations	85386	85386	85386	85386	85386
Year FE	Yes	Yes	Yes	Yes	Yes
Data Zone FE	Yes	Yes	Yes	Yes	Yes

Notes: The outcome variables are specific crime rates per 1,000 inhabitants. The analysis was conducted on the analytical sample (see Section 3.4) made of 6,099 Data Zones from school year 2006/07 to 2018/19. We use year and Data Zone fixed effects. Standard errors adjusted for clustering at the Data Zone level in parentheses. */**/*** denote statistical significance on the 10%, 5% and 1% level respectively.

6. *Ministerial call in, only where the authority makes a closure decision - a maximum of eight weeks*. This can occur in the event the Ministers believe the LA did not comply with the Act (2010)'s requirements. This phase consists of two parts: First, three weeks from the date of the authority's decision, during which anyone can make representations to Ministers on whether the decision should be called in. Second, a maximum of further five weeks for Ministers to decide whether or not to issue a call-in notice. Ministers may require information from the authority during this period. On 30 March 2015 the School Closure Review Panels, independent statutory bodies created *ad hoc*, took over the responsibility from the Scottish Ministers

7. *School Closure Review Panel Determination, a maximum of nine or 17 weeks*. The panel might: *i* refuse consent to the proposal; *ii* refuse consent and remit it to the education authority for a fresh decision; *iii* grant consent to the proposal, either subject to conditions, or unconditionally.

8. *Restriction on school closure consultation for five years*. This only applies in case the School Closure Review Panel refuses consent to the closure proposal or if at the and of Phase Five, the LA decides not to proceed with a closure.