Does stop and search reduce crime? Evidence from street-level data and a surge in operations following a high-profile crime

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Abstract
This paper uses a surge in stop and search operations following a high-profile murder to look at their effect on recorded crime. Difference-in-difference estimates using detailed geocoded data at the street-level suggest a doubling to trebling of the number of searches in streets close to the place of the murder. IV estimates on the effects of stops and searches on crime suggest little effect on property crime, weapons offences and violent crime or drug offences. Some specifications find reductions in anti-social behaviour, suggesting that any effects on crime are due to an increased police presence on the streets.

KEYWORDS
deterrence, England, high-profile crime, police powers, stop and search

1 | INTRODUCTION

In many countries the police have the power to briefly detain and search a person, often based on a reasonable suspicion that an offence has been committed. These powers—‘stop and search’ in the United Kingdom and ‘stop and frisk’/‘Terry stop’ in the United States—are controversial: The decision who to stop might well be influenced by possible biases of the police such as more or less explicit profiling by ethnicity (see, e.g. Alpert et al., 2005; Coviello & Persico, 2015; Gaston, 2019;
Additionally, different policing tactics, such as the extent to which stop and search powers are used, might influence community attitudes towards the police through different lived experiences and thus influence future crime prevention and detection (e.g. Brunson & Miller, 2006; Jefferson & Walker, 1993; Miller & D’Souza, 2016; Sharp & Atherton, 2007; Slocum & Wiley, 2018; Tankebe, 2012; Weitzer & Tuch, 2002). Against this background, this paper is concerned with the question to what extent stop and search operations influence recorded crime. Answering this question is an important input into the wider discussion around the appropriateness of stop and search as a police tactic: If stop and search is a helpful, but ethically questionable tool to combat crime, a discussion about the trade-offs involved will look different than if stop and search does not work in the first place.

Empirically answering this question is hindered by the fact that police forces might use stop and search operations in a targeted way, for example, by increasing operations at crime hotspots—in terms of location, timing or both—which has the potential to bias estimates of their effect through the introduction of unobserved confounders. In fact, randomised controlled trials of the policing of crime hot spots suggest such targeted policing as a viable policing strategy (see, e.g. Ariel et al., 2020; Braga & Bond, 2008; Braga et al., 1999; Ratcliffe et al., 2011; Weisburd et al., 2009). To overcome these challenges this paper uses a surge in stop and search operations in the city centre of Newcastle upon Tyne, UK, following a high-profile and public murder in August 2019. On the evening of 14 August 2019, local lawyer Peter Duncan was stabbed with a screwdriver at a local shopping centre and subsequently died at the scene. The murder was described as resulting from a chance encounter by the police (e.g. BBC, 2019a; Daily Mail, 2019a) and attracted nationwide attention with coverage of the initial murder and the subsequent investigation and trial by outlets such as the BBC (2019a, 2019b), the Guardian (e.g. 2019a, 2019b, 2019c) and the Daily Mail (e.g. 2019a, 2019b, 2019c, 2019d). Immediately following the murder, Northumbria Police increased existing stop and search operations in Newcastle City Centre (Chronicle, 2019) and kept these in place for the following months (Chronicle, 2020). Importantly, the reasons underlying this surge was reassurance of the local population, not a reaction to a beginning or ongoing crime wave. Section 3 presents evidence in favour of this view: Specifically, there is no evidence of a differential trend in total crime or violent crime in Newcastle City Centre before the murder that might have triggered an increase in stop and search operations. There is also no evidence that the increased searches targeted weapon offences in particular—in fact, the vast majority of additional searches were for drugs with a small increase in searches for stolen goods. Further evidence also suggests little evidence that the city centre was policed differently in ways other than increased stops and searches—the proportion of searches devoted to specific items does not change after the murder, neither does the proportion of searches ending in arrests nor no further actions. Using sensor data measuring pedestrian footfall in Newcastle’s City Centre provided by Newcastle University’s Urban Observatory (James et al., 2014) also suggest that the local population did not alter their behaviour following the murder by avoiding the City Centre either generally or at specific hours.

Using detailed street-level data on recorded offences as well as stop and search operations from Northumbria Police, I estimate difference-in-differences style regressions. I first show that stop and search operations in Newcastle city centre were increased substantially in the months following the murder, going from an average of 0.09 searches per street to 0.22 searches per street. At the same time stop and search operation in other inner-city areas outside of the city centre stayed roughly constant with an increase from 0.011 searches per street to 0.017, while stop and search operations in other areas moved from 0.005 to 0.007 searches per street. I also show that
these increases in stop and search operations vary with distance to the place of the murder: Streets within a radius of 200 m saw an increase from 0.21 searches per street to 0.65, those between 200 and 500 m one from 0.09 to 0.29, those between 500 and 1 km one from 0.05 to 0.09 and those more than a 1 km away one from 0.005 to 0.009. Estimates using street-level fixed effects, month fixed effects and detailed month-by-month effects in a difference-in-differences model with leads and lags suggest that stop and search operations doubled on average over the months following the murder relative to the period prior to August 2019, with some months seeing a trebling of operations relative to the pre-murder levels. To put this 200% increase into perspective: The largest (annual) increase in stop and frisk operations observed in New York City during the period 2002–2019 was an approximate doubling from 2003 to 2004 when stops and frisks increased from 160,851 to 313,523, while the local police surges under Operation Impact analysed by MacDonald et al. (2016) amount to a 14% increase in searches in designated hot spots.

There are multiple principle mechanisms through with stop and search can influence recorded crime (e.g. Miller et al., 2000; Quinton et al., 2017). Of particular relevance to this paper are: (a) A search might discover otherwise unrecorded offences. This effect is likely particularly strong for offences that are unlikely to be recorded by a victim, either because a victim does not exist, for example, in the case of the possession of illegal objects such as weapons or drugs, or because the victim has not reported the crime, for example, due to not being aware of the crime or fearing retaliation by the offender or wider community. (b) Stop and search operations might prevent crime through multiple channels: It could disrupt crime if an offender about to commit a crime is searched. It could also increase specific deterrence if a searched offender decides not to commit future crimes due to a higher perceived risk of detection. Finally, it could increase general deterrence in two ways, either directly through increased searches or indirectly through a higher police presence on the streets. For example, carrying drugs or weapons becomes riskier if the chance of being stopped and searched increases. In addition, the increased physical presence of police officers on the streets that is necessary to increase stop and search operations might deter criminals from operating. In this particular case, I show that the surge in stop and search operations in Newcastle largely led to increases in searches with no further action being taken, that is, searches that did not themselves lead to the discovery of a crime. This in turn suggests that we are essentially looking at the second mechanism and should think primarily in terms of general deterrence effects.

In a second step, I build on the difference-in-difference estimates in a series of instrumental variable regressions to look at the effect of stop and search on recorded offences. Previous evidence specifically on the crime-reducing effects of stop and search is comparatively rare, in particular when focusing on quasi-experimental studies exploiting some form of exogenous shift in stop and search operations. Among non-experimental studies, several papers focusing on stop and frisk in New York City use small spatial units, such as census tracks (Rosenfeld & Fornango, 2017) or exact coordinates (Weisburd et al., 2016; Wooditch & Weisburd, 2016). These papers generally find a modest negative association between stop and crime. Weisburd et al. (2016), using an instrumental variable approach with Bartik-style instruments, provide additional support for a possible causal interpretation of this link. Another series of papers focus on specific programmes increasing stop and search operations: McCandless et al. (2016) focus on increases in weapon searches in London as part of Operation BLUNT 2, a program designed to combat knife crime that varied by London Borough. Evidence from differences-in-differences estimates suggest no effects of

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1 Own calculation based on data from New York Civil Liberties Union (2019).
increased weapon searches on assaults, robberies, weapon and drug possession offences and three types of property crime. McDonald et al. (2016) evaluate the effects of Operation Impact in New York City, which involved surges in police presence and searches in high crime areas. These areas, relative to control areas in the same precincts, experienced increases in investigative stops as well as reductions in total reported crimes, assaults, burglaries, drug violations, misdeemeanour crimes, felony property crimes, robberies and felony violent crimes. Finally, in another non-experimental paper for the United Kingdom, Tirantelli et al. (2018) use lagged regression models as well as a sudden increase in suspicion-less searches from 2007 to 2011 in an interrupted time-series design on data from London boroughs for 2004 to 2014. They find little evidence for an effect on recorded drugs offences, non-domestic violent crime, burglary, robbery and theft, vehicle crime and criminal damage. Importantly, unlike McCandless et al. (2016) and McDonald et al. (2016) the quasi-experimental surge in stops and searched used here is unrelated to any pre-existing trends in crime or any wider policing tactic, such as policing of hotspots or special programmes targeted at particular crimes, and is purely aimed at reassuring the local population. However, it is important to be clear about the context in which to interpret my results: They ultimately refer to a single city centre with a large number of retail and related properties that did not experience a major surge in crimes that are usually considered to be susceptible to stop and search. It is entirely possible that stop and search performs differently in different contexts, such as when employed in an area experiencing significant problems with illegal drugs and weapons, and care needs to be taken to extrapolate my findings to contexts that are very different from the one considered here.

A related literature in economics has focused on quasi-experimental shifts in general police strength or deployment and generally found that increased police deployment has a crime-reducing effect. Examples include redeployment of police following terrorist attacks in Buenos Aires (Di Tella & Schargrodsky, 2004) and London (Draca et al., 2011), police (or other guard) redeployments within cities due to specific events (e.g. Cheng & Long, 2018; MacDonald et al., 2016; Mastrobuoni, 2019; McMillen et al., 2019) or specific initiatives around police hiring or equipment (e.g. Bove & Gavrilova, 2017; Mello, 2019). Di Tella and Schargrodsky (2004) focus on increased police protection of Jewish institutions in Buenos Aires following an attack on the main Jewish centre in July 1994 and observe a fall in car thefts in areas affected by the increase in visible police. Draca et al. (2011) use the redeployment of police across London boroughs following the July 2005 London bombings and find significant reductions in crime, in particular for theft and violent crimes. Studies using within-city redeployment through increases in patrols by a private university (MacDonald et al., 2016), shift patterns (Mastrobuoni, 2019), a programme to hire civilian guards protecting routes to and from schools (McMillen et al., 2019) and a special task force in New Orlean’s French Quarter (Cheng & Long, 2018) also usually find an effect of more intensive policing on crime rates. Conceptually, my identification is closest in spirit to Di Tella and Schargrodsky (2004) and Draca et al. (2011) in the sense of looking at a shift in police resources in reaction to a one-off high-profile crime rather than as part of hotspot policing or other specific programmes designed to target specific local problems. However, this paper uses an event that is significantly more common than major terrorist attacks. Additionally, while terrorist attacks are often associated with specific demographic groups, which might influence public and police behaviour (see, e.g. Dávila & Mora, 2005; Kaushal et al., 2007, for evidence of discrimination against Arab and Muslims in the United States following the 11 September 2001, terrorist attacks), the perpetrator, victim as well as the majority of the local population in this case were white. About 90% of the searched
persons in my data are white as are most of the targets of additional searches conducted after the murder.

Overall, both reduced form and IV estimates suggest little impact of the surge in stops and search operations on most crime. A consistent finding across all specifications is a lack of an effect on either drug offences or weapons offences and violent crime, that is, some of the crime generally considered to be susceptible to stop and search operations. Some specifications suggest a possible effect on property crime, however, this finding varies substantially depending on the exact specification. A fairly consistent finding is a drop in anti-social behaviour, criminal damage and arson and public order offences (broadly offences which cause fear, alarm or distress to the public that are more serious than anti-social behaviour, such as affray, the provocation of violence, harassment, violent disorder, public nuisance, acts to stir up racial or religious hatred or acts outraging public decency), largely driven by reductions in the former. In some specifications, these reductions are large enough to lead to a negative effect on total recorded crime. The lack of an effect on crime considered to be susceptible to stop and search, including those considered by McCandless et al. (2016) and Tiratelli et al. (2018), is consistent with the criminological literature for the United Kingdom. The possible observed reductions in anti-social behaviour are in line with the idea that the increase in stop and search operations resulted in increased general deterrence. In fact, given that anti-social behaviour becomes become riskier in the face of a higher police presence, but not necessarily through a higher risk of being searched, it seems likely that the crime-reducing effects are driven by an increased and more active police presence on the streets. Viewed through this lens, the results are also in line with the general literature on police deployment and crime in economics. An implication of this main result is that the crime-reducing benefits of increased stop and search operations should also be achievable through—politically much less contentious—increases in police presence on the street, such as additional patrols.

The paper proceeds as follows: Section 2 gives an overview over stop and search powers of the police in England. Section 3 describes data and the general empirical approach. Section 4 presents results on increased stop and search operations and their nature. Section 5 looks at the effects of stop and search operations on crime. Section 6 presents multiple robustness checks. Section 7 concludes.

2 STOP AND SEARCH POWERS OF THE ENGLISH POLICE

The power of the police to stop and search a person in England (and Wales) arises due to various Acts of Parliament. With a few exceptions, detailed in the section OA.1 in the online appendix alongside a full list of all Acts of Parliament granting stop and search powers, these require a police officer to have reasonable grounds to suspect that a person is carrying an illegal object. Before beginning a search, the police officer is required to state their name and police station, the object being searched for (e.g. drugs or a knife), the reason and legal grounds for the search

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2 The notion of anti-social behaviour was introduced in the Crime and Disorder Act 1998 with some later changes through the Anti-social Behaviour Act 2003. It basically describes acting ‘in a manner that caused or was likely to cause harassment, alarm or distress to one or more persons not of the same household as himself’ (the perpetrator) (Part I, Chapter 1, Section 1 of the Crime and Disorder Act 1998).

3 Public order offences in the data also principally cover offences such as treason, espionage, terrorism, attempting to injure or alarm the sovereign and the prohibition of quasi-military organisations. It seems a priori unlikely, however, that these matter much for the context here.
and the searched person’s right to obtain a copy of the search record. In a public place, the police can require the searched person to take off any coats, jackets or gloves. Any additional removal of clothing requires the police to take the searched person out of public view and requires the search to be conducted by an officer of the same sex as the searched person. There is no possibility for a ‘consensual’ search in situations where no power to stop and search exist. In addition, the police have a right to stop and question any person for their name, what they are doing in an area and where they are going. People do not have to answer these questions and ignoring the police’s questions cannot in itself be used to justify a search or an arrest. In my data (see Section 3), the vast majority of searches (in excess of 95%) were conducted under section 23 of the Misuse of Drugs Act 1971, which can be used to search for controlled drugs, and section 1 of the Police and Criminal Evidence Act 1984, which can be used to search for a variety of items, namely stolen goods, weapons including knives, illegal fireworks and articles used in various property crimes, such as crowbars or lockpicks.

3 DATA AND EMPIRICAL APPROACH

The main source of data on offences and stops and searches is www.police.uk, a website maintained by the British police that provides crime maps for England and Wales. The underlying data can be accessed on https://data.police.uk/. Offence data are available in a geocoded format by offence category and month from December 2013, while stop and search data are available from December 2014. This paper uses data from Northumbria Police from January 2018 to January 2020, which is (a) the latest available data point at the time of writing and (b) the last month before the 2019/20 Coronavirus pandemic hit the United Kingdom and started to divert the attention of public bodies. This timeframe allows us to look at the 19 months before the surge in stop and search operations in August 2019 to establish a baseline for trends in both crime and stop and search operations and the 6-month period following the surge.

Northumbria Police is one of 43 police forces in England and Wales. Its area of responsibility covers the metropolitan county of Tyne and Wear (covering the cities of Newcastle upon Tyne and Sunderland and the metropolitan boroughs Gateshead, North Tyneside and South Tyneside) and the county of Northumberland in the North East of England. Tyne and Wear is a large, predominantly urban agglomeration area with a combined population of slightly above 1 million people spread over 538 km². Northumberland is a largely rural county to the north of Tyne and Wear and to the south of Scotland with a population of slightly above 300,000 spread over 5013 km². Spatial restrictions to the estimation sample are discussed below.

Offences are coded into 14 categories, namely Anti-social behaviour, Bicycle theft, Burglary, Criminal damage and arson, Drugs, Other crime, Other theft, Possession of weapons, Public order, Robbery, Shoplifting, Theft from the person, Vehicle crime, Violence and sexual offences. A short description of each category can be found in Section OA.2 in the online appendix, alongside a link to the whole list of Home Office offence codes covered under each category. The categories are consistent over the observation period. For most analyses, I aggregate these to four categories: Anti-social behaviour, criminal damage and public order; property crime; drugs and weapons offences and violent crime. I also look at total recorded crime counts. The raw data are measured at the offence level. For each offence the data note the offence category, the date (coarsened to month and year as part of the anonymisation process) and the latitude and longitude of the place where the offence was committed. Locations are anonymised slightly to preserve anonymity of the victims. Specifically, each crime is placed on the closest map point from a master list. These
anonymised map points are chosen to correspond to the centre point of a street, a public place such as a park or airport or a commercial premise like a shopping centre or nightclub. Each map point contains at least eight postal addresses or no postal addresses at all.\textsuperscript{4} The vast majority of map points across England and Wales are streets (count of 679,089), followed by sports and recreation areas (24,510), parking areas (17,797), parks and open spaces (14,051) and supermarkets and petrol stations (5703 and 5501) respectively. Given that this paper looks at a densely populated urban area, most crimes will likely simply be moved to the midpoint of the nearest street, that is, by a few metres.

Stop and search data are measured in a similar way: The unit of observation is an individual search with the same anonymisation process applied for both location and date. In addition, the data notes for each search some demographic information on the searched person, the legal base for the search, the object searched for and the outcome of the search. The object searched for is what motivated the officer to initiate the search, not an eventual illegal object found as a result of the search. For example, if an officer initiated a search based on a reasonable suspicion that someone was carrying a knife, but then finds illegal drugs, the former is recorded as the object of the search. For this paper I group these into four categories: Weapons, drugs, stolen goods/articles for use in theft (e.g. lockpicks or crowbars) and other objects (largely poaching offences). The latter category contains—unsюрprisingly in an urban area—very few cases and is not used as an outcome in any regression. Outcomes of searches are grouped into four categories: No further action (i.e. nothing was found), arrest, court summons and cautions and related (including, e.g. fines).

Both offences and stops and searches are initially aggregated to counts at the month-location level. Each location is then matched to the nearest unit postcode from the November 2019 postcode master list, where ‘nearest’ is defined in terms of the geodetic distance. Postcodes without a match for a given offence/stop and search category in a given month are assigned a count of zero. UK unit postcodes are relatively small spatial units, roughly corresponding to streets or parts of streets and covering on average 15 delivery points (addresses). I restrict the estimation sample to the Newcastle upon Tyne postcode area and within that to postcode districts NE1 to NE41,\textsuperscript{5} which essentially drops large parts of Northumberland and some non-geographic postcode districts corresponding to British Telecom, Spark Response Ltd, HMRC, the Department of Work and Pensions and locked boxes in the Head Post Office. I also drop district NE19 which covers a largely rural area to the West of Newcastle. Some parts of Northumberland bordering on Newcastle upon Tyne, for example, NE20, which covers Ponteland, but also Newcastle International Airport, are included in the sample. The resulting dataset is a strongly balanced panel covering 28,251 postcodes/streets over 25 months for a total of 706,275 observations. In terms of measurement, the spatial scale of the dataset is likely slightly coarser than the exact coordinates/street segments used by Weisburd et al. (2016) and Wooditch and Weisburd (2016), but crime and stops and searches are still measured at a very granular spatial scale. A possibly bigger problem—although unavoidable given the data—is the aggregation at the time level. Looking at monthly averages can in principle miss changes to the timing of crimes and stop and searches that happen at a smaller scale, for example, crime moving to hours when fewer stops and searches are conducted.

Panel (a) in Figure 1 presents a map of the included and excluded postcode districts in the NE postcode area.

\textsuperscript{4}Details on the location anonymisation process and a description of map points can be found at https://data.police.uk/about/#location-anonymisation.

\textsuperscript{5}There is no NE14 postcode district, leading to 40 districts being present in the estimation sample.
FIGURE 1  Treated and control areas within NE Postcode Area. (a) Postcode districts included in estimation sample. (b) Treated and control areas
In a first step, I investigate the increase in stop and search operations following the murder of Peter Duncan in August 2019. I begin by estimating simple $2 \times 2$ difference-in-differences where Newcastle City Centre (equivalent to postcode district NE1) serves as the treatment group. As control groups I use (a) other areas in Newcastle’s inner-city area, specifically the postcode districts NE2 Jesmond, Spital Tongues, NE3 Gosforth, Fawdon, Kingston Park, Great Park (East), NE4 Fenham, Westgate, Wingrove, NE5 Westerhope, Newcastle West, NE6 Walker, Byker, Heaton, NE7 High Heaton, Benton and (b) all streets in the postcode districts NE2 to NE41, with the exception of NE19 as explained above. Both result in identical estimates. The remainder of the paper displays results using inner-city areas in Newcastle as controls. Results using the wider control group can be found in section OA.3 in the online appendix. Panel (b) in Figure 1 visualises the treated and control areas: Newcastle City Centre is marked in light grey. The narrower control area is comprised of neighbouring postcode districts north of the River Tyne. The wider control area additionally includes the postcode districts depicted in dark grey. The treatment area comprises 847 streets (21,175 observations), the postcode districts NE2 to NE7 5655 streets (141,375 observations) and the postcode districts NE8 to NE41 21,749 streets with 543,725 observations. In the simplest specification I split the sample into a pre- and a post-period. The former runs from January 2018 to July 2019, the latter from August 2019 to January 2020. As the murder occurred on 14 August 2019, I generally include August 2019 in the post-treatment period. Alternative estimates excluding August 2019 can be found in section OA.4 in the online appendix. Results are generally identical.

Table 1 presents descriptive statistics for the estimation sample, split by area and treatment period. There is a clearly visible increase in the number of stop and search operations in Newcastle City Centre in the period from August 2019 that is not mimicked in the other areas. As already stated, the largest increase can be found in searches not resulting in further action and in searches for drugs, although some of the other categories also saw increases. There are drops in offence counts in multiple categories, although these are often across treated and control areas, highlighting the need for more advanced modelling.

I begin by estimating

$$sas_{idt} = \alpha + \gamma \ast treated_d + \delta \ast post_t + \tau \ast (treated_d \ast post_t) + \varepsilon_{idt}, \quad (1)$$

where $sas_{idt}$ is the number of stop and search operations in street/postcode $i$ nested within postcode district $d$ in month $t$. Standard errors are initially clustered at the level of the street. I also provide estimates with clustering at the level of the postcode districts as well as results from randomisation inference procedures as a robustness check. These are largely qualitatively identical to the main estimates and can be found in Section 6.1.

To shed some light on possible mechanisms connecting stop and search operations and recorded crime I also consider alternative outcomes such as the number of stop and search operations by outcome (no further action, arrest, court summons, caution and related) and the object that was searched for (weapons, drugs, stolen goods/articles used in theft). Importantly, stops and searches resulting in no further action cannot—by definition—result in the discovery of a crime and can only influence crime through disruption or some form of deterrence. Looking at the object of searches will shed some light on whether the police mainly increased weapons-related searches or searches across the board.

I subsequently build on the specification in (1) by replacing $post_t$ with month fixed effects ($\theta_t$) and $\alpha$ with fixed effects initially at the postcode district level and finally at the street level to arrive at
**TABLE 1** Descriptive statistics

| Area | Newcastle upon Tyne City Centre (postcode district NE1) | Other inner-city areas Newcastle (NE2-NE7) | Other areas (NE8-NE41) |
|------|------------------------------------------------------|------------------------------------------|-----------------------|
|      | Before 08/2019                                       | After 08/2019                            | Before 08/2019        | After 08/2019 |
| Period |                                                   |                                           | Before 08/2019        | After 08/2019 |
|       |                                                   |                                           | Before 08/2019        | After 08/2019 |
|       |                                                   |                                           | Before 08/2019        | After 08/2019 |
|       |                                                   |                                           | Before 08/2019        | After 08/2019 |

**Stops and searches (average count by street)**

|                      | Before 08/2019 | After 08/2019 | Before 08/2019 | After 08/2019 |
|----------------------|----------------|---------------|----------------|---------------|
| Number of stops and searches | 0.087          | 0.219         | 0.011          | 0.018         |
|                      | 0.005          | 0.007         | 0.003          | 0.005         |

**Number of stops and searches by outcome**

|                      | Before 08/2019 | After 08/2019 | Before 08/2019 | After 08/2019 |
|----------------------|----------------|---------------|----------------|---------------|
| No further action    | 0.062          | 0.172         | 0.008          | 0.013         |
| Arrest               | 0.012          | 0.015         | 0.002          | 0.003         |
| Court summons        | 0.010          | 0.026         | 0.001          | 0.001         |
| Caution and related  | 0.002          | 0.006         | 0.001          | 0.001         |

**Number of stops and searches by object searched for**

|                      | Before 08/2019 | After 08/2019 | Before 08/2019 | After 08/2019 |
|----------------------|----------------|---------------|----------------|---------------|
| Weapons              | 0.014          | 0.025         | 0.003          | 0.003         |
| Drugs                | 0.060          | 0.173         | 0.005          | 0.011         |
| Stolen goods/articles for use in theft | 0.012 | 0.018 | 0.003 | 0.001 |

**Number of stops and searches by ethnicity of searched person**

|                      | Before 08/2019 | After 08/2019 | Before 08/2019 | After 08/2019 |
|----------------------|----------------|---------------|----------------|---------------|
| White                | 0.073          | 0.198         | 0.009          | 0.012         |
| Non-white            | 0.014          | 0.021         | 0.002          | 0.005         |

**Offences (average count by street)**

|                      | Before 08/2019 | After 08/2019 | Before 08/2019 | After 08/2019 |
|----------------------|----------------|---------------|----------------|---------------|
| Total crime          | 1.571          | 1.363         | 0.554          | 0.463         |
| Anti-social behaviour, criminal damage, public order | 0.658 | 0.552 | 0.260 | 0.203 |
| **Off of which**     |                |               |                |               |
| Anti-social behaviour | 0.437          | 0.359         | 0.142          | 0.108         |
| Criminal damage and arson | 0.068 | 0.061 | 0.062 | 0.052 |
| Public order         | 0.154          | 0.131         | 0.055          | 0.042         |
| Property crime       | 0.481          | 0.415         | 0.144          | 0.120         |
| **Off of which**     |                |               |                |               |
| Burglary             | 0.022          | 0.020         | 0.027          | 0.020         |
| Robbery              | 0.011          | 0.011         | 0.003          | 0.002         |
| Shoplifting          | 0.201          | 0.171         | 0.032          | 0.025         |
| Vehicle crime        | 0.016          | 0.014         | 0.027          | 0.025         |
| Theft of bicycle     | 0.020          | 0.019         | 0.008          | 0.007         |
| Theft from the person | 0.063          | 0.060         | 0.005          | 0.005         |
| Other theft          | 0.148          | 0.120         | 0.043          | 0.037         |
The crucial identifying assumption underlying (1) and (2) is that Newcastle City Centre would have experienced similar trends in stop and search operations over the period August 2019 to January 2020 in the absence of the murder. While this assumption is impossible to test as it involves counterfactuals, it is generally seen as more plausible if trends were similar in the pre-treatment period. Figure 2 plots trends in stop and search operation by month for the three areas. It is immediately apparent that (a) Newcastle City Centre experiences vastly more stop and search operations than other areas and that (b) the surge in stop and search operations following August 2019 dwarfs any previous variation in stop and search operations by orders of magnitude. However, Figure 2 presents unconditional trends, while (2) contains various fixed effects. To test whether pre-trends are identical in this more elaborate specification, I estimate a version of (2) including leads and lags for each month over the observation period (using July 2019 as the base period, with \( \tau \) normalised to zero):

\[
sas_{idt} = \alpha_i + \theta_t + \tau \ast (treated_d \ast post_t) + \varepsilon_{idt}, \tag{2}
\]

\( \tau^j \) in (3) gives the difference between treated and control areas in month \( j \) relative to July 2019. Figure 3 plots these estimates alongside their 95% confidence intervals.

As we can see, estimates for \( \tau^j \) are very similar for both control groups. They are also reassuring for the empirical design: While there are sometimes small positive estimates for \( \tau^j \) in the month prior to August 2019, suggesting occasional increases in stop and search operations in the city centre relative to other areas, these pre-treatment increases are generally much smaller than the increases in operations observed in and after August 2019. The estimates also suggest that the increase in stop and operations occurred mainly from October to December 2019 and began to tail off by January 2020.

### Table 1 (Continued)

| Area | Newcastle upon Tyne City Centre (postcode district NE1) | Other inner-city areas Newcastle (NE2-NE7) | Other areas (NE8-NE41) |
|------|--------------------------------------------------------|-------------------------------------------|-----------------------|
|      | Period | Before 08/2019 | After 08/2019 | Before 08/2019 | After 08/2019 | Before 08/2019 | After 08/2019 |
| Drugs | | 0.069 | 0.062 | 0.010 | 0.010 | 0.007 | 0.007 |
| Weapon offences and violent crime | | 0.352 | 0.325 | 0.132 | 0.121 | 0.148 | 0.142 |
| Of which | | | | | | | |
| Weapons | | 0.013 | 0.009 | 0.003 | 0.004 | 0.004 | 0.003 |
| Violence and sexual offences | | 0.339 | 0.316 | 0.129 | 0.118 | 0.144 | 0.139 |
| Other crime | | 0.011 | 0.009 | 0.008 | 0.008 | 0.010 | 0.010 |
| Number of streets | | 847 | 5655 | 21,749 | 21,749 | |
| Number of observations | | 16,093 | 5082 | 107,445 | 33,930 | 413,231 | 130,494 |

\[
sas_{idt} = \alpha_i + \theta_t + \sum_{j=08/2019}^{06/2019} \tau^j \ast (treated_d \ast 1 \{t = j\}) + \sum_{j=01/2020}^{01/2020} \tau^j \ast (treated_d \ast 1 \{t = j\}) + \varepsilon_{idt}. \tag{3}
\]
A related concern is the possibility that the surge in stop and search operations and the murder of Peter Duncan coincided with pre-existing increases in crime. Figures 4 and 5 investigate this possibility by re-estimating (3) with total crime and violent crimes as the outcomes. Focusing on the time period before the murder in August 2019 does not suggest any particular surge in criminal activity, either generally or in terms of violent offences that could have triggered the surge in stop and search operations observed in Figures 2 and 3.

A possible criticism of these estimates is the ad hoc definition of the treatment and control groups. While postcode districts correspond roughly to recognised boundaries within cities, it seems unlikely that the police directly use postcode district boundaries to plan operations. To investigate the robustness of my estimates to alternative definitions of the treatment and control groups, I use a second definition using distance from the place of the murder. The underlying logic is that if stop and search operations were ramped up to reassure the public following a high-profile crime, they should increase proportionally more in streets closer to the place where the crime took place. To operationalise this idea, I group streets into four groups based on the geodetic distance to Old Eldon Square, the place where the murder occurred. The groups are (1) streets within a 200 m radius of Old Eldon Square, (2) streets within 200 to 500 m, (3) 500 m to 1 km and (4) further than 1 km. Figure 6 presents descriptive evidence that stop and search mainly increased for groups 1 and 2 and that these increases were stronger for streets closer to Old Eldon Square. Estimates relying on this alternative group definition can be found in section OA.6.4 in the online appendix.

I then turn to the question how stop and search influences crime. To do so I estimate regressions with similar specifications to those already described. The most comprehensive
**FIGURE 3** Stop and search—estimated difference between treated and controls by month. *Note:* Coefficient plots of the interaction from Equation (3), conditional on postcode fixed effects and month fixed effects. Standard errors are adjusted for clustering on the postcode level. Treated is the postcode district NE1 City Centre. Controls are other inner-city areas, specifically the postcode districts NE2 Jesmond, Spital Tongues, NE3 Gosforth, Fawdon, Kingston Park, Great Park (East), NE4 Fenham, Westgate, Wingrove, NE5 Westerhope, Newcastle West, NE6 Walker, Byker, Heaton, NE7 High Heaton, Benton.

specification uses street fixed effects and month fixed effects as well as interactions between the treatment group and the pre-treatment months as in

\[
\text{crime}_{i dt} = \alpha_t + \theta_t + \tau \ast \text{sas}_{i dt} + \sum_{j=01/2018}^{06/2019} \tau^j \ast (\text{treated}_d \ast 1\{t = j\}) + \varepsilon_{i dt},
\]

where \( \text{crime}_{i dt} \) is the crime count for a specific offence in street \( i \) nested within postcode district \( d \) in month \( t \). Less comprehensive specifications omit the pre-trend interactions and use small sets of fixed effects. Simply regressing offences on stop and search operations as in (4) is unlikely to yield unbiased estimates as stop and search operations might well be targeted based on anticipated crimes. To address this endogeneity of \( \text{sas}_{i dt} \) in (4) I exploit the increase in stop and search operations from August 2019 in an instrumental variable design. Specifically, I use either \((\text{treated}_d \ast \text{post}_t)\) or \(\sum_{j=08/2019}^{01/2020} \tau^j \ast (\text{treated}_d \ast 1\{t = j\})\) as excluded instruments in a 2SLS regression (this strategy follows Draca et al., 2011, and essentially scales the observed reduction in crime by the observed increase in stops). Under an interpretation as a local average treatment effect (LATE, see Angrist et al., 1996; Imbens & Angrist, 1994), \( \tau \) in Equation (4) can be seen as the reduction in crime caused by the post-murder surge in stop and search operations. As we will see the instruments are generally very strong with first stage F-values well above the usual critical thresholds. The independence assumption also appears to hold—as discussed earlier the timing and place of the murder were essentially random and there were no pre-existing crime trends in the City Centre. A possibly bigger problem are violations of the exclusion restrictions.
FIGURE 4  Total crime—estimated difference between treated and controls by month. Note: Coefficient plots of the interaction from Equation (3), conditional on postcode fixed effects and month fixed effects. Standard errors are adjusted for clustering on the postcode level. Treated is the postcode district NE1 City Centre. Controls are other inner-city areas, specifically the postcode districts NE2 Jesmond, Spital Tongues, NE3 Gosforth, Fawdon, Kingston Park, Great Park (East), NE4 Fenham, Westgate, Wingrove, NE5 Westerhope, Newcastle West, NE6 Walker, Byker, Heaton, NE7 High Heaton, Benton.

FIGURE 5  Violent crime and sexual offences—estimated difference between treated and controls by month. Note: Coefficient plots of the interaction from Equation (3), conditional on postcode fixed effects and month fixed effects. Standard errors are adjusted for clustering on the postcode level. Treated is the postcode district NE1 City Centre. Controls are other inner-city areas, specifically the postcode districts NE2 Jesmond, Spital Tongues, NE3 Gosforth, Fawdon, Kingston Park, Great Park (East), NE4 Fenham, Westgate, Wingrove, NE5 Westerhope, Newcastle West, NE6 Walker, Byker, Heaton, NE7 High Heaton, Benton.
For example, it might be possible that the murder triggered behavioural changes by the local population, such as avoiding the City Centre, either generally or during certain hours or it could be possible that the police changes not just the number of stops and searches but also their focus. I will return to this question in Sections 6 and sections OA.6.1 and OA.6.2 of the online appendix. The evidence presented there suggests that these concerns do not present major problems.

Most previous research has focused on offences that can be directly affected by stop and search operations, such as drug offences, weapons offences, violent crime and some property crimes. Given that stop and search operations might also have wider deterrence effects through a more visible and active police presence on the streets, I also consider other offences, such as anti-social behaviour and public order offences, that could plausibly be indirectly affected.

4 | CHANGES TO STOP AND SEARCH OPERATIONS

I begin by investigating the intensity and nature of the surge in stop and search operations following the August 2019 murder of Peter Duncan. Table 2 provides estimates for the various difference-in-differences specification using Newcastle City Centre, operationalised as the postcode district NE1, as the treated area and other inner-city areas as control groups. Estimates using the alternative control group can be found in section OA.3 of the online appendix. Changing the control group makes little difference for the results. Additionally, the results are highly consistent across the different specifications. This result is not unexpected—the murder leading to the changes in stop and search operations was a fairly random event, both in terms of timing and in terms of location, which suggests that the inclusion of more detailed spatial or temporal control variables should not make a major different to the results. Column (4) suggests that streets in Newcastle City Centre experienced an increase in stops and searches by about 0.13 searches per street
TABLE 2 Difference-in-difference estimates, outcome = stop and search operations

| Specification | (1) 2 * 2 DiD | (2) + month FE | (3) + postcode district FE | (4) + postcode FeS | (5) with leads and lags |
|---------------|---------------|----------------|---------------------------|--------------------|------------------------|
| City Centre * 08/2019 and later | 0.126*** | 0.126*** | 0.126*** | 0.126*** |
| | (0.030) | (0.030) | (0.030) | (0.030) |
| City Centre * 08/2019 | | | | 0.042** |
| | | | | (0.018) |
| City Centre * 09/2019 | | | 0.034* |
| | | | (0.019) |
| City Centre * 10/2019 | | | 0.208*** |
| | | | (0.045) |
| City Centre * 11/2019 | | | 0.232*** |
| | | | (0.059) |
| City Centre * 12/2019 | | | 0.203*** |
| | | | (0.059) |
| City Centre * 01/2020 | | | 0.153*** |
| | | | (0.039) |
| Observations | 162,550 | 162,550 | 162,550 | 162,550 | 162,550 |
| $R^2$ | 0.013 | 0.014 | 0.014 | 0.414 | 0.416 |

Note: Coefficients, standard errors adjusted for clustering at the postcode level in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% level. Column (1) is a simple difference-in-differences estimate, column (2) add months fixed effects, (3) add postcode area fixed effects, (4) replace these with postcode (~street) fixed effects and (5) adds monthly leads and lags for the interaction term.

and month, representing a 150% increase relative to the pre-August 2019 average. Column (5), which estimates monthly effects, shows that stop and search operations mainly increased from October to December 2019, up to an additional 0.24 searches per street and month, equivalent to a trebling of searches relative to the mean prior to August 2019. August and September appear to be a slow ramping up-period, although the additional searches still represent a 50% increase relative to the earlier mean, and January 2020 looks like the beginning of a planned wind-down of operations. A delay like this is not necessarily implausible given that increases in stop and search operations require the police to redeploy personnel from other areas or operations. Given that Table 1 did not suggest a decline in stops and searches elsewhere, it seems likely that police were primarily redeployed from other activities rather than from stop and search operations in other locations.

Table 3 looks at changes in the numbers of the conducted stop and search operations split by the ethnicity of the searched person. It suggests that most of the additional searches were targeted at white individuals. This result is reassuring given the concerns around ethnic biases in stop and search operation on the one side and the ethnic profile of North East England and the ethnicities of the people involved in the murder of Peter Duncan on the other side.
Table 3  Difference-in-difference estimates, outcomes = searches by ethnicity of searched person

| Ethnicity of searched person | (1)       | (2)       |
|------------------------------|-----------|-----------|
|                              | White     | Non-white |
|                              |           |           |
| **Control areas = Newcastle inner-city areas** |           |           |
| City Centre * 08/2019        | 0.041**   | 0.001     |
|                              | (0.016)   | (0.007)   |
| City Centre * 09/2019        | 0.032*    | 0.002     |
|                              | (0.016)   | (0.006)   |
| City Centre * 10/2019        | 0.194***  | 0.014     |
|                              | (0.042)   | (0.009)   |
| City Centre * 11/2019        | 0.224***  | 0.007     |
|                              | (0.055)   | (0.008)   |
| City Centre * 12/2019        | 0.188***  | 0.015     |
|                              | (0.052)   | (0.010)   |
| City Centre * 01/2020        | 0.145***  | 0.008     |
|                              | (0.034)   | (0.010)   |
| Observations                 | 162,550   | 162,550   |

Note: Coefficients, standard errors adjusted for clustering at the postcode level in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% level. Estimates based on specification (5) from Table 2.

Table 4 looks at changes in the numbers of the conducted stop and search operations split by the object searched for. Maybe somewhat surprisingly, given that the reason for the increase in operations was a violent crime, the results do not suggest an increase in the number of searches for weapons but are largely driven by a higher number of searches for drugs. There are two basic facts that might help to explain this result: The police need a reasonable suspicion that an offence has been committed to stop and search a person and, as Table 1 suggest, drug offences were always more common in Newcastle City Centre than weapons offences. In other words, there might simply be more cases justifying a stop and search for drugs than cases that would justify a search for weapons. The observed effects are large and suggest that the number of drugs-related searches peak roughly trebled during October to December 2019 relative to the pre-surge period.

An important question to understand the mechanism linking stop and search operations and recorded crime, in particular when trying to disentangle (recorded crime-increasing) crime discoveries from (crime-reducing) deterrence and disturbance effects, is what the outcomes of the additional searches were. If most of these resulted in no further action being taken, we could interpret any effects on crime as deterrence or disturbance effects, while the picture would be more complicated if there were also increases in arrests or court summons.

Table 5 considers this question by looking at the number of searches resulting in no further action, arrests, court summons and cautions and related outcomes. The picture presented in the table is very clear: There are large and highly significant increases in the number of searches resulting in no further action, much smaller but often significant increases in searches ending with a court summons and essentially no change in searches resulting in direct arrests or cautions.
T A B L E 4 Difference-in-difference estimates, outcomes = searches by object of search

| Object of search | (1) | (2) | (3) |
|------------------|-----|-----|-----|
|                  | Weapons | Drugs | Stolen goods/articles for use in theft |
| **Control areas = Newcastle inner-city areas** | | | |
| City Centre * 08/2019 | 0.012 | 0.023* | 0.005 |
|                      | (0.010) | (0.014) | (0.005) |
| City Centre * 09/2019 | 0.008 | 0.022 | 0.005 |
|                      | (0.009) | (0.015) | (0.004) |
| City Centre * 10/2019 | 0.016 | 0.173*** | 0.016* |
|                      | (0.010) | (0.035) | (0.010) |
| City Centre * 11/2019 | 0.012 | 0.198*** | 0.019** |
|                      | (0.009) | (0.047) | (0.009) |
| City Centre * 12/2019 | 0.013 | 0.182*** | 0.010 |
|                      | (0.011) | (0.051) | (0.007) |
| City Centre * 01/2020 | 0.002 | 0.136*** | 0.017** |
|                      | (0.007) | (0.034) | (0.007) |
| Observations | 162,550 | 162,550 | 162,550 |
| **R^2** | 0.163 | 0.349 | 0.183 |

Note: Coefficients, standard errors adjusted for clustering at the postcode level in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% level. Estimates based on specification (5) from Table 2.

These results strongly suggest that the surge in stop and operations in and after August 2019 should not have led to a mass discovery of previously unnoticed offences and that eventual effects on crime rates would arise due to disturbance and deterrence effects.

5 | DO STOP AND SEARCH OPERATIONS INFLUENCE RECORDED CRIME?

We now turn to the question whether stop and search operations influence crime. We begin by looking at reduced form estimates presented in Table 6. The results using a single post-treatment dummy suggest a decline in total recorded crime, anti-social behaviour, criminal damage and public order offences as well as property crime. Looking at the detailed month-by-month effects suggests a much more mixed picture with generally insignificant effects for all crime types, although point estimates for total recorded crime, anti-social behaviour, criminal damage and public order offences and property crime are often negative. Note that these results are not directly comparable to the results using a single post-treatment dummy as they also include interactions between pre-treatments months and the treatment group.

The top half of Table 7 presents instrumental variable estimates using the difference-in-differences interaction terms as excluded instruments. For comparison purposes, Table 7 also presents OLS estimates for the corresponding specifications.
Overall, the IV estimates confirm the lack of an obvious effect suggested by the reduced form regressions. There is no evidence for an effect on either drug offences or weapons offences and violent crime and at best suggestive evidence for a decline in property crime in some specifications. Estimates using monthly difference-in-difference interactions as excluded instruments are usually less in favour of a crime-reducing effect of stop and search, mirroring the much more mixed picture from the reduced form regressions in Table 6. The estimates also suggest a decline in anti-social behaviour, criminal damage and public order offences in the magnitude of $-0.4$ offences per month. To give a sense of the magnitude of this effect: Stops and searches in Newcastle City Centre increased from 0.09 to 0.22 per street and month after the murder of Peter Duncan, that is, by 0.13. The implied reduction in anti-social behaviour, criminal damage and public order offences from the estimates is $-0.4 \times 0.13$ or $-0.052$ per street and month. This compares to a pre-August 2019 mean of 0.658 offences per street and month and an overall observed drop in anti-social behaviour, criminal damage and public order offences by 0.106 offences per street and month (see Table 1). In other words, a back of the envelope calculation suggests that the extra stops and searches after the murder were responsible for approximately half of the observed drop in anti-social behaviour, criminal damage and public order offences in Newcastle City Centre or alternatively led to a drop of about 8% of the pre-murder mean.

Contrasting these results with the corresponding OLS results reveals that the latter are severely biased: OLS estimates range from a crime-increasing effect of stops and searches in specifications without postcode fixed effects and zero effects in specifications including these. These results
### TABLE 6  Reduced form estimates, control areas = all areas

|                           | Total recorded crime | Anti-social behaviour, criminal damage, public order offences | Property crime | Drug offences | Weapon offences, violent and sexual crime |
|---------------------------|----------------------|---------------------------------------------------------------|----------------|--------------|------------------------------------------|
| City Centre * 08/2019 and later | -0.118**             | -0.050**                                                      | -0.041*        | -0.008       | -0.017                                   |
|                           | (0.053)              | (0.024)                                                       | (0.023)        | (0.007)      | (0.016)                                  |
| City Centre * 08/2019     | -0.027               | -0.011                                                        | -0.008         | 0.015        | -0.022                                   |
|                           | (0.079)              | (0.062)                                                       | (0.032)        | (0.011)      | (0.031)                                  |
| City Centre * 09/2019     | 0.002                | -0.002                                                        | 0.023          | 0.024*       | -0.040                                   |
|                           | (0.079)              | (0.061)                                                       | (0.035)        | (0.013)      | (0.030)                                  |
| City Centre * 10/2019     | 0.053                | -0.034                                                        | 0.066          | 0.031***     | -0.018                                   |
|                           | (0.098)              | (0.062)                                                       | (0.044)        | (0.011)      | (0.036)                                  |
| City Centre * 11/2019     | 0.003                | -0.055                                                        | 0.019          | 0.010        | 0.024                                    |
|                           | (0.079)              | (0.061)                                                       | (0.029)        | (0.011)      | (0.031)                                  |
| City Centre * 12/2019     | -0.140               | -0.218***                                                     | 0.010          | 0.029***     | 0.033                                    |
|                           | (0.089)              | (0.077)                                                       | (0.042)        | (0.011)      | (0.036)                                  |
| City Centre * 01/2020     | -0.092               | -0.004                                                        | -0.044         | 0.015        | -0.061*                                  |
|                           | (0.094)              | (0.069)                                                       | (0.040)        | (0.013)      | (0.032)                                  |

**Observations**  
|                           | 162,550              | 162,550                                                      | 162,550        | 162,550      | 162,550                                  |

**R²**  
|                           | 0.833                | 0.833                                                       | 0.683          | 0.772        | 0.403                                    |

**Note:** Coefficients, standard errors adjusted for clustering at the postcode level in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% level. All estimates contain with postcode (=street) and months fixed effects.
**TABLE 7**  Effects of stop and search on recorded crime, 2SLS second stage estimates and OLS benchmark estimates

| Specification | (1)  | (2)  | (3)  | (4)  | (5)  |
|---------------|------|------|------|------|------|
| 2 * 2 DiD     |      |      |      |      |      |
| + month FE    |      |      |      |      |      |
| + postcode district FE |      |      |      |      |      |
| + postcode FEs |      |      |      |      |      |
| (4) with leads and lags |      |      |      |      |      |

**Control areas = Newcastle inner-city areas**

Outcome: Total recorded crime

| OLS: # Stops and searches | 3.191*** | 3.194*** | 3.189*** | 0.049 | 0.053 |
|                          | (0.450)  | (0.450)  | (0.451)  | (0.062)| (0.061)|
| IV: # Stops and searches | −0.935** | −0.935** | −0.935** | −0.935** | −0.123 |
|                          | (0.403)  | (0.403)  | (0.404)  | (0.404)| (0.290)|

Outcome: Anti-social behaviour, criminal damage, public order offences

| OLS: # Stops and searches | 1.194*** | 1.195*** | 1.193*** | −0.042 | −0.041 |
|                          | (0.152)  | (0.152)  | (0.152)  | (0.037)| (0.037)|
| IV: # Stops and searches | −0.397** | −0.397** | −0.397** | −0.397** | −0.444*** |
|                          | (0.177)  | (0.177)  | (0.177)  | (0.177)| (0.190)|

Outcome: Property crime

| OLS: # Stops and searches | 1.116*** | 1.117*** | 1.116*** | −0.018 | −0.017 |
|                          | (0.290)  | (0.290)  | (0.291)  | (0.040)| (0.040)|
| IV: # Stops and searches | −0.329*  | −0.329*  | −0.329*  | −0.329* | 0.100 |
|                          | (0.171)  | (0.171)  | (0.171)  | (0.171)| (0.127)|

Outcome: Drug offences

| OLS: # Stops and searches | 0.209*** | 0.209*** | 0.209*** | 0.103*** | 0.104*** |
|                          | (0.025)  | (0.025)  | (0.025)  | (0.012)| (0.012)|
| IV: # Stops and searches | −0.060  | −0.060  | −0.060  | −0.060 | 0.053 |
|                          | (0.057)  | (0.057)  | (0.057)  | (0.057)| (0.040)|

Outcome: Weapon offences, violent and sexual crime

| OLS: # Stops and searches | 0.644*** | 0.644*** | 0.643*** | −0.003 | −0.002 |
|                          | (0.103)  | (0.103)  | (0.103)  | (0.020)| (0.020)|
| IV: # Stops and searches | −0.133  | −0.133  | −0.133  | −0.133 | 0.133 |
|                          | (0.124)  | (0.124)  | (0.124)  | (0.124)| (0.105)|

| Observations | 162,550 | 162,550 | 162,550 | 162,550 | 162,550 |
|--------------|--------|--------|--------|--------|--------|
| First stage F (excl. instruments) | 422 | 422 | 422 | 710 | 92 |

**Note:** Coefficients, standard errors adjusted for clustering at the postcode level in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% level. Excluded instruments are the interaction terms from Table 2. Property crime is the sum of burglary, robbery, shoplifting, vehicle crime, bicycle theft, theft from the person and other theft.
highlight that stops and searches are indeed focused on crime hotspots, introducing upward bias in the estimates. These hotspots appear to be largely time-invariant—for example, because they correspond to night economy hotspots—so that a large part of this bias is removed by the inclusion of postcode fixed effects. However, as the difference between the OLS and IV estimates for some crimes suggests, even in these specifications OLS can still be biased, presumably due to stop and search operations being targeted in anticipation of increases in offences.

How do these results compare to the existing UK evidence that generally found little effects of stops and searches on crime (McCandless et al., 2016; Tiratelli et al., 2018)? An important aspect is that the existing literature focused mainly on those offences that are usually targeted by stop and search operations, that is, drug offences, weapons offences, violent crime and some property offences. For these categories, my results lead to identical conclusions.

Table 8 presents IV estimates (based on column 5 in Table 6) for individual offence categories. Some of these categories, for example, robbery or weapons offence, have very low underlying crime counts, which makes it inherently unlikely to observe large treatment effects. Overall, there is only a limited number of offence categories which appear to be affected. These are anti-social behaviour and ‘other crime’ (covering forgery, perjury and miscellaneous crime). The former essentially suggests that the drop in anti-social behaviour, criminal damage and public order offences are only driven by the former, that is, the least serious offences in that category. The increase in ‘other crime’ is difficult to interpret, given that there are few mechanisms that could plausibly link stop and search operations to these offences, and might well be a statistical artefact. Importantly, anti-social behaviour does not appear to be particularly susceptible to stops and searches per se, as the risk of committing them does not change with the likelihood of being stopped and searched. However, offences become riskier in the face of an increased police presence. This in turn suggests that the crime-reducing effects of stops and searches observed here are simply driven by a more active policing of streets in Newcastle City Centre and less by more individuals being stopped and searched. A political implication arising from this finding is that the benefits of the surge in (politically sensitive) stops and searches could have been realised by simply increasing (politically much less sensitive) police patrols.

6 | ROBUSTNESS

This section sums up results from a variety of robustness checks. Detailed results can be found in section OA.5 in the online appendix. Sections OA.5.1 and OA.5.2 investigate two possible violations of the exclusion restriction. In Section OA.5.1 I test whether policing priorities in have changed after the murder—for example, by changing the types of searches conducted in the city centre or the relative toughness of any follow-up actions, such as arrests. To investigate this question, I look at the proportion of various types of searches out of all searches conducted in each postcode district. There is little evidence for any systematic change in the objects being searched for or in the proportion of searches ending with arrests or no further action. Overall, these results suggest that while the police conducted more stops and searches following the murder, they did not fundamentally change the types of searches conducted by officers.

In section OA.5.2 I investigate changes in the behaviour of the local population, for example whether people started avoiding the city centre, either generally or during specific hours. To test this possibility, I rely on data measuring footfall in the City Centre from Newcastle University’s Urban Observatory (James et al., 2014) in a 1-month window around the murder. Footfall data are generated from 20 CCTV cameras in the city centre with pedestrian traffic counted in 5-min
### TABLE 8  Effects of stop and search on recorded crime by crime category, second stage estimates

| Controls                                      | All areas                        |
|-----------------------------------------------|----------------------------------|
| **Anti-social behaviour, criminal damage, public order offences** |                                  |
| Anti-social behaviour                         |                                  |
| # Stops and searches                          | $-0.385^{***}$                   |
|                                               | (0.168)                          |
| **Criminal damage and arson**                |                                  |
| # Stops and searches                          | 0.015                            |
|                                               | (0.044)                          |
| **Public order offences**                     |                                  |
| # Stops and searches                          | $-0.074$                         |
|                                               | (0.057)                          |
| **Drug offences**                             |                                  |
| Drugs                                         |                                  |
| # Stops and searches                          | 0.053                            |
|                                               | (0.035)                          |
| **Property crime**                            |                                  |
| Burglary                                      |                                  |
| # Stops and searches                          | 0.012                            |
|                                               | (0.023)                          |
| Robbery                                       |                                  |
| # Stops and searches                          | $-0.010$                         |
|                                               | (0.016)                          |
| Shoplifting                                   |                                  |
| # Stops and searches                          | 0.144                            |
|                                               | (0.091)                          |
| Bicycle theft                                 |                                  |
| # Stops and searches                          | $-0.031$                         |
|                                               | (0.023)                          |
| Theft from the person                         |                                  |
| # Stops and searches                          | $-0.011$                         |
|                                               | (0.051)                          |
| Other theft                                   |                                  |
| # Stops and searches                          | $-0.004$                         |
|                                               | (0.056)                          |
| Other crime                                   |                                  |
| # Stops and searches                          | 0.035**                          |
|                                               | (0.014)                          |

(Continues)
TABLE 8 (Continued)

| Controls                                      | All areas |
|-----------------------------------------------|-----------|
| Vehicle crime                                 |           |
| # Stops and searches                          | −0.008    |
| Weapon offences, violent and sexual crime     |           |
| Possession of weapons                         |           |
| # Stops and searches                          | 0.001     |
|                                              | (0.016)   |
| Violent crime and sexual crime                |           |
| # Stops and searches                          | 0.132     |
|                                              | (0.109)   |
| Observations                                 | 162,550   |

Note: Coefficients, standard errors adjusted for clustering at the postcode level in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% level. Estimates based on specification (5) from Table 5.

intervals. Overall, there is little indication for any substantial change in behaviour following the murder that would suggest any altered behaviour by the local population, either during normal business hours (8 am to 7 pm) and night-time/early morning (10 pm to 5 am).6

Section OA.5.3 looks at statistical inference given an ongoing discussion in the literature how to adjust standard errors in difference-in-differences settings (e.g. Bertrand et al., 2004; Conley & Taber, 2011; Ferman & Pinto, 2019). In a first step, I use pragmatic adjustment to the standard errors that also carries over to the second stage of the IV estimate in a straightforward way by simply clustering standard errors at the postcode district level. Using all areas as control groups this yields 39 clusters, which is at the lower end of what is considered to be an acceptable number of clusters for a balanced panel (see, e.g. the discussion in Cameron & Miller, 2015). First stage estimates are basically unchanged and suggest no weak instrument problem even after adjusting for clustering. However, second stage estimates all become highly significant.

Given possible issues with this cluster adjustment due to the small number of clusters, I also implement two simple randomisation inference procedures. First, I randomise treatment assignment by postcode district and recalculate first and second stages using these 39 permutations. Second, I extend these permutations to additionally permute over the time periods January 2016 to January 2018, January 2017 to January 2019 and January 2018 to January 2020 with the treatment date set to August in the second year, leading to a total of 117 permutations (39 districts and three time periods). Increases in stop and searches are generally in the far-right tail of the distribution. Results also confirm the insignificance of the effect of stops and searches on property crime, drugs and weapons offences and violent crime found earlier. The only change is that effects on anti-social behaviour, criminal damage and public order offences appear to be non-significant. Given the agreement between these estimates and the main estimates and possible issues with small cluster sizes it seems prudent to place more weight on these null results.

6While arguably not constituting hard or even additional proof, the author's office is located close to the City Centre and this picture largely confirms the impression I gained from my daily commute.
Section OA.5.4 presents estimates using definitions of the treatment and control areas based on distance from the place of the murder—Old Eldon Square in Newcastle City Centre. The estimates suggest the biggest increase for streets within a 200 m radius of Old Eldon Square, where stop and search operations increased by 0.43 per street and month. The estimates also suggest that the increase in stop and search operations drops with distance from Old Eldon Square—streets with a distance between 200 and 500 m experience an increase by 0.19 searches per street and month, dropping to 0.04 for streets with a distance between 500 and 1 km. Second stage estimates again suggest an effect on anti-social behaviour, criminal damage and public order offences of a slightly smaller magnitude than that in Table 7. The estimates also confirm the lack of an effects on either drugs offences or weapon offences and violent crime. There is again a possible effect on property crime that is of similar magnitude to that found in columns (1) to (4) in Table 7.

Finally, section OA.5.5 investigates robustness to functional form issues. First stages are generally robust to the use of (a) the number of stops and searches, (b) the number of stops and searches scaled by the population in each postcode using data from the 2011 census and (c) an inverse hyperbolic sine transformation that works similarly to the log transformation but retains zero valued observations (Bellemare & Wichmann, 2020). Second stages are robust to using rates per 100 populations for both the outcome and the number of stops and searches, but become insignificant when using the inverse hyperbolic sine transformation on the outcome—which is not surprising given the high proportion of streets with zero crimes in each month. In a second step, I additionally calculate first stages and reduced forms using a Poisson model with postcode and month fixed effects to account for these excess zeroes. I again find a highly significant and large increase in stops and searches in the months following the murder. Reduced form results are generally very similar to these found in Table 6.

### 7 | DISCUSSION AND CONCLUSION

This paper used a surge in stop and search operations in the city centre of Newcastle upon Tyne, UK, following a high-profile and public murder in a shopping centre in August 2019, to look at the effects of stop and search operations on crime. I found that monthly stop and search operation in Newcastle city centre doubled on average over the months following the murder relative to the period prior to August 2019, with some months seeing a trebling of operations relative to the pre-murder levels. Most of these additional searches resulted in no further action being taken, which suggest that any crime-reducing effects arose due to deterrence effects.

In line with the criminological literature, I found little evidence for a crime-reducing effect of stops and search operations on either drug offences or weapon offences and violent crime. There appears to be a possible effect on property crime in some specifications, although the evidence for this effect is mixed, and fairly substantial evidence for a reduction in anti-social behaviour, criminal damage and public order offences across most specifications. I also document that OLS estimates of the effect of stop and search are often biased, even when including high-dimensional fixed effects for locations and time. Looking at detailed offence categories reveals that effects are driven by reductions in offence categories not considered by earlier studies, chiefly anti-social behaviour, with little to no evidence for a crime-reducing effect of stop and search on other offence categories, including those considered by McCandless et al. (2016) and Tiratelli et al. (2018). The observed reductions are in line with the idea that any effect of the increase in stop and search operations arose through increased general deterrence. In fact, given the reductions in anti-social behaviour—an offence which becomes riskier in the face of a higher police presence,
but not necessarily through a higher risk of being searched—it seems likely that any possible crime-reducing effects are driven by an increased and more active police presence on the streets. Viewed through this lens, the results are also in line with the general literature on police strength and crime in economics. An implication of this main result is that the crime-reducing benefits of increased stop and search operations should also be achievable through—politically much less contentious—increases in police presence on the street.

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