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Co-location and Crime Reporting: Does a Salient Crime Impact Subsequent Crime Reporting in That Location? The “Nirbhaya” case in Delhi

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Abstract

In 2012, anger erupted on the streets of Delhi following the violent rape and murder of a young woman. The scale of the protests, and the intensity of the public’s opprobrium of the police and the administration of Delhi, was unprecedented. Using the synthetic control method, this paper argues that this crime (the “Nirbhaya” case) had a measurable impact on reporting by victims of similar crimes – rape and other sexual assaults – committed in the same place or jurisdiction, Delhi. Co-location can differentially affect reporting of crimes. There could be revised threat perceptions about the likelihood of being repeat victims. There could be greater identification with the victim because of the shared physical environment. Co-located individuals can feel a heightened sense of responsibility and urgency as they share the same administrative, judicial, and socio-political ecosystem. Our results show that over the period 2013-2015, the annual average reporting of rape cases in Delhi was 23 percent higher compared with its pre-intervention annual average (2001-2011); average annual reporting of molestation and sexual harassment over the period 2013-2015 was 40 percent higher compared with its pre-intervention annual average. We show that the Nirbhaya case had a causal impact on reporting of crimes against women in Delhi.

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I. Introduction

In December 2012, a 23-year-old woman was beaten, and gang raped by six men in a moving bus in a middle-class South Delhi neighborhood in India. After the attack, she was thrown out onto the roadside, and thirteen days later, she succumbed to her injuries. Crimes against women are extremely common in India. According to a 2018 poll by Thomson Reuters, India is the most dangerous country for women.¹ Yet this incident shocked the country and profoundly affected the residents of Delhi.² People in Delhi took to the streets to protest the state and the federal government and demanded urgent steps to guarantee safety for women and speedy justice for the brutalized and deceased victim. The victim is now remembered as “Nirbhaya”, meaning fearless, for her resistance against the perpetrators of the crime as well as her thirteen days fight for life after the injuries inflicted on her.³⁴

Given the salience of this crime and the intensity of the emotional toll it took on the residents of Delhi, how did they react to crimes against women in its aftermath? In particular, did it cause greater reporting of crimes against women in Delhi vis-à-vis other jurisdictions.

Reporting plays a key role in the detection and subsequent channeling of a situation of violence and other crimes against women to a judicial level for appropriate investigation (Reynaldos et al 2018). Globally, lack of reporting has meant subdued deterrence in crimes against women. Reporting of crimes against women is also critically important from a public health perspective to make medical care available for victims and for minimizing the physical and mental

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¹ http://poll2018.trust.org/country/?id=india [last accessed: 15 December 2018].
³ Indian law does not allow the rape victim’s name to be released to the media. The victim, Jyoti Singh, was therefore given the name “Nirbhaya” by the press and the public. Later, her parents voluntarily offered that information to the newspapers because they did not want her identity to be hidden.
⁴ Out of the six convicted, four were executed in March 2020. One allegedly committed suicide in prison in March 2013 and the sixth accused being a juvenile was released after 3 years in a correctional home.
health damage. How does co-location to a violent crime like this affect reporting by victims of similar, related, and relatable, crimes?

Among the factors, in addition to crime and victim features, neighborhood social cohesion and socio-economic disadvantage have been shown to affect reporting of crimes in general (Goudriaan et al. 2006). The impact of such geographic co-location can unfold in myriad of ways: there could be revised threat perceptions about the likelihood of being repeat victims as would be predicted by victimization theories in criminology relating to lifestyle exposure. There are also socio-cultural reasons such as identification with the victim because of the shared physical environment. Co-located individuals can feel a heightened sense of responsibility and urgency for the safety of their location as they share with the victim of the crime the same administrative, judicial, and socio-political ecosystem. All these can lead to an attitudinal shift with respect to beliefs about redressal as well as social stigma regarding crimes against women and can affect greater reporting.

Lack of reporting is the most fundamental and common obstruction in addressing crimes against women. Owing to factors like stigmatization, apathy and foot-dragging of the law enforcement authorities, and fear of retribution for the victims, there is substantial under-reporting of crimes against women in India (Gupta 2014). Gupta (2014) reveals by comparing the National Family Health Survey (NFHS) and National Crime Records Bureau data that most cases of sexual and physical violence against women, whether by their husbands or other men, in India, have gone unreported.

In NFHS -3, every third Indian woman aged between 15 and 49 stated that she had experienced sexual or physical violence in her lifetime. For the year 2005, only about 5.8% of the incidents of sexual violence against women which were committed by men other than the survivors’ husbands were reported to the police (the intimate partner violence figures that were
estimated were even lower at 1%). Even for a developed economy like the United States, rate of rape reporting has remained low. Studies using random sample surveys find reporting rates ranging from 16 percent to 36 percent (Anderson 2003). Rape reporting is particularly problematic in India due to its culture of apathy. These institutional and cultural hurdles compound the ubiquitous problem of victim blaming.

A small number of earlier papers, using India data, document increased reporting of women-centric crimes in response to policies that lead to women empowerment. Iyer et al. (2012) show that political reservations with a certain number of seats in local governments being reserved for women lead to increased reporting of crimes against women. Amaral (2014) finds that changes in inheritance law that empowered women significantly reduced both documented crimes against women and reports of violence in India. Mathur and Slavov (2017) suggest that improved representation increased the probability of reported domestic violence. Amaral et al. (2015) study

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5 The victims are faced with feelings of contamination, of having been defiled or desecrated, exacerbated by cultural judgments that treat raped women as dirty and impure, or as "damaged goods" (Banerjee 2003, Baxi et al. 2006, Ruggi 1998). In a highly publicized investigation carried out by Tehelka in Delhi, an Indian News Magazine known for its investigative journalism, members of the Delhi Police were filmed discussing their apathy toward rape victims. In the videos, the policemen are shown supporting rape myths such as "women are asking for it," "crying rape as a source of income," and other forms of victim blaming. Note that this reporting, titled "Investigation: The Rapes will Go on," first came out on April 14, 2012, i.e. predating the Nirbhaya case in December 2012. There have been instances of prominent politicians blaming rape victims for inviting trouble by going to pubs, drinking and smoking, or generally claiming that "boys will be boys." In other cases, there have been attempts to marry off rape victims to their rapists, since the goal is for the victim to not remain unmarried. These psychological factors combine with institutional barriers related to legal and administrative system result in low propensity to report. See https://www.washingtonpost.com/news/worldviews/wp/2012/12/29/india-rape-victim-dies-sexual-violence-profile/?utm_term=.b0342edf3edb [last accessed: 15 December 2018]. Also see, https://www.news18.com/news/politics/10-bizarre-statements-made-by-indian-politicians-that-will-make-you-facepalm-hard-1481489.html [last accessed: 15 December 2018].

6 In recent decades, specifically in developed countries, awareness of the extent of such crimes has increased. The "rape shield" laws often attempt to counter some of the victim blaming that take place. These laws often include restrictions on the admissibility of evidence about a victim's sexual history, elimination of prompt reporting requirement, the corroboration requirement, and the reciting of the traditional cautionary rule.

7 Some studies on domestic violence find a lower risk of domestic violence among women who work (Bhattacharya et al 2009), earn more income (Rao 1997), or have greater wealth (Panda and Agarwal 2005). Rao (1997) finds that the woman's income plays a larger role in explaining reductions in violence than the incomes of other family members. On the other hand, Jejeebhoy (1998) finds no statistically significant relationship between domestic violence and a woman's paid employment, and Kishor and Johnson (2004), Eswaran and Malhotra (2011), Kimuna et al. (2013) and Krishnan et al. (2010) find an increase in the risk of domestic violence among women who work for pay.
the impact of the National Rural Employment Guarantee Scheme in India and find that, with expanded employment opportunities for women, there was an increase in reported domestic violence.

Elsewhere, Wyatt (1992) shows that African American women were less likely than white women to have disclosed their rapes mainly because they did not believe that they would be protected by traditional authorities and institutions. In South Africa for example, while sexual violence is widely prevalent, the rise in reported rape may in part be attributed to the post-apartheid regime, under which black women felt safer reporting sexual crimes.\(^8\)

The subjective assessment of women about the costs (social recrimination, loss of privacy and increased chance of retaliation) and benefits (social support, legal justice), determines reporting that is down casted with no guarantee of offender apprehension (Allen 2007). Allen (2007) explores the economics of the reporting and chronic nonreporting of rape in the context of this information-allocation problem. Reporting choice relates to social and social psychological aspects of crime, which include personal attitudes as well as the broader societal context (Canter and Youngs 2016). In this situation, the aftermath of a salient crime like the Nirbhaya case can have compelling immediacy and social and psychological effects for co-located victims of such crimes affecting their behavior towards reporting.

The Nirbhaya case and the events that followed in Delhi constitute an exogenous shock. The widespread sympathy the victim evoked, and the scale and intensity of public outcry witnessed in Delhi, may have created conditions for victims in Delhi (co-located victims of crimes against women) to come forward and report their case. Our hypothesis is that, following the Nirbhaya case, at least in the short to medium term, victims of such abuse in Delhi were differentially

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\(^8\) Assault was endemic during the apartheid era with Johannesburg’s most popular daily *The Star* reporting twenty or thirty rapes every weekend in Soweto.
impacted owing to immediacy. The effects of Nirbhaya case were felt in far off places. Yet, co-location we hypothesize would have differential effects in reporting of crimes against women that we try to estimate.

We employ a synthetic control method (SCM) to estimate the causal impact of the 2012 Nirbhaya case on reporting of crimes against women in Delhi. Based on the National Crime Records Bureau (NCRB) data, our estimates show that, in Delhi, the 2012 Nirbhaya case had a positive and significant impact on the reporting of crimes such as rape, molestation, and sexual harassment. Over the period 2013-2015, the annual average reporting of rape cases in Delhi was 23 percent higher compared with its pre-intervention annual average (2001-2011); average annual reporting of molestation and sexual harassment over the period 2013-2015 was 40 percent higher compared with its pre-intervention annual average.

Our unit of analysis is state and federally administered areas (FAA) in India. This is important since administration and policing jurisdictions are based on state and union territories (FAA). Being in two different administrative jurisdictions, even two adjacent districts could be subject to different governance and policing systems and efficacy.

Given the salience of the Nirbhaya case, there have been attempts to study its impact in sociological, anthropological, and public administration literature. McDougal et al. (2018) report that relative to the period 2005-2012, there was a 33 percent increase in rape reporting in India over the period 2013-2016; the increases after 2012 were significantly higher in districts closer to Delhi. McDougal et al. (2018), however, do not estimate a causal impact, i.e., they do not adopt an impact evaluation approach and instead conduct a before-and-after 2012 comparison. In contrast, our focus is on causal impacts of co-location to a salient crime like the Nirbhaya case and its causal impacts on reporting of crimes against women.
Additionally, the similarity between Delhi and its counterfactual is not correctly captured based solely on distance from Delhi. A state like Maharashtra or Karnataka with large urban areas like Mumbai and Bangalore, respectively, would be better comparators for Delhi than a nearby district with greater share of rural population. Metropolitan areas have large number of administrative police zones. Delhi is divided into eleven administrative police zones while Mumbai is divided into thirteen administrative police zones.

Importantly, it is not clear, a priori, what constitutes the right comparator group for Delhi from the point of view of reporting of crimes against women. Choice of comparison units also follows from victimization theories in criminology where lifestyle exposure theory posits that persons with certain demographic profiles are more prone to experience criminal victimization because their lifestyles expose risky situations that increase the amount of time spent in public spaces, particularly at night, and time spent among strangers (Madero-Hernandez 2019). Our program evaluation method lets us choose the right counterfactual for Delhi through an optimal weighting system considering a large set of comparator units rather than assume it arbitrarily.

The SCM relaxes the parallel trends assumption and allows for estimation of a specification with interactive fixed effects which nests more traditional additive fixed effects models (Powell 2018). SCM with a long period of pre-intervention fit is also likely to account for time varying unobserved factors that difference-in-difference estimation is not able to do (Abadie et al. 2010).

We also present a series of falsification tests: we look at murders where under-reporting is less likely to be an issue (generally there would be a dead body). In program evaluation, these falsification tests are traditionally conducted to establish validity of the hypothesized link between the intervention and the outcome(s). For example, the murder falsification test accommodates the possibility that the increased reporting of crimes against women may simply be due to an increase in crime, rather than reporting; we, however, find no impact. We also carry out a pure falsification
test – we estimate the impact on road accident deaths, an outcome that would not be affected by the Nirbhaya case; we find no effect. And, following the common practice in SCM analyses, we carry out time placebo tests where we test for a mock intervention with timing different from that of the actual intervention.

While we argue that the Nirbhaya case may have impacted reporting by co-located victims of crimes against women, there were also administrative and legislative actions after Nirbhaya case that could bear on recording of crimes against women. We describe these in detail later. Many of these changes occurred in other locations as well. In case of Delhi where we want to assess the impact on reporting, we, do not find any strong evidence of an impact on arrests or convictions for rape, molestation, and sexual harassment in Delhi.

Courts in India are backlogged with more than 33 million cases (by March 2018). Based on NCRB data, by the end of 2016, there were more than 133,000 pending cases related to rape in Indian courts. With such backlog, judgment and convictions take a long time. Aware of this backlog effect, we also look at charge sheeting which is a precursor to trials in court and gets the case ready for hearing. We do not find an impact on charge sheeting for rape, molestation, and sexual harassment in Delhi either.

This paper contributes to the literature on the economics of violence against women (Wyatt 1992, Iyer et al. 2012, Amaral et al. 2015, Mathur and Slavov 2017). We also contribute to the general literature on crime reporting. Amaral et al. (2016) look at policing changes and its effects on greater reporting of crimes against women; Miller and Segal (2014) investigate the effects of incorporating women in the police in the U.S. on reporting rates of domestic violence and find a rise in reporting and a decrease in female homicides committed by the intimate partner. In this paper, we estimate a positive impact on women’s reporting behavior in locations where stirring crimes against women occurred. We find that while reporting in Delhi differentially increased after
2012, there has been little change in the administration related deterrents reflected in the extent of charge sheeting as well as conviction rates for crimes against women.

Our paper is organized as follows. In Section II, we present a brief discussion of the Nirbhaya case and why it was distinctive from the point of view of crimes against women, in its recording and reporting. In section III, we provide a description of our data. In Section IV, we discuss the synthetic control method, and the main findings from the paper. Section V provides a discussion of our results, and Section VI concludes.

II. The Nirbhaya Case

Discussions about rape in India have traditionally been minimal in the public arena (Nigam 2014). However, with the Nirbhaya case, it was noticeably different. Drache et al. (2013) argue that the Delhi rape case can be understood as a trigger event that provoked people to engage more pointedly with the issue of gender justice.

Particularly for citizens of Delhi, some of this was a consequence of the fact that people could empathize with Nirbhaya's personal story, with co-location and homo-jurisdiction from a law-and-order perspective. The feeling of connectedness for citizens of Delhi who could relate with the victim where Delhi is a big center of migrants in search of a better career and standard of living just as Nirbhaya was.

Delhi was uniquely affected being the epicenter of the incident. Not only did the crime happen in Delhi, since the nation's capital is in Delhi, it hosts India's political, administrative and media nerve centers. There were protests over the incident elsewhere as well, but those simply do not compare in terms of the extent or intensity in Delhi by any metric. We are focused on the implications of co-location to this crime for other victims of crimes against women. Protests and
unrest in Delhi were large-scale and extremely disruptive.\(^9\) The parliament itself was briefly shuttered after Nirbhaya was hospitalized as the news spread. There were extensive vigils and public demonstrations in Delhi because of people’s frustration in the government’s handling of the case.

Large protests took place in key locations in Delhi, such as, India Gate (the war memorial) and Raisina Hill (the official residence of the President of India, the Secretariat building housing the Prime Minister's Office and several other important ministries).\(^10\) Water cannons and tear gas were turned on the crowds protesting.\(^11\) Seven metro rail stations in Delhi were closed on December 22, 2012, to discourage protests and the police blocked roads to India Gate and Raisina Hill.\(^12\) Another day, nine metro rail stations were closed.\(^13\)

After Nirbhaya’s death, protests in Delhi amplified like nowhere else and were marked by clashes outside the Parliament where people from the BJP (India's main opposition party at the time) calling upon the parliament members to hold a special session and address the case and adopt stricter laws involving crimes against women. Protests in Delhi grew violent and news outlets accused the Delhi police of using excessive force during these demonstrations in Delhi – in one incident, 375 tear gas canisters were administered at India Gate to disperse just one crowd protest.\(^14\) Overall, Delhi Police was under uniquely tremendous pressure, not only with regards to their handling of the protests but also with respect to the handling of these kinds of crimes.

III. Data Description

The procedure for reporting a crime in India is as follows. When a person reports a crime to the police, it must be recorded in a written report, an FIR (First Information Report), which is then read and signed by the person reporting. When this procedure is complete, the crime is treated as reported and becomes a part of crime records maintained by the police (Iyer et al. 2012).

We use data on the reported number of crimes at the state level from various issues of the “Crime in India” publications of the National Crime Records Bureau (NCRB), Government of India, for the period 2001-2015. These data emerge from the FIRs for specific crimes and are the primary source of administrative and official data on crimes in India.

The data first collected by the respective state and union territory police at the police stations in each district are then validated at the state level and then validated and checked again at the time of consolidation by the NCRB officers. Crimes in these reports are classified into two broad categories, Indian Penal Code (IPC) crimes and Special and Local Laws (SLL) crimes. The IPC crimes include rape, murder, dowry deaths, homicide, and assault, among others. The SSL crimes include violations of existing laws, such as the Dowry Prohibition Act of 1961, the Protection of Women from Domestic Violence Act of 2005, and other laws aimed at protecting children and property.

The outcome variables are the following. Reported crimes per 100,000 people: rape, molestation and sexual harassment, and murder and culpable homicide; arrests per 100,000 people for rape and molestation and sexual harassment; charge sheeting and convictions, respectively, per 100,000 people for rape and molestation and sexual harassment. Road accident deaths per 100,000 and murder and culpable homicide per 100,000 are used in the falsification tests. Road accident deaths data was obtained from annual NCRB publications called Accidental Deaths and Suicides in India.
In addition, we collected data on predictor variables that are used to match Delhi with other states and union territories to create a counterfactual or synthetic Delhi. These variables include state/union territory economic and demographic characteristics. Variables such as per capita GDP and per capita GDP in the secondary sector, population by age, share of women in higher education enrollment, were collected from the Economic and Political Weekly Research Foundation (EPWRF) time series data. Election data used have been directly downloaded from the election commission website.\textsuperscript{15}

Our treatment unit is Delhi, a union territory (National Capital Territory) that contains New Delhi, the capital of India. The donor pool comprises the remaining 31 states/union territories. A few very small union territories are dropped due to lack of data. Table 1 presents a comparative profile of reported crimes and predictors in Delhi alongside the donor pool for the period 2005-2015. On average, Delhi has higher rates of reporting for rapes, molestation and sexual harassment, murder and culpable homicide and road accidents, relative to the donor pool. In addition, conviction rates for such crimes are higher in Delhi. Figure 2 shows that, post-2012, reported rape, molestation and sexual harassment in Delhi saw a large spike relative to other jurisdictions while reported murder and culpable homicide, as well as reported road accident deaths, do not exhibit such movements.

\textbf{IV. Estimation: Synthetic Control Method (SCM)}

The fact that co-location in Delhi for the 2012 incident (a single treated unit) underscores the choice of SCM as our preferred method for assessing the impacts of the Nirbhaya case on reporting by co-located victims of crimes against women in Delhi. With a solitary affected unit, accurate inference is difficult, perhaps impossible, in a clustering framework (Donald and Lang, 2007, Buchmueller et al., 2011). SCM, on the other hand, is devised to address precisely these kinds

\textsuperscript{15}https://eci.gov.in/
of situations, and the method naturally renders itself to permutations or randomization tests for inference (Bertrand et al. 2004; Abadie et al. 2010; Bohn et al. 2014).

In any program evaluation, one of the more serious issues is finding appropriate comparison or control states that can provide a reliable counterfactual for the treatment/affected unit, Delhi. Not every state or union territory in India would be a suitable candidate for a comparison unit for Delhi based on economic and demographic characteristics and the environment related to crime and law and order. It is also unlikely that we can find a single unit that would be like Delhi across different characteristics. SCM provides a systematic way to choose comparison units. The counterfactual Delhi is the weighted average of the states and union territories where the pre-intervention matching across a wide variety of characteristics and over an extended period generates the weights.

Table 1 shows the set of predictor variables to obtain pre-intervention matching between Delhi and the donor pool. We use demographic characteristics such as share of population that is male between the age 15-35, total and women’s share in higher education enrollment, total and urban population growth; economic characteristics such as economic growth, overall GDP as well as GDP of the secondary sector; crime related variables such as reporting of crimes against women as well as reporting and arrests of all crimes. In case of law and order and socio-political characteristics, we include density of total and female police, and ratio of votes for female to male candidate in Lok Sabha (the lower house in the parliament) election.

IV.1. Main Results

We start our SCM estimation with the assessment of the impact on reporting of the two main crimes against women in Delhi. Figure 3 shows the impact on reporting of rapes, and reporting of molestation and sexual harassment, respectively. In the left column, the pictures show a close pre-intervention fit between the actual and synthetic Delhi prior to 2012 and a wide gap
afterwards. The post-intervention gap is the measure of the causal impact of the Nirbhaya case on reported rapes, molestation, and sexual harassment.

To determine the statistical significance of the estimated impact, we conduct the permutations/randomization test, which is a placebo test that answers the question, “How often would we obtain a gap as large as this if we had chosen a state or union territory in the donor pool at random?” We apply a placebo intervention in 2012 to each donor pool unit. The pictures on the right column of Figure 3 present results of the permutation/randomization/placebo tests (Abadie et al. 2010; Bertrand et al. 2004; Bohn et al. 2014; Munasib and Maguire 2016; Munasib and Rickman 2015).

The gap between the actual and the synthetic for Delhi is represented by the darker line while the same for each donor pool unit is represented by a green line. The fact that the dark line stands out among the green lines, is a visual indication that Delhi stands out from the placebo estimates. We thus infer that the impact of the changes brought about by the 2012 Nirbhaya Case on reporting of rape, molestation and sexual harassment in Delhi was significant.

Columns 1 and 2 of Table 2 present the estimates underlying Figure 3. The pre-intervention Root Mean Square Prediction Error (RMSPE) to mean ratio describes the goodness of the pre-estimation fit; a small value of this statistic indicates a good pre-intervention match between the actual and the synthetic. The pictures in the left column of Figures 3 show the close fit visually. The estimated impact is the post-intervention difference between the actual and the synthetic Delhi, which is estimated over the period 2013-2015. The annual average reporting of rape in Delhi increases by 2.2 per 100,000, by 44 percent; average annual reporting of molestation and sexual harassment over the period 2013-2015 increased by 4.7 per 100,000, or by 72 percent.

The finding of the permutation or randomization tests is described in terms of the following statistics. First, we calculate the difference-in-difference (DID) statistic, which is the post-
intervention difference between the actual and the synthetic minus the pre-intervention difference between the actual and the synthetic; we then calculate the DID rank, which is the ranking of the absolute value of the magnitude of the DID of the treatment state (colocation) against all the placebo (co-located in other jurisdictions) DID magnitudes (Bohn et al. 2014, Munasib and Rickman 2015). The interpretation of a large DID is that the difference in the post-intervention outcome between the actual and the synthetic is much larger compared to the same during pre-intervention. If DID rank is 1, the estimated impact of the intervention in the treatment state is greater than any of the estimated placebo impacts.

We also calculate the p-value of the DID statistics and the donor probability – the probability of obtaining a DID as large as that of Delhi’s if one were to assign the intervention at random in the data. We find that for both crimes against women, DID rank is 1 and significant at 1 percent level with very low donor probability (3 percent). We, therefore, conclude that the impact of the Nirbhaya case on reporting of rape, molestation and sexual harassment was statistically significant.

Table 2 also reports the ‘optimal’ weights generated by the SCM procedure. Chhattisgarh, Chandigarh, Tripura, and Andhra Pradesh contribute with the largest weights in synthetic Delhi for rape per 100,000, while Puducherry, Chandigarh, Goa, Andhra Pradesh and Sikkim contribute with the largest weights for molestation and sexual harassment per 100,000. These weights testify to the importance of getting the comparison group for Delhi through optimal weighting as implemented in SCM.

**IV.2. Falsification Tests**

Columns 3 and 4 of Table 2 summarize the findings when the above exercise is repeated for the following falsification tests: SCM estimates of the 2012 Nirbhaya case on murder and culpable homicide (MCH), and road accident deaths. In the reporting of these crimes, the estimated
impacts are not significant, the DID ranks are 17 and 9, respectively, out of 31 comparison units. Figure 4 is a visual representation of the same findings. The test with road accident deaths is a pure falsification test where the outcome, reasonably, would not be affected by the Nirbhaya case.

To accommodate for the possibility that the increased reporting that we estimate is due to an increase in crime itself driven by unobservable factors, we estimate the impact of the Nirbhaya case on murder and culpable homicide. Murder and culpable homicides (there usually is a dead body), by the very nature of the crime, is not susceptible to large and systematic reporting issues. That we do not find an impact of the Nirbhaya case on this outcome indicates that the intervention may not be conflated with a general rise in crime in 2012 for some unobserved reason. These results echo the findings in Iyer et al. (2012), where the authors argue that the change in reported crimes against women is due to an increase in reporting rather than an increase in the actual incidence of these crimes.

In columns 1-4 of panel A of Table 4, we present the pre-intervention characteristics of the synthetic (collocated in Delhi) of each outcome along with the characteristics of the actual Delhi. These are the matches that generated the synthetics used to estimate the impacts. Except for 1 out of 11 characteristics (per capita GDP), we find a good match between the actual and the synthetic.\footnote{Delhi is among the top 3 in per capita GDP across all Indian states and union territories. As a result, the donor units are unlikely to generate a close match for per capita GDP. Inclusion of per capita GDP of the secondary sector, the synthetics do produce close matches.}

IV.3. Robustness Tests

In columns 1-4 of panel A of Table 3, we present a robustness test where we re-estimate the impact of the Nirbhaya case on all outcomes using a different set of predictors. We retain some of the key predictors – education enrollment, density of police, overall and of female police, higher education enrollments, total and secondary sector GDP, share of male age 15-35, and total arrests.
We then augment the set of predictors with a marker of female political participation and voice, i.e., ratio of votes for female to male candidates in the parliamentary elections and reporting and arrests in all crimes. The results remain qualitatively the same and quantitatively very close to those in columns 1-4 of Table 2. Additionally, columns 1-4 of panel B of Table 4 present the pre-intervention characteristics of the synthetic Delhi for each outcome along with the characteristics of the actual Delhi for this alternative set of predictors.

In Panel B of Table 3, we estimate the impact of the 2012 Nirbhaya case by excluding the states from the donor pool that are adjacent to Delhi. McDougal et al. (2018) find that rape reporting increased more in districts closer to Delhi (before and after 2012 comparison), more significantly in districts within Delhi. Our focus is on Delhi and on the impacts of co-location of victims that has a clear basis for identification of a causal impact. Though our causal estimates are by construction incomparable with McDougal et al (2018) who looked at national level changes with before and after comparison and they look at only rape, our estimate for Delhi is a 31% causal increase in reporting in Delhi (compared to 33% for India that McDougal et al have).

It is possible that, due to proximity, some areas surrounding Delhi – belonging to two states, Haryana, and Uttar Pradesh – may have witnessed some of the same effects as Delhi. We, therefore, exclude Haryana and Uttar Pradesh from the donor pool and run the SCM estimates. The results remain qualitatively the same and quantitatively very close to those in columns 1-4 of Table 2.

Delhi as an administrative unit is highly urbanized and contains within it a large metropolitan city. Among cities Delhi is the second largest in the country in terms of population. Could other cities form a suitable donor pool for creation of a synthetic Delhi? Very few cities compare with Delhi in terms of its size. Only Mumbai has a comparable population; other cities are much smaller. The donor pool comprising comparable cities would contain only 5-6 units.
Moreover, Delhi, like any other state, also has villages within its jurisdiction. Based on the records of the Delhi government there are nearly 360 villages within Delhi.\(^\text{17}\)

With these considerations, we specifically looked at high urbanization states. We chose the top twenty most urbanized states/UTs in India based on the ranking of population, population density and share of urban population.\(^\text{18}\) The SCM estimates and the full list of states/UTs in this donor pool of most urbanized states are in Table 5. The findings, again, remain qualitatively the same and quantitatively very similar to the main findings.

**IV.4. Time Placebo Test**

In our main estimates, the impact is estimated as the post-intervention gap between the actual and the synthetic. To test that this gap is due to the 2012 Nirbhaya case and not the inability of the model to find a good synthetic, we artificially assume that the date of the intervention is 2008 and conduct a time placebo test. Table 6 summarizes the SCM estimates with time placebo. We find that, across all outcomes, the placebo intervention generates statistically non-significant impacts.

**V. Law Enforcement**

In this section, we test whether law enforcement related changes following the Nirbhaya incident had any significant impacts that are best captured in terms of outcomes such as arrests, charge sheeting and finally convictions. Typically, arrests happen after the registration of the First Information Report (FIR) (when the case is first reported). The FIR is followed by a charge sheet,
prepared based on the evidence collected. A conviction takes place when a person’s crime(s) is proven in the court of law.

In Table 2, we report the main estimates of the impact of the Nirbhaya case on arrests (columns 5 and 6), charge sheeting and convictions (columns 7 and 8) under rape, molestation, and sexual assault cases in Delhi. Columns 5-8 of panel A of Table 3 present the estimates with the alternative set of predictors and columns 5-8 of panel B of Table 3 present the estimates where the states adjacent to Delhi are excluded. Across all these, we find an impact of the 2012 Nirbhaya case on arrests under rape and molestation and sexual assault cases to be marginally significant at best and the impact on charge sheeting and convictions under rape and molestation and sexual assault cases to be not significant.

VI. Discussion

We estimate that the 2012 “Nirbhaya” crime case had a causal impact on the co-located reporting of crimes against women in Delhi, particularly rape, molestation, and sexual harassment. We ran a series of robustness and falsification tests that confirm our findings.

Our finding is that the Nirbhaya case led to a measurable change in victims’ attitudes towards reporting, in the same environment. There could be an induced reduction in stigma of rape following such a large crime. Our results show that co-location to a large crime can go a long way in explaining the heightened recording and reporting of such crimes. We can find parallels in other areas. For instance, Ellen DeGeneres’s high profile coming out about homosexuality on mainstream American television appears to have made it easier for gay, lesbian and bisexual individuals to realize their full identity (Gomillion and Giuliano, 2011). Ayoub and Garretson (2015) estimate that access to ideas and images concerning gay and lesbian people had a significant influence in bringing forth more liberal attitudes and social tolerance towards gay
people particularly among the young. In this case, the co-location in a relevant space to a large event i.e. coming out of a high-profile individual.

In a different context, the death of Freddie Gray, an African American, due to police negligence and unnecessary use of force that was publicized by the media also brought in public condemnation. As images of Freddie Gray dying emerged, the city of Baltimore erupted, with protests filling the streets (Marcus 2016). The police officers were taken to trial, though ultimately charges were dropped against them. A parallel of co-location in this case would be either the changes in reporting by black victims particularly in location of the event, in the same environment and jurisdiction.

In our paper, we find that policing and law enforcement by itself does not explain the result. While we find that the crime may have led the police in Delhi to be more prompt in recording crimes against women, there is no significant increase in either charge sheeting or conviction rates for the crimes against women. Overall, it seems that women in Delhi were impacted in terms of coming forward to report a crime, which explains the large uptick in reporting in Delhi, but not much has changed beyond reporting and recording of crimes. Further, if policing were the solution, we could have seen a similar increase in reporting or reduction in other crimes as well, which did not occur. Generally, the effect of policing on crime has been widely debated in the literature (Di Tella and Schardorstsky 2004) and the findings are not definite enough to generalize in different contexts.

One question that arises is the following: Is it possible that Delhi exhibited a different reporting dynamic for crimes against women than the rest of India in the period before the December 2012 attack? We resolve this issue through time placebo tests. The non-significant result in time placebo tests reveal no special dynamics in reporting before this attack that differentiated Delhi. The question whether the incident coincided with other unrelated changes
leading to greater reporting are also addressed through several falsification tests. Further, the use of SCM with good pre-intervention fit over a long-time period, accounts for both time varying observed and unobserved factors that could be related to reporting.19

Finally, could it be that there were fad and/or copycat effects because of a high-profile crime along the lines of Columbine school shooting? Simon (2007) identifies copycat crimes as driven by fads and the effects tend to diminish over time. Such channels go beyond reporting of the crime, instead explain the rise in the incidence of the crime itself. Could it be that those with criminal tendencies were motivated by an incident like Nirbhaya case and committed copycat crimes leading to higher incidence of crimes against women in Delhi itself as we see differentially increased reporting in Delhi?

There are reasons for this effect to be not so important for the case that we study here. One fundamental way in which a crime like gang rape differs from those prone to copycat crimes is that such crimes are driven either by popular culture, such as crimes driven by Grand Theft Auto video games or where drawing attention to the crime is an integral part of the crime itself (school shooting, attack on a synagogue, suicide bombing). In such cases, fear of facing law is usually secondary.

The criminals involved in the Nirbhaya case like other rapists were absconding, hiding their identity, and running away from police, and were nabbed only after a manhunt. One of the accused later died in the prison allegedly committing suicide. The rest four as discussed above were tried and executed in March 2020, fighting a protracted legal case including filing mercy petitions to the President of India (that was rejected). We believe that a copy-cat effect of the Nirbhaya case, if it

19 Abadie et al. (2010) show that with a long pre-intervention matching on outcomes and characteristics, a synthetic control also matches on time-varying unobservables. As Abadie and Diamond (2015) explain, “only units that are alike in both observed and unobserved determinants of the outcome variable as well as in the effect of those determinants on the outcome variable should produce similar trajectories of the outcome variable over extended periods of time.”
existed at all, would have been limited to isolated cases involving individuals with severe, and very specific, mental health issues.

VII. Conclusions

A crucial challenge in the literature on crime is to obtain an estimate of the effect of changes in the external environment on reporting of crimes, particularly those against women. In this paper, we address the question framing it in the context of co-location of victims to a salient crime, the Nirbhaya case, to assess the impact on reporting. To estimate the impact of this shock on co-located victims, we collected data on different crimes across Indian states and found a large, positive, and significant impact on reporting of crimes against women in Delhi.

The results are robust to alternative specifications with different sets of predictors, different subsamples for the donor pool, and different placebo tests. These findings suggest that the estimated effects correspond to the changed incentives for reporting and recording in Delhi. While the public pressure and outrage may have led more women to report crimes against them supra Delhi, it may also have led to increased recording of crimes by the police. However, the policing effect does not extend much beyond greater recording as neither the rate of convictions, charge sheeting nor arrests change significantly following the incident. Hence, we ascribe much of the reported increase in crimes to a willingness by women to come forward and report incidents, rather than a greater willingness of the police and legal system to convict criminals associated with these crimes.

The legacy of the Nirbhaya case and the associated protests and civic engagements in Delhi may, eventually, have an impact on the legal infrastructure. There have been some changes that could very well have bearing on the criminal justice system, at least in the future. Some of the policy responses included the establishment of the first all-female police station in India that opened in a Delhi suburb in 2015. This was to be followed by such stations in other locations over
a period of time. The impacts of such important changes would need a separate evaluation from the perspective of crimes against women.

Further, in response to the Nirbhaya case, some significant legal changes were made based on the Justice J. S. Verma committee report. The committee was created to suggest changes in Criminal Law. The committee recommended improvements in police and government procedures in incidents of rape. As part of the Criminal Law Ordinance of 2013, new laws were passed and six new fast-track courts were to be created to hear rape cases. To increase reporting of rapes, the government identified several potential strategies that include the registration of a First Information Report (FIR) at all police stations, police reforms such as a three-digit emergency response number and publicizing the identity of those convicted of crimes against women. More recently, in 2018, the Ministry of Women and Child Development has started to distribute specially designed “rape kits” to all police stations and hospitals to carry out the collection of evidence, such as blood and semen samples in sexual assault and rape cases. The money for this initiative will come from the Nirbhaya Fund.

These changes are: (1) the definition of rape was expanded to include oral sex as well as the insertion of an object or any other body part into a woman’s vagina, urethra or anus, (2) the punishment for rape was made stricter, (3) gang-rape should entail punishment of no less than 20 years, which may extend to life and if gang-rape is followed by death, that should be punished with life imprisonment, (4) an improved standard of consent (consent to be unequivocal and clearly communicated, and lack of physical resistance is not to be assumed to be consent), (5) onus of registering a case of rape is put on the police (police officers failing to register a case of rape reported or attempting to abort investigation are to face punishment; also, police officers with “reputations of outstanding ability and character” were to be placed at the higher levels of the police force).

Several other recommendations related to ensuring that women can lead a life of dignity and security, that they not be humiliated in courts to prove that rape had happened, and not be subject to voyeurism, unwanted sexual advances or acid attacks, were also passed. Some of the suggestions, such as criminalizing marital rape, were not accepted.

By comparison, in the United States, such procedures are well-established. The Violence Against Women Act in the United States requires states to provide sexual assault forensic exams free of charge if they want to remain eligible for critical anti-crime grant funding. One major issue in the United States, is the backlog of rape kits, which slows the investigative and judicial process. However, states are taking action and some are mandating testing of newly collected kits.
References


Ayoub PM and Garretson J (2014). “Getting the message out: Media context and global changes in attitudes toward homosexuality,” *Comparative Political Studies*, Volume: 50 issue: 8, page(s): 1055-1085


Figures

Figure 2: Descriptive Pictures of Selected Outcome Variables

Note: Outcome variables are in logs of ‘outcome per 100,000’; for example, Rape = log of rape reported per 100,000. MSH = Molestation & sexual harassment, MCH = Murder & culpable homicide, Accident = Road accident death.
Figures 3: SCM Estimates of the Impact of 2012 Nirbhaya Gang Rape on Reporting of Rape, and Molestation and Sexual Harassment

Note: Purely for visual clarity in the placebo pictures (on the right), following Abadie Diamond and Hainmueller (2010), we exclude the units with pre-intervention RMSPE 90 times larger than that of the treated unit.
Figures 4: SCM Estimates of the Impact of 2012 Nirbhaya Gang Rape on Reporting of Murder and Culpable Homicide, and Road Accident Deaths

Note: Purely for visual clarity in the placebo pictures (on the right), following Abadie Diamond and Hainmueller (2010), we exclude the units with pre-intervention RMSPE 90 times larger than that of the treated unit.
### Table 1: Summary Statistics

#### Outcomes: Reporting & arrests per 100,000 (2001-2015)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Mean</th>
<th>Std dev</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rape per 100,000: reporting</td>
<td>2.54</td>
<td>1.74</td>
<td>0.09</td>
<td>10.14</td>
<td>4.93</td>
</tr>
<tr>
<td>Molestation &amp; sexual harassment per 100,000: reporting</td>
<td>5.18</td>
<td>3.90</td>
<td>0.05</td>
<td>23.01</td>
<td>10.21</td>
</tr>
<tr>
<td>Murder &amp; culpable homicide per 100,000: reporting</td>
<td>3.59</td>
<td>1.54</td>
<td>1.12</td>
<td>10.77</td>
<td>3.71</td>
</tr>
<tr>
<td>Road accident deaths per 100,000</td>
<td>10.31</td>
<td>5.53</td>
<td>1.61</td>
<td>31.09</td>
<td>12.27</td>
</tr>
<tr>
<td>Arrests per 100,000: rape</td>
<td>3.03</td>
<td>2.13</td>
<td>0.09</td>
<td>16.90</td>
<td>5.70</td>
</tr>
<tr>
<td>Arrests per 100,000: molestation &amp; sexual harassment (MSH)</td>
<td>6.41</td>
<td>5.16</td>
<td>0.00</td>
<td>27.28</td>
<td>11.04</td>
</tr>
</tbody>
</table>

#### Outcomes: Convictions per 100,000 (2006-2015)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Mean</th>
<th>Std dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rape cases chargesheeted per 100,000</td>
<td>1.60</td>
<td>1.84</td>
<td>0.00</td>
<td>9.13</td>
</tr>
<tr>
<td>MSH cases chargesheeted per 100,000</td>
<td>3.16</td>
<td>3.79</td>
<td>0.00</td>
<td>17.72</td>
</tr>
<tr>
<td>Convictions per 100,000: rape</td>
<td>0.50</td>
<td>1.08</td>
<td>0.00</td>
<td>10.86</td>
</tr>
<tr>
<td>Convictions per 100,000: MSH</td>
<td>0.78</td>
<td>1.28</td>
<td>0.00</td>
<td>10.94</td>
</tr>
</tbody>
</table>

#### Predictors: Characteristics (2001-2011)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Mean</th>
<th>Std dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female police per 100,000</td>
<td>10.49</td>
<td>11.72</td>
<td>0.00</td>
<td>77.69</td>
</tr>
<tr>
<td>Police per 100,000 people</td>
<td>281.90</td>
<td>223.68</td>
<td>37.83</td>
<td>991.67</td>
</tr>
<tr>
<td>Women's share of higher education enrollment</td>
<td>0.43</td>
<td>0.08</td>
<td>0.18</td>
<td>0.69</td>
</tr>
<tr>
<td>Higher education enrollment (% of population)</td>
<td>1.53</td>
<td>0.98</td>
<td>0.47</td>
<td>7.49</td>
</tr>
<tr>
<td>Per capita GDP (current Rs lakh)</td>
<td>0.46</td>
<td>0.32</td>
<td>0.07</td>
<td>2.40</td>
</tr>
<tr>
<td>Per capita GDP secondary sector (current Rs lakh)</td>
<td>0.13</td>
<td>0.13</td>
<td>0.01</td>
<td>0.96</td>
</tr>
<tr>
<td>All crimes against women: arrests per 100,000</td>
<td>22.39</td>
<td>13.32</td>
<td>1.33</td>
<td>78.18</td>
</tr>
<tr>
<td>Male age 15-35 (% of population)</td>
<td>17.94</td>
<td>3.65</td>
<td>1.77</td>
<td>30.92</td>
</tr>
<tr>
<td>Annual population growth rate</td>
<td>1.08</td>
<td>0.11</td>
<td>0.61</td>
<td>1.61</td>
</tr>
<tr>
<td>Growth in urban population 2001-2011</td>
<td>1.20</td>
<td>0.28</td>
<td>1.00</td>
<td>2.57</td>
</tr>
<tr>
<td>Annual per capita GDP growth rate</td>
<td>1.99</td>
<td>0.93</td>
<td>0.95</td>
<td>7.01</td>
</tr>
<tr>
<td>All crimes per 100,000: reporting</td>
<td>184.17</td>
<td>89.72</td>
<td>43.20</td>
<td>513.81</td>
</tr>
<tr>
<td>All crimes: arrests per 100,000</td>
<td>237.91</td>
<td>125.52</td>
<td>36.02</td>
<td>670.82</td>
</tr>
<tr>
<td>Loksabha election: ratio of votes for female to male candidate (%)</td>
<td>8.40</td>
<td>10.74</td>
<td>0.00</td>
<td>58.01</td>
</tr>
</tbody>
</table>

Note: (a) The donor pool consists of the following 31 states/territories: Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chandigarh, Chhattisgarh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu And Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Puducherry, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Uttarakhand, West Bengal. (b) The following variables have only two data points over the period 2001-2011: male age 15-35 (% of population), growth in urban population 2001-2011, Loksabha election: ratio of votes for female to male candidate. (c) The election refers to the Loksabha (parliamentary) election. (e) In the SCM analysis, the outcome variables and the monetary variables are used in logarithm. (f) Rs (=Rupees) is the Indian currency and 1 Lakh = 100,000.
Table 2: SCM Estimate of the Impact of 2012 Nirbhaya Gang Rape on Reporting, Arrests, Charge sheeting and Convictions

<table>
<thead>
<tr>
<th></th>
<th>Reporting</th>
<th></th>
<th>Arrests</th>
<th></th>
<th>Chargesheets</th>
<th></th>
<th>Convictions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rape</td>
<td>MSH</td>
<td>MCH</td>
<td>Accident</td>
<td>Rape</td>
<td>MSH</td>
<td>Rape</td>
<td>MSH</td>
</tr>
<tr>
<td>Pre-int RMSPE to mean ratio</td>
<td>0.02</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.02</td>
<td>0.00</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>Estimated impact</td>
<td>0.79</td>
<td>1.55</td>
<td>0.10</td>
<td>-0.21</td>
<td>0.69</td>
<td>1.56</td>
<td>0.63</td>
<td>0.67</td>
</tr>
<tr>
<td>DID rank</td>
<td>1</td>
<td>1</td>
<td>17</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>P-value: DID</td>
<td>0.00</td>
<td>0.00</td>
<td>0.50</td>
<td>0.25</td>
<td>0.06</td>
<td>0.03</td>
<td>0.06</td>
<td>0.13</td>
</tr>
<tr>
<td>Donor probability</td>
<td>0.03</td>
<td>0.03</td>
<td>0.53</td>
<td>0.28</td>
<td>0.09</td>
<td>0.06</td>
<td>0.09</td>
<td>0.16</td>
</tr>
</tbody>
</table>

**Donor pool weight**
- Andaman & Nicobar Islands: 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.01, 0.01
- Andhra Pradesh: 0.07, 0.10, 0.05, 0.03, 0.24, 0.04, 0.00, 0.35, 0.00, 0.00
- Arunachal Pradesh: 0.00, 0.00, 0.05, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00
- Chandigarh: 0.27, 0.20, 0.10, 0.26, 0.17, 0.03, 0.24, 0.46, 0.27, 0.00
- Chhattisgarh: 0.50, 0.00, 0.00, 0.00, 0.22, 0.00, 0.68, 0.00, 0.00, 0.00
- Goa: 0.00, 0.19, 0.06, 0.23, 0.00, 0.24, 0.00, 0.00, 0.00, 0.00
- Haryana: 0.00, 0.00, 0.30, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00
- Jammu And Kashmir: 0.00, 0.00, 0.01, 0.00, 0.00, 0.02, 0.00, 0.00, 0.00, 0.00
- Kerala: 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.23, 0.00, 0.00
- Madhya Pradesh: 0.00, 0.00, 0.00, 0.00, 0.38, 0.00, 0.00, 0.00, 0.25, 0.24
- Maharashtra: 0.00, 0.00, 0.00, 0.49, 0.00, 0.25, 0.00, 0.00, 0.00, 0.00
- Mizoram: 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.24, 0.00, 0.00
- Orissa: 0.00, 0.13, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00
- Puducherry: 0.00, 0.34, 0.10, 0.00, 0.00, 0.43, 0.00, 0.00, 0.00, 0.00
- Sikkim: 0.01, 0.03, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.08
- Tripura: 0.16, 0.00, 0.20, 0.00, 0.00, 0.00, 0.08, 0.00, 0.00, 0.22
- Uttarakhand: 0.00, 0.00, 0.12, 0.00, 0.00, 0.00, 0.00, 0.00, 0.00, 0.45

Notes: (a) Outcome variables are in logs of ‘outcome per 100,000’; for example, Rape = log of rape reported per 100,000. (b) MSH = Molestation & sexual harassment, MCH = Murder & culpable homicide, Accident = Road accident death. (c) RMSPE = Root mean squared prediction error. (d) The donor pool consists of 31 states/territories. Only donor units with weight $\geq 0.01$ for at least one of the outcomes are reported. (e) DID = post- and pre-intervention difference in difference.
Table 3: SCM Estimate of the Impact of 2012 Nirbhaya Gang Rape on Reporting, Arrests, Charge sheeting and Convictions, with Alternative Set of Predictors and Alternative Set of Donor Pool

<table>
<thead>
<tr>
<th></th>
<th>Reporting</th>
<th>Arrests</th>
<th>Chargesheets</th>
<th>Convictions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Pre-int RMSPE to mean ratio</td>
<td>0.02</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Estimated impact</td>
<td>0.86</td>
<td>1.54</td>
<td>0.16</td>
<td>-0.14</td>
</tr>
<tr>
<td>DID rank</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>P-value: DID</td>
<td>0.00</td>
<td>0.00</td>
<td>0.28</td>
<td>0.28</td>
</tr>
<tr>
<td>Donor probability</td>
<td>0.03</td>
<td>0.03</td>
<td>0.31</td>
<td>0.31</td>
</tr>
</tbody>
</table>

Panel A: Alternative Donor Pool - Excluding Adjacent States

<table>
<thead>
<tr>
<th></th>
<th>Reporting</th>
<th>Arrests</th>
<th>Chargesheets</th>
<th>Convictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-int RMSPE to mean ratio</td>
<td>0.02</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Estimated impact</td>
<td>0.76</td>
<td>1.71</td>
<td>0.09</td>
<td>-0.21</td>
</tr>
<tr>
<td>DID rank</td>
<td>1</td>
<td>1</td>
<td>14</td>
<td>8</td>
</tr>
<tr>
<td>P-value: DID</td>
<td>0.00</td>
<td>0.00</td>
<td>0.43</td>
<td>0.23</td>
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<tr>
<td>Donor probability</td>
<td>0.03</td>
<td>0.03</td>
<td>0.47</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Notes: (a) Panel A: SCM estimates with an alternative (to that used in Table 2) set of predictors. The donor pool consists of exactly the same 31 states/territories used in Table 2. (b) Panel B: SCM using the same set of predictors but a smaller donor pool. The donor pool consists of 29 states/territories; the two states that surround Delhi, Haryana and Uttar Pradesh, are dropped from the donor pool. (c) Outcome variables are in logs of 'outcome per 100,000'; for example, Rape = log of rape reported per 100,000. (d) MSH = Molestation & sexual harassment, MCH = Murder & culpable homicide, Accident = Road accident death. (e) RMSPE = Root mean squared prediction error. (f) DID = post- and pre-intervention difference in difference.
Table 4: SCM Estimate of the Impact of 2012 Nirbhaya Gang Rape on Reporting, Arrests, Charge sheeting and Convictions - Pre-intervention Characteristics Match

<table>
<thead>
<tr>
<th></th>
<th>Reporting</th>
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<th>Arrests</th>
<th>Chargesheets</th>
<th>Convictions</th>
<th>Actual De Ihi</th>
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<tbody>
<tr>
<td></td>
<td>Rape</td>
<td>MSH</td>
<td>MCH</td>
<td>Accident</td>
<td>Rape</td>
<td>MSH</td>
</tr>
<tr>
<td>Female police per 100,000</td>
<td>2.06</td>
<td>2.38</td>
<td>2.14</td>
<td>2.43</td>
<td>1.21</td>
<td>2.34</td>
</tr>
<tr>
<td>Police per 100,000</td>
<td>5.33</td>
<td>5.38</td>
<td>5.54</td>
<td>5.36</td>
<td>4.99</td>
<td>5.31</td>
</tr>
<tr>
<td>Women share higher education</td>
<td>0.44</td>
<td>0.47</td>
<td>0.45</td>
<td>0.47</td>
<td>0.41</td>
<td>0.48</td>
</tr>
<tr>
<td>Higher education</td>
<td>1.97</td>
<td>2.65</td>
<td>2.04</td>
<td>2.46</td>
<td>2.03</td>
<td>2.38</td>
</tr>
<tr>
<td>Per capita GDP</td>
<td>-0.89</td>
<td>-0.39</td>
<td>-0.64</td>
<td>-0.31</td>
<td>-1.07</td>
<td>-0.32</td>
</tr>
<tr>
<td>PC GDP secondary sector</td>
<td>-2.31</td>
<td>-1.56</td>
<td>-1.93</td>
<td>-1.64</td>
<td>-2.56</td>
<td>-1.30</td>
</tr>
<tr>
<td>Male age 15-35</td>
<td>18.38</td>
<td>17.69</td>
<td>18.67</td>
<td>18.64</td>
<td>19.32</td>
<td>17.70</td>
</tr>
<tr>
<td>Population growth rate</td>
<td>1.12</td>
<td>1.09</td>
<td>1.09</td>
<td>1.13</td>
<td>1.04</td>
<td>1.09</td>
</tr>
<tr>
<td>Urban population growth</td>
<td>1.22</td>
<td>1.17</td>
<td>1.23</td>
<td>1.14</td>
<td>1.16</td>
<td>1.15</td>
</tr>
<tr>
<td>PC GDP growth rate</td>
<td>1.99</td>
<td>2.03</td>
<td>2.01</td>
<td>2.08</td>
<td>1.88</td>
<td>2.03</td>
</tr>
</tbody>
</table>

Panel A: Main Estimates

Panel B: Estimates with Alternative Set of Predictors

Notes: (a) The table reports the characteristics match in underlying the SCM estimates. (b) Panel A corresponds to the estimates presented in Table 2, Panel B corresponds to the estimates presented in Table 3 (Panel A). (c) Outcome variables are in logs of ‘outcome per 100,000’; for example, Rape = log of rape reported per 100,000. (d) Detailed descriptions and names of the variables are in Table 1. (e) The election refers to the Loksabha (parliamentary) election. (f) The monetary variables are in logarithm.
Table 5: SCM Estimate of the Impact of 2012 Nirbhaya Gang Rape on Reporting, Arrests, Charge sheeting and Convictions, with Donor Pool of Most Urbanized States/UTs

<table>
<thead>
<tr>
<th>(1) Reporting</th>
<th>(2) Arrests</th>
<th>(3) Chargesheets</th>
<th>(4) Convictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rape</td>
<td>MSH</td>
<td>MCH</td>
<td>Accident</td>
</tr>
<tr>
<td>Pre-int RMSPE to mean ratio</td>
<td>0.14</td>
<td>0.14</td>
<td>0.05</td>
</tr>
<tr>
<td>Estimated impact</td>
<td>0.8</td>
<td>1.43</td>
<td>0.05</td>
</tr>
<tr>
<td>DID rank</td>
<td>1</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>P-value: DID</td>
<td>0</td>
<td>0</td>
<td>0.67</td>
</tr>
<tr>
<td>Donor probability</td>
<td>0.05</td>
<td>0.05</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Notes: (a) SCM estimates with top 20 urbanized states/UTs based on the ranking of population size, population density and share of urban population: Tamil Nadu, West Bengal, Maharashtra, Kerala, Chandigarh, Uttar Pradesh, Punjab, Puducherry, Karnataka, Gujarat, Andhra Pradesh, Bihar, Haryana, Goa, Madhya Pradesh, Jharkhand, Rajasthan, Uttarakhand, Assam and Orissa. (b) The predictors are the same as the main estimates. (c) Outcome variables are in logs of ‘outcome per 100,000’; for example, Rape = log of rape reported per 100,000. (d) MSH = Molestation & sexual harassment, MCH = Murder & culpable homicide, Accident = Road accident death. (e) RMSPE = Root mean squared prediction error. (f) DID = post- and pre-intervention difference in difference.

Table 6: Time Placebo Test: SCM Estimate of the Impact of 2012 Nirbhaya Gang Rape on Reporting, Arrests, Chargesheetings and Convictions

<table>
<thead>
<tr>
<th>(1) Reporting</th>
<th>(2) Arrests</th>
<th>(3) Chargesheets</th>
<th>(4) Convictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rape</td>
<td>MSH</td>
<td>MCH</td>
<td>Accident</td>
</tr>
<tr>
<td>Pre-int RMSPE to mean ratio</td>
<td>0.00</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>Estimated impact</td>
<td>-0.42</td>
<td>-0.05</td>
<td>0.17</td>
</tr>
<tr>
<td>DID rank</td>
<td>5</td>
<td>29</td>
<td>15</td>
</tr>
<tr>
<td>P-value: DID</td>
<td>0.13</td>
<td>0.88</td>
<td>0.44</td>
</tr>
<tr>
<td>Donor probability</td>
<td>0.16</td>
<td>0.91</td>
<td>0.47</td>
</tr>
</tbody>
</table>

Notes: (a) Time placebo test for 2001-2011, with a placebo intervention in 2008. (b) The donor pool and the set of predictors are the same as those in the main estimates in Table 2. (c) Outcome variables are in logs of ‘outcome per 100,000’; for example, Rape = log of rape reported per 100,000. (d) MSH = Molestation & sexual harassment, MCH = Murder & culpable homicide, Accident = Road accident death. (e) RMSPE = Root mean squared prediction error. (f) DID = post- and pre-intervention difference in difference.